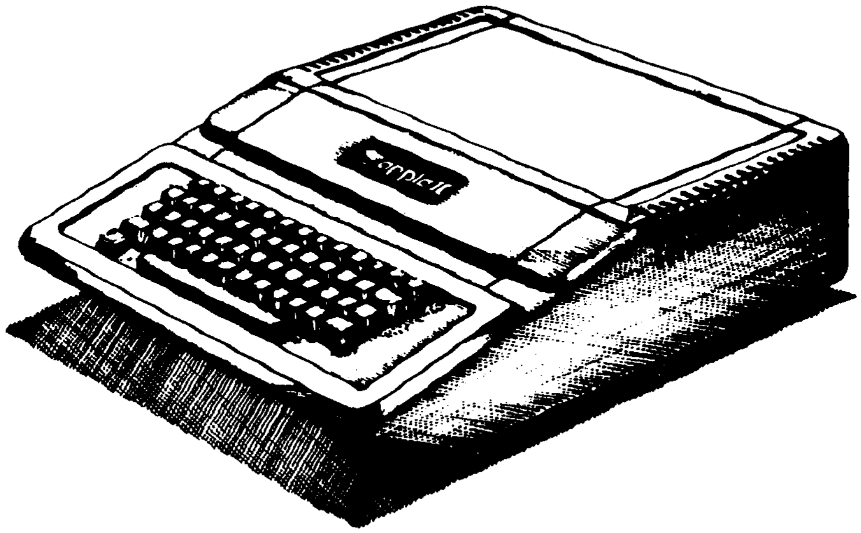

Apple][Computer Family Information

AppleSOFT BASIC Info:
AppleSoft Internal Entry Points

Crossley - Apple Orchard Mar/Apr 1980

Document # 43

Applesoft Internal Entry Points

By John Crossley (from the Apple Orchard)

CONTENTS

INTRODUCTION

This is a guide for the 6502 machine language programmer who wants to take advantage of the various subroutines in Applesoft. The addresses included assume that the user has an Apple II Plus, an Applesoft firmware card, or a Language Card. This list is believed to be correct, but be warned that it was a spare time project. If you find errors, contact your user group. This data is meant for the experienced programmer, *NOT THE BEGINNER.* Read your Applesoft Reference manual for more information.

Take special note of CHRGET. This subroutine is the heart of Applesoft. When Applesoft wants the next character or an instruction it points TXTPTR at the program or the input buffer and JSRs to CHRGET. When Applesoft READs DATA, TXTPTR is temporarily set to the last used DATA statement.

LABELS	HEX ADDR	
A1	3C,3D	Apple monitor pointer for cassette routines
A2	3E,3F	Apple monitor pointer for cassette routines
ARYTAB	6B,6C	Start of array storage
BUF	200,2FF	Line input buffer
CHARAC	OD	Used by STRLT2
CURLIN	75,76	The current line number (=FF if in direct mode.
DATLIN	7B,7C	Line number of current DATA statement
DATPTR	7D,7E	The address the next DATA comes from
DSCTMP	9D,9E, 9F	Temp string descriptor
ENDCHR	OE	Used by SRTLT2
ERRFLG	D8	$80 if ONERR active
ERRLIN	DA,DB	Line number where error occurred
ERRNUM	DE	Which error occurred
ERRPOS	DC,DD	TXTPTR save for HNDLERR
ERRSTK	DF	Stack pointer value before error
FBUFFR	100-110	FOUT buffer
FIRST	F0	Used by PLOTFNS
FORPNT	85,86	General pointer. see COPY
FRESPC	71,72	Temp pointer for string storage routines
FRETOP	6F,70	Bottom of string storage
H2	2C	Used by PLOTFNS
HIGHDS	94,95	Used by BLTU
HIGHTR	96,97	Used by BLTU
HPAG	E6	HIRES page to plot on. ($20 for HGR, $40 for HGR2)
INDEX	5E,5F	Temp pointer for moving strings
INVFLG	32	Mask for inverse output
LASTPT	53	Last used temp string pointer
LINNUM	50,51	General purpose 16 bit number location
LOWTR	9B,9C	General purpose register. GETARYPT FINDLN, BLTU
MEMSIZ	73,74	HIMEM
OLDLIN	77,78	Last line executed
ORMASK	F3	Mask for flashing output
PRGEND	AF,BO	The end of the program text
REMSTK	F8	Stack pointer saved before each statement
ROT	F9	
SCALE	E7	
SPDBYT	F1	Speed = delay number
STREND	6D,6E	The top of array storage
STRNG1	AB,AC	Pointer to a string. See MOVINS
STRNG2	AD,AE	Pointer to a string. See STRLT2
SUBFLG	14	$00 subscripts allowed, $80=no subscripts
TEMPPT	52	Last used temporary string descriptor
TXTPTR	B8,B9	Next byte to be read
TXTTAB	67,68	Start of program text
V2	2D	Used by PLOTFNS
VALTYP	11	Flags last FAC operation 0=number, FF= string
VARPNT	83,84	Used by PTRGET
VARTAB	69,6A	Start of variable storage

APPLESOFT INTERNAL ENTRY POINTS

ABBREVIATIONS

A	the 6502 accumulator
X	the 6502 X register
Y	the 6502 Y register
Z	the zero flag of the 6502 status register
C	the carry flag of the 6502 status register

A,X is a 16 bit number where A has the most significant byte and X the least significant byte.
(Y,A) is the number or string whose address is in Y and A with the msb in Y and the lsb in A.

FAC	the floating point accumulator
ARG	the ARGument register
msb	most significant bit or byte
lsb	least significant bit or byte
eol	end of line token ($00)

TXTPTR INPUT ROUTINES

CHRGET 00B1(177) (Increment TXTPTR)
CHRGOT 00B7(183) (No increment)

These routines load A from TXTPTR and set certain 6502 status flags. X and Y are not changed.

On exit:

A=the character
Z is set if A is ':' or eol ($3A or $00)
C is clear if A is an ASCII number ('0' to '9').

TXTPTR TO INTEGER

LINGET DAOC (55820)

Read a line number (integer 0 to 63999) from TXTPTR into LINNUM. LIN GET assumes that the 6502 registers and A have been set up by the CHRGET that fetched the first digit. Normally exits through CHRGET which fetches the character after the number. If the number is greater than 63999 then LINGET exits via SYN TAX ERROR. LINNUM is zero if there is no number at TXTPTR.

GTBYTC E6F5 (59125)

JSR to CHRGET to gobble a character and fall into GETBYT.

GETBYT E6F8 (59128)

Evaluates the formula at TXTPTR, leaves the result in FAC, and falls into CONINT. On the entry TXTPTR points to the first character of the formula.

PLOTFNS F1EC (61932)

Get 2 LO-RES plotting coordinates (0-47,0-47) from TXTPTR separated by a comma. On entry TXTPTR points to the first character of the formula for the first number. PLOT FNS puts the first number in FIRST and the second number in H2 and V2.

HFNS F6B9 (63161)

Get HI-RES plotting coordinates (0-279,0-191) from TXTPTR. On entry TXTPTR points to the first character of the formula for the first number. Leaves the 6502 registers set up for HPOSN.

On exit:

A=vertical coordinate
X=lsb of horizontal coordinate
Y=msb of horizontal coordinate.

FLOATING POINT MATH PACKAGE

INTRODUCTION

This is the number format used throughout Applesoft:

The exponent is a single byte signed number (EXP) in excess $80 form (the signed value has $80 added to it). The mantissa is 4 bytes (HO, MOH, MO, LO). The binary point is assumed to be to the right of the most significant bit. Since in binary floating point notation the msb is always 1, the number's sign is kept there when the number is stored in packed form in memory. While in the math package the sign is kept in a separate byte (SGN) where only bit 7 is significant. If the exponent is zero, then the number is zero although the mantissa isn't necessarily zero.

Examples:

	EXP	HO	MOH	MO	LO	SGN
Packed format						
-10	84	A0	00	00	00	
10	84	20	00	00	00	
FAC format						
-10	84	A0	00	00	00	FF
10	84	A0	00	00	00	00

Arithmetic routine calling conventions:

For single argument functions:
The argument is in FAC.
The result is left in FAC.

For two argument functions:
The first argument is in ARG (see CONUPK).
The second argument is in FAC.
The result is left in FAC.

FLOATING POINT REGISTERS

NOTE: many of the following locations are used for other things when not being used by the floating point math package.

	FAC	ARG	TEMP1	TEMP2	TEMP3	RND
EXP	9D	A5	93	98	8A	C9
HO	9E	A6	94	99	8B	CA
MOH	9F	A7	95	9A	8C	CB
MO	A0	A8	96	9B	8D	CC
LO	A1	A9	97	9C	8E	CD
SGN	A2	AA	(packed format)			

FLOATING POINT OPERATORS

FMULT E97F (59775)
Move the number in memory pointed to by Y,A into ARG and fall into . . .
FMULTT E982 (59778)
Multiply FAC and ARG. On entry A and Z reflect FACEXP.

FDIV EA66 (60006)
Move the number in memory pointed to by Y,A into ARG and fall into . . .
FIDVT EA69 (60009)
Divide ARG by FAC. On entry A and Z reflect FACEXP.

FADD E7BE (59326)
Move the number in memory pointed to by Y,A into ARG and fall into . . .
FADDT E7C1 (59329)
Add FAC and ARG. On entry A and Z reflect FACEXP.

FSUB E7A7 (59303)
Move the number in memory pointed to by Y,A, into ARG and fall into . . .
FSUBT E7AA (59306)
Subtract FAC from ARG. On entry A and Z reflect FACEXP.

FPWRT EE97 (61079)
Exponentiation (ARG to the FAC power). On entry A and Z should reflect the value of FACEXP.

NOTE: Most FAC move routines set up A and Z to reflect FACEXP but a LDA $9D will insure the proper values.

FLOATING POINT CONSTANTS

NOTE: The following addresses point to numbers in packed form suitable for use by CONUPK and MOVMF.

RND	00C9	(201)
1/4	F070	(61552)
1/2	EE64	(61028)
-1/2	E937	(59703)
1	E913	(59667)
10	EA50	(59984)

SQR(.5)	E92D	(59693)
SQR(2)	E932	(59698)
LN(2)	E93C	(59708)
LOG(e)2	EEDB	(61147)
PI/2	F063	(61539)
PI*2	F06B	(61547)
-32768	E0FE	(57598)
1000000000	ED14[1E9]	(60692[489])

FLOATING POINT FUNCTIONS

SGN EB90 (60304)

Calls SIGN and floats the result in the FAC.

On exit:

FAC=1 If FAC was greater than 0
FAC=0 If FAC was equal to 0
FAC=1 If FAC was less than 0

ABS EBAF (60335)

Absolute value of FAC

INT EC23 (60451)

Greatest integer value of FAC. Uses QINT and floats the result.

SQR EE8D (61069)

Take the square root of FAC

LOG E941 (59713)

Log base e of FAC

EXP EF09 (61193)

Raise e to the FAC power

RND EFAE (61358)

Form a 'random' number in FAC

COS EFEA (61418)

COS(FAC)

SIN EFF1 (61425)
SIN(FAC)

TAN F03A (61498)
TAN(FAC)

ATN F09E (61598)
ARCTAN(FAC)

FLOATING POINT NUMBER MOVE ROUTINES

MOVFM EAF9 (60153)

Move memory pointed to by Y,A, into FAC. On exit A and Z reflect FACEXP.

MOV2F EB1E (60190)

Pack FAC and move it into temporary register 2. Uses MOVMF. On exit A and Z reflect FACEXP.

MOV1F EB21 (60193)

Pack FAC and move it into temporary register 1. Uses MOVMF. On exit A and Z reflect FACEXP.

MOVML EB23 (60195)

Pack FAC and move it into zero page area pointed to by X. Uses MOVMF. On exit A and Z reflect FACEXP.

MOVMF EB2B (60203)

Pack FAC and move it into memory pointed to by Y,X. On exit A and Z reflect FACEXP.

MOVFA EB53 (60243)

Move ARG into FAC. On exit A= FACEXP and Z is set.

MOVAF EB63 (60259)
Move FAC into ARG. On exit A= FACEXP and Z is set.

CONUPK E9E3 (59875)

Load ARG from memory pointed to by Y,A. On exit A and Z reflect FACEXP.

SUMMARY OF MOVES

FAC	=>(Y,A)	EB2B
FAC	=>(0,X)	EB23
FAC	=>TEMP 1	EB21
FAC	=>TEMP 2	EB1E
FAC	=>ARG	EB63
(Y,A)	=>FAC	EAF9
(Y,A)	=>ARG	E9E3
ARG	=>FAC	EB53

FLOATING POINT UTILITIES

SIGN EB82 (60290)

Set A according to the value of FAC.

On exit:

A=1 if FAC is positive.
A=0 if FAC=0
A=FF if FAC is negative

FOUT ED34 (60724)

Creates a string in FBUFFR equivalent to the value of FAC. On exit Y,A points to the string. The string ends in a zero. FAC is scrambled. Use STROUT to then print the number.

FCOMP EBB2 (60338)

Compare FAC and a packed number in memory pointed to by Y,A.

On exit:

A=1 if (Y,A)<FAC
A=0 if (Y,A) =FAC
A=FF if (Y,A)>FAC

NEGOP EED0 (61136)

FAC=-FAC

FADDH E7A0 (59296)

Add 1/2 to FAC

DIV10 EA55 (59989)

Divide FAC by 10. Returns positive numbers only.

MUL10 EA39 (59961)

Multiply FAC by 10. Works for both positive and negative numbers.

CONVERSIONS INTEGER TO FAC

SNGFLT E301 (58113)

Float the unsigned integer in Y.

GIVAYF E2F2 (58098)

Float the signed integer in A,Y.

FLOAT EB93 (60307)

Float the signed integer in A.

FAC TO INTEGER

CONINT E6FB (59131)

Convert FAC into a single byte number in X and FACLO. Normally exits through CHRGET. If FAC is greater than 255 or less than 0 then CONINT exits via ILLEGAL QUANTITY ERROR.

AYINT E10C (57612)
If FAC is less than +32767 and greater than -32767 then perform QINT.

QINT EBF2 (60402)

Quick greatest integer function. Leaves INT(FAC) in FACHO, MO, LO signed. QINT assumes FAC 2 to the 23rd (8388608 decimal)

GETADR E752 (59218)

Convert the number in FAC (-65535 to +65535) into a 2 byte integer (0-65535) in LINNUM.

GETNUM E746 (59206)

Read a 2 byte number into LINNUM from TXTPTR, check for a comma, and get a single byte number in X. On entry TXTPTR points to the first character of the formula for the first number, Uses FRMNUM, GETADR, CHKCOM, GETBYT.

COMBYTE E74C (59212)

Check for a comma and get a byte in X. uses CHKCOM, GETBYT. On entry TXTPTR points to the comma.

TXTPTR TO FAC

FRMEVL DD7B (56699)

Evaluate the formula at TXTPTR using CHRGET and leave the result in FAC. On entry TXTPTR points to the first character of the formula. This is the main subroutine for the commands that use formulas and works for both strings and numbers. If the formula is a string literal, FRMEVL gobbles the opening quote and executes STRLIT and ST2TXT.

APPLESOFT INTERNAL ENTRY POINTS

FRMNUM DD67 (56679)

Evaluate the formula at TXTPTR, put it in FAC, and make sure it's a number. On entry TXTPTR points to the first character of the formula. TYPE MISMATCH ERROR results if the formula is a string.

FIN EC4A (60490)

Input a floating point number into FAC from CHRGET. FIN assumes that the 6502 registers and A have been set up by the CHRGET that fetched the first digit.

STRING UTILITIES

In Applesoft strings have three parts: the descriptor, a pointer to the descriptor, and the ASCII string. A string descriptor contains the length of the string and the address of its first character. See page 137 of the Applesoft Reference Manual. Through most of the routines the descriptor is left in memory and a pointer is kept in FAC. The pointer is the address of the descriptor. The actual string could be anywhere in memory. In a program, 10 A$="HI" will leave a descriptor pointing into the program text.

CAT E597 (58775)

Concatenate two strings. FACMO,LO point to the first string's descriptor and TXTPTR points to the '+' sign.

STRINI E3D5 (58325)

Get space for creation of a string and create a descriptor for it in DSCTMP. On entry A=length of the string.

STRSPA E3DD (58333)

JSR to GETSPA and store the pointer and length in DSCTMP.

COPY DAB7 (55991)

Free the string temporary pointed to by Y,A and move it to the memory pointed to by FORPNT.

MOVINS E5D4 (58836)

Move a string whose descriptor is pointed to by STRNG1 to memory pointed to by FRESPA.

MOVSTR E5E2 (58850)

Move the string pointed to by Y,X with a length of A to memory pointed to by FRESPA.

STRTXT DE81 (56961)

Sets Y,A equal to TXTPTR plus C and falls into STRLIT.

STRLIT E3E7 (58343)

Store a quote in ENDCHR and CHARAC so that STRLT2 will stop on it.

STRLT2 E3ED (58349)

Take a string literal whose first character is pointed to by Y,A and build a descriptor for it. The descriptor is built in DSCTMP, but PUTNEW transfers it into a temporary and leaves a pointer to it in FACMO,LO. Characters other than zero that terminate the string should be saved in CHARAC and ENDCHR. Leading quotes should be skipped before STRLT2. On exit the character after the string literal is pointed to by STRNG2. Falls into PUTNEW.

PUTNEW E42A (58410)

Some string function is returning with a result in DSCTMP. Move DSCTMP to a temporary descriptor, put a pointer to the descriptor in FACMO,LO, and flag the result as a string.

GETSPA E452 (58450)

Get space for character string. May force garbage collection. Moves FRESPC and FRETOP down enough to store the string. On entry A=number of characters. Returns with A unaffected and pointer to the space in Y,X, FRESPC, and FRETOP. If there's no space then OUT OF MEMORY error.

FRESTR E5FD (58877)

Make sure that the last FAC result was a string and fall into

FREFAC E600 (58880)

Load the string descriptor pointer in FACMO, LO into Y, A and fall into FRETMP.

FRETMP E604 (58884)

Free up a temporary string. On entry the pointer to the descriptor is in Y,A. A check is made to see if the descriptor is a temporary one allocated by PUTNEW. If so, the temporary is freed up by updating TEMPPT. If a temp is freed up a further check is made to see if the string is the lowest in memory. If so, that area of memory is freed up also by updating FRETOP. On exit the address of the string is in INDEX and Y,X and the string length is in A.

FRETMS E635 (58933)

Free the temporary descriptor without freeing up the string. On entry Y,A point to the descriptor to be freed. On exit Z is set if anything was freed.

DEVICE INPUT ROUTINES

INLIN D52C (54572) (No prompt)
INLIN+2 D52E (54574) (Use character in X for prompt)

Input a line of text from the current input device into the input buffer, BUF, and fall into GDBUFS.

GDBUFS D539 (54985)

Puts a zero at the end of the input buffer, BUF, and masks off the msb on all bytes.

On entry:

X=the end of the input line

On exit:

A=0
X=FF
Y=1

INCHR D553 (54611)

Get one character from the current input device in A and mask off the msb. INCHR uses the main Apple input routines and supports normal handshaking.

DEVICE OUTPUT ROUTINES

STROUT DB3A (56122)

Print string pointed to by Y,A. The string must end with a zero or a quote.

STRPRT DB3D (56125)

Print a string whose descriptor is pointed to by FACMO, FACLO.

OUTDO DB5C (56156)

Print the character in A. INVERSE, FLASH, and NORMAL in effect.

CRDO DAFB (56059)

Print a carriage return.

OUTSPC DB57 (56151)

Print a space.

OUTQST DB5A (56154)

Print a question mark.

INPRT ED19 (60697)

Print "IN" and the current line number from CURLIN. Uses LINPRT.

LINPRT ED24 (60708)

Prints the 2 byte unsigned number in X,A.

PRNTFAC ED2E (60718)

Prints the current value of FAC. FAC is destroyed. Uses FOUT and STROUT.

INTERNAL LOCATOR ROUTINES

PTRGET DFE3 (57315)

Read a variable name from CHRGET and find it in memory. On entry TXTPTR points to the first character of the variable name. On exit the address to the value of the variable is in VARPNT and Y,A. If PTRGET can't find a simple variable it creates one. If it can't find an array it creates one dimensioned to 0 to 10 and sets all elements equal to zero.

GETARYPT F7D9 (63449)

Read a variable name from CHRGET and find it in memory. On entry TXTPTR points to the first character of the variable name. This routine leaves LOWTR pointing to the name of the variable array. If the array can't be found the result is an OUT OF DATA ERROR.

FNDLIN D61A (54810)

Searches the program for the line whose number is in LINNUM.

On exit:

1. If C set LOWTR points to the link field of the desired line.
2. If C clear then line not found. LOWTR to the next higher line.

DATA D995 (55701)

Move TXTPTR to the end of the statement. Looks for ':' or eol (0).

DATAN D9A3 (55715)

Calculate the offset in Y from TXTPTR to the next ':' or eol (0).

REMN D9A6 (55718)

Calculate the offset in Y from TXTPTR to the next eol (0).

ADDON D998 (55704)

Add Y to TXTPTR.

INITIALIZATION ROUTINES

SCRTCH D64B (54859)

The 'NEW' command. Clears the program, variables, and stack.

CLEARC D66C (54892)

The 'CLEAR' command. Clears the variables and stack.

STKINI D683 (54915)

Clears the stack.

RESTOR D849 (55369)

Sets the DATA pointer, DATPTR, to the beginning of the program.

STXTPT D697 (54935)

Set TXTPTR to the beginning of the program.

STORAGE MANAGEMENT ROUTINES

BLTU D393 (54163)

Block transfer makes room by moving everything forward.

On entry:

Y,A and HIGHDS=destination of high address +1
LOWTR=lowest address to be moved
HIGHTR=highest address to be moved + 1

On exit:

LOWTR is unchanged
HIGHTR=LOWTR — $100
HIGHDS=lowest address transferred — $100

REASON D3E3 (54243)

Makes sure there's enough room in memory, checks to be sure that the address Y,A is less than FRETOP. May cause garbage collection. Causes OMERR if there's no room.

GARBAG E484 (58500)

Move all currently used strings up in memory as far as possible. This maximizes the free memory area for more strings or numeric variables.

MISCELLANEOUS BASIC COMMANDS

Note that many commands are not documented because they jump into the new statement fetcher and cannot be used as a subroutine.

CONT D898 (55448)

MOVES OLDTXT and OLDLIN into TXTPTR and CURLIN.

NEWSTT D7D2 (55250)

Execute a new statement. On entry TXTPTR points to the ':' preceding the statement or the zero at the end of the previous line. Use NEWSTT to restart the program with CONT. *THIS ROUTINE DOES NOT RETURN.*

RUN D566 (54630)

Run the program in memory. *THIS ROUTINE DOES NOT RETURN.*

GOTO D93E (55614)

Uses LINGET and FNDLIN to update TXTPTR. GOTO assumes that the 6502 registers and A have been set up by the CHRGET that fetched the first digit.

LET DA46 (55878)

Uses CHRGET to get address of the variable, '=', evaluate the formula, and store it. On entry TXTPTR points to the first character of the variable name.

HIRES GRAPHICS ROUTINES

NOTE: Regardless of which screen is being displayed, HPAG (location $E6) determines which screen is drawn on. ($20 for HGR, $40 for HGR2)

HGR2 F3D8 (62424)

Initialize and clear page 2 HIRES.

HGR F3E2 (62434)

Initialize and clear page 1 HIRES.

HCLR F3F2 (62450)

Clear the HIRES screen to black.

BKGND F3F6 (62454)

Clear the HIRES screen to last plotted color.

HPOSN F411 (62481)

Positions the HIRES cursor without plotting, HPAG determines which page the cursor is pointed at.

On entry:

Horizontal=Y,X
Vertical=A

HPLOT F457 (62551)

Call HPOSN then try to plot a dot at the cursor's position. No dot may be plotted if plotting non-white at a complementary color X coordinate.

On entry:

Horizontal =Y,X
Vertical =Y

HLIN F53A (62778)

Draws a line from the last plotted point or line destination to the coordinate in the 6502 registers.

On entry:

Horizontal=X,A
Vertical=Y

HFIND F5CB (62923)

Convert the HIRES cursor's position to X-Y coordinates. Used after SHAPE to find where you've been left.

On exit:

$E0=horizontal lsb
$E1=horizontal msb
$E2=vertical

DRAW F601 (62977)

Draw the shape pointed to by Y,X using the current HCOLOR. On entry A=rotation factor.

APPLESOFT INTERNAL ENTRY POINTS

XDRAW F65D (63069)
Draw the shape pointed to by Y,X by inverting the existing color of the dots the shape draws over. On entry, A= rotation factor.

SETHCOL F6EC (63212)
Set the HIRES color to X. X must be less than 8.

SHLOAD F775 (63349)
Loads a shape table into memory from tape above MEMSIZ (HIMEM) and sets up the pointer at $E8.

CASSETTE ROUTINES

SAVE D8B0 (55472)
Save the program in memory to tape.

LOAD D8C9 (55497)
Load a program from tape.

VARTIO D8F0 (55536)
Set up A1 and A2 to save 3 bytes ($50-$52) for the length.

PROGIO D901 (55553)
Set up A1 and A2 to save the program text.

ERROR PROCESSOR ROUTINES

ERROR D412 (54290)
Checks ERRFLG and jumps to HNDL ERR if ONERR is active. Otherwise it prints [c/r] '?' [error message § X] 'ERROR'. If this is during program execution then it also prints 'IN' and the CURLIN.

HANDLERR F2E9 (62185)
Saves CURLIN in ERRLIN, TXTPTR in ERRPOS, X in ERRNUM, and REMSTK in ERRSTK. REMSTK is is equal to the 6502 stack pointer and is set up at the start of each statement. X contains the error code. This may be used to interrupt the execution of a BASIC program. See the Applesoft Reference Manual page 136 for the value of X for a given error.

RESUME F317 (62231)
Restores CURLIN from ERRLIN and TXTPTR from ERRPOS and transfers ERRSTK into the 6502 stack pointer.

SYNTAX CHECKING ROUTINES

ISCNTC D858 (55384)
Checks the Apple keyboard for a control — C ($83). Executes the BREAK routine if there is a control — C.

CHKNUM DD6A (56682)
Make sure FAC is numeric. See CHKVAL.

CHKSTR DD6C (56684)
Make sure FAC is a string. See CHKVAL.

CHKVAL DD6D (56685)
Checks the result of the most recent FAC operation to see if it is a string or numeric variable. A TYPE MIS MATCH ERROR results if FAC and C don't agree.
On entry:
C set checks for strings
C clear checks for numerics

ERRDIR E306 (58118)
Causes ILLEGAL DIRECT ERROR if the program isn't running. X is modified.

ISLETC E07D (57469)
Checks A for an ASCII letter ('A' to 'Z'). On exit C set if A is a letter.

PARCHK DEB2 (57010)
Checks for '(', evaluates a formula, and checks for ')'. Uses CHKOPN and FRMEVL then falls into CHKCLS.

CHKCLS DEB8 (57016)
Checks at TXTPTR for ')'. Uses SYNCHR.

CHKOPN DEBB (57019)
Checks at TXTPTR for '(', Uses SYN CHR.

CHKCOM DEBE (57022)
Checks at TXTPTR for ','. uses SYN CHR.

SYNCHR DECO (57024)
Checks at TXTPTR for the character in A. TXTPTR is not modified. Normally exits through CHRGET. Exits with SYNTAX ERROR if they don't match.