

Peter Gerrard Kevin Bergin

The Complete COMMODORE 64 ROM Disassembly

CommanderF - TCS
CommodoreFan '11

MOS
6526
2283

MOS
6526
2383



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**Peter Gerrard
&
Kevin Bergin**



Duckworth

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Preface

This book is intended to be used by the serious Commodore 64 programmer, and gives a complete disassembly of all the 64 ROM routines.

Also included for reference is the complete 6510 machine code instruction set, together with a listing for a full assembler/disassembler for the Commodore 64.

Some sections of the code will obviously not make sense as disassemblies: error messages, for instance, will disassemble into pure garbage! However, for the sake of completeness, it's all been left in.

Many programmers could have produced this book, but not many programmers have access to amenable publishers, as we have. The book has been produced to serve purely as a *reference guide and nothing else*.

If it leads you to a better understanding of your computer and the way that it works, and if it helps you to write better machine code programs, then the purpose of this book will have been achieved.

We'd like to thank the publishers for their help and advice in producing this book, and also the Hare and Hounds public house in Ashford, where the idea for this series of books was first conceived.

P.G. & K.B.

Fundamental memory map and ROM disassembly

Complete Commodore 64 ROM Disassembly

0000	0	Chip directional register
0001	1	Chip I/O;memory & tape control
0003-0004	3-4	Float-Fixed vector
0005-0006	5-6	Fixed-Float vector
0007	7	Search character
0008	8	Scan-quotes flag
0009	9	TAB column save
000A	10	0=LOAD, 1=VERIFY
000B	11	Input buffer pointer/# subscript
000C	12	Default DIM flag
000D	13	Type:FF=string, 00=numeric
000E	14	Type:80=integer, 00=floating point
000F	15	DATA scan/LIST quote/memory flag
0010	16	Subscript/FNx flag
0011	17	0=INPUT;\$40=GET;\$98=READ
0012	18	ATN sign/Comparison avel flag
0013	19	Current I/O prompt flag
0014-0015	20-21	Integer value
0016	22	Pointer:temporary string stack
0017-0018	23-24	Last temp string vector
0019-0021	25-33	Stack for temporary strings
0022-0025	34-37	Utility pointer area
0026-002A	38-42	Product area for multiplication
002B-002C	43-44	Pointer:Start of Basic

002D-002E	45-46	Pointer:Start of Variables
002F-0030	47-48	Pointer:Start of Arrays
0031-0032	49-50	Pointer:End of Arrays
0033-0034	51-52	Pointer:String-storage (moving down)
0035-0036	53-54	Utility string pointer
0037-0038	55-56	Pointer:Limit of memory
0039-003A	57-58	Current Basic line number
003B-003C	59-60	Previous Basic line number
003D-003E	61-62	Pointer:Basic statement for CONT
003F-0040	63-64	Current DATA line number
0041-0042	65-66	Current DATA address
0043-0044	67-68	Input vector
0045-0046	69-70	Current variable name
0047-0048	71-72	Current variable address
0049-004A	73-74	Variable pointer for FOR/NEXT
004B-004C	75-76	Y-save;op-save;Basic pointer save
004D	77	Comparison symbol accumulator
004E-0053	78-83	Misc. work area, pointers,etc.
0054-0056	84-86	Jump vector for functions
0057-0060	87-96	Misc. numeric work area
0061	97	Accum#1:Exponent
0062-0065	98-101	Accum#1:Mantissa
0066	102	Accum#1:Sign
0067	103	Series evaluation constant pointer
0068	104	Accum#1 hi-order (overflow)
0069-006E	105-110	Accum#2:Exponent,etc.
006F	111	Sign comparison,Ac#1 vs #2
0070	112	Accum#1 lo-order (rounding)
0071-0072	113-114	Cassette buff len/Series pointer
0073-008A	115-138	CHRGET subroutine;get Basic character

007A-007B	122-123	Basic pointer (within subroutine)
008B-00BF	139-143	RND seed value
0090	144	Status word ST
0091	145	Keyswitch PIA:STOP and RVS flags
0092	146	Timing constant for tape
0093	147	Load=0, Verify=1
0094	148	Serial output:deferred character flag
0095	149	Serial deferred character
0096	150	Tape EOT received
0097	151	Register save
0098	152	How many open files
0099	153	Input device, normally 0
009A	154	Output CMD device, normally 3
009B	155	Tape character parity
009C	156	Byte-received flag
009D	157	Direct=\$80/RUN=0 output control
009E	158	Tp Pass 1 error log/char. buffer
009F	159	Tp Pass 2 error log corrected
00A0-00A2	160-162	Jiffy Clock HML
00A3	163	Serial bit count/EOT flag
00A4	164	Cycle count
00A5	165	Countdown, tape write/bit count
00A6	166	Tape buffer pointer
00A7	167	Tp Wrt ldr count/Rd pass/inbit
00A8	168	Tp Wrt new byte/Rd error/inbit cnt
00A9	169	Wrt start bit/Rd bit err/stbit
00AA	170	Tp scan;Cnt;Ld;End/byte assy
00AB	171	Wr lead length/Rd checksum/parity
00AC-00AD	172-173	Pointer:tape buffer, scrolling
00AE-00AF	174-175	Tape end adds/End of program

00B0-00B1	176-177	Tape timing constants
00B2-00B3	178-179	Pntr:start of tape buffer
00B4	180	1=Tp timer enabled;bit count
00B5	181	Tp EDT/RS232 next bit to send
00B6	182	Read character error/outbyte buff.
00B7	183	# characters in file name
00B8	184	Current logical file
00B9	185	Current secondary address
00BA	186	Current device
00BB-00BC	187-188	Pointer to file name
00BD	189	Wr shift word/Rd input character
00BE	190	# blocks remaining to Wr/Rd
00BF	191	Serial word buffer
00C0	192	Tape monitor interlock
00C1-00C2	193-194	I/O start address
00C3-00C4	195-196	Kernel setup pointer
00C5	197	Last key pressed
00C6	198	# characters in keyboard buffer
00C7	199	Screen reverse flag
00CB	200	End-of-line for input pointer
00C9-00CA	201-202	Input cursor log (row, column)
00CB	203	Which key: 64 if no key
00CC	204	0=flash cursor
00CD	205	Cursor timing countdown
00CE	206	Character under cursor
00CF	207	Cursor in blink phase
00D0	208	Input from screen/from keyboard
00D1-00D2	209-210	Pointer to screen line
00D3	211	Position of cursor on above line
00D4	212	0=direct cursor, else programmed

00D5	213	Current screen line length
00D6	214	Row where cursor lives
00D7	215	Last inkey/checksum/buffer
00D8	216	# of INSERTs outstanding
00D9-00F2	217-242	Screen line link table
00F3-00F4	243-244	Screen colour pointer
00F5-00F6	245-246	Keyboard pointer
00F7-00FB	247-248	RS-232 Rev pntr
00F9-00FA	249-250	RS-232 Tx pntr
00FF-010A	256-266	Floating to ASCII work area
0100-013E	256-318	Tape error log
0100-01FF	256-511	Processor stack area
0200-0258	512-600	Basic input buffer
0259-0262	601-610	Logical file table
0263-026C	611-620	Device # table
026D-0276	621-630	Sec Adds table
0277-0280	631-640	Keyboard buffer
0281-0282	641-642	Start of Basic memory
0283-0284	643-644	Top of Basic memory
0285	645	Serial bus timeout flag
0286	646	Current colour code
0287	647	Colour under cursor
0288	648	Screen memory page
0289	649	Max size of keyboard buffer
028A	650	Repeat all keys
028B	651	Repeat speed counter
028C	652	Repeat delay counter
028D	653	Keyboard Shift/Control flag
028E	654	Last shift pattern
028F-0290	655-656	Keyboard table setup pointer

0291	657	Keyboard shift mode	
0292	658	0=scroll enable	
0293	659	RS-232 control reg.	
0294	660	RS-232 command reg.	
0295-0296	661-662	Bit timing	
0297	663	RS-232 status	
0298	664	# bits to send	
0299-029A	665-666	RS-232 speed code	
029B	667	RS232 receive pointer	
029C	668	RS232 input pointer	
029D	669	RS232 transmit pointer	
029E	670	RS232 output pointer	
029F-02A0	671-672	IRQ save during tape I/O	
02A1	673	CIA 2 (NMI) Interrupt Control	
02A2	674	CIA 1 Timer A control log	
02A3	675	CIA 1 Interrupt log	
02A4	676	CIA 1 Timer A enabled flag	
02A5	677	Screen row marker	
02C0-02FE	704-766	(Sprite 11)	
0300-0301	768-769	Error message link	
0302-0303	770-771	Basic warm start link	
0304-0305	772-773	Crunch Basic tokens link	
0306-0307	774-775	Print tokens link	
0308-0309	776-777	Start new Basic code link	
030A-030B	778-779	Get arithmetic element link	
030C	780	SYS A-reg save	
030D	781	SYS X-reg save	
030E	782	SYS Y-reg save	
030F	783	SYS status reg save	
0310-0312	784-785	USR function jump	(B248)

0314-0315	788-789	Hardware interrupt vector	(EA31)
0316-0317	790-791	Break interrupt vector	(FE66)
0318-0319	792-793	NMI interrupt vector	(FE47)
031A-031B	794-795	OPEN vector	(F34A)
031C-031D	796-797	CLOSE vector	(F291)
031E-031F	798-799	Set-input vector	(F20E)
0320-0321	800-801	Set-output vector	(F250)
0322-0323	802-803	Restore I/O vector	(F333)
0324-0325	804-805	INPUT vector	(F157)
0326-0327	806-807	Output vector	(F1CA)
0328-0329	808-809	Test-STOP vectot	(F6ED)
032A-032B	810-811	GET vector	(F13E)
032C-032D	812-813	Abort I/O vector	(F32F)
032E-032F	814-815	Warm start vector	(FE66)
0330-0331	816-817	LOAD link	(F4A5)
0332-0333	818-819	SAVE link	(F5ED)
033C-03FB	828-1019	Cassette buffer	
0340-037E	832-895	(Sprite 13)	
0380-03BE	896-958	(Sprite 14)	
03C0-03FE	960-1022	(Sprite 15)	
0400-07FF	1024-2047	Screen memory	
0800-9FFF	2048-40959	Basic RAM memory	
B000-9FFF	32768-40959	Alternate: ROM plug-in area	
A000-BFFF	40960-49151	ROM: Basic	
A000-BFFF	40960-49151	Alternate: RAM	
C000-CFFF	49152-53247	RAM memory, including alternate	
D000-D02E	53248-53294	Video chip (6566)	
D400-D41C	54272-54300	Sound chip (6581 SID)	
DB00-DBFF	55296-56319	Colour nybble memory	
DC00-DC0F	56320-56335	Interface chip 1,IRQ (6526 CIA)	

DD00-DD0F	56576-56591	Interface chip 2,NMI (6526 CIA)
D000-DFFF	53248-57343	Alternate: Character set
E000-FFFF	57344-65535	ROM: Operating system
E000-FFFF	57344-65535	Alternate: RAM
FFB1-FFF5	65409-65525	Jump table, Including:-
FFC6		-Set Input channel
FFC9		-Set Output channel
FFCC		-Restore default I/O channels
FFCF		-INPUT
FFD2		-PRINT
FFE1		-Test Stop key
FFE4		-GET

Commodore 64 - ROM Memory Map

A000;	ROM control vectors
A00C;	Keyword action vectors
A052;	Function vectors
A0B0;	Operator vectors
A09E;	Keywords
A19E;	Error messages
A328;	Error message vectors
A35B;	Misc. messages
A3B9;	Scan stack for FOR/GOSUB
A3B8;	Move memory
A3FB;	Check stack depth
A408;	Check memory space
A435;	'out of memory'
A437;	Error routine
A469;	BREAK entry
A474;	'ready'
A480;	Ready for Basic

A49C; " " " "

A533; Re-chain lines

A560; Receive input line

A579; Crunch tokens

A613; Find Basic line

A642; Perform [NEW]

A65E; Perform [CLR]

A68E; Back up text pointer

A69C; Perform [LIST]

A742; Perform [FOR]

A7ED; Execute statement

A81D; Perform [RESTORE]

A82C; Break

A82F; Perform [STOP]

A831; Perform [END]

A857; Perform [CONT]

A871; Perform [RUN]

A883; Perform [GOSUB]

A8A0; Perform [GOTO]

A8D2; Perform [RETURN]

A8F8; Perform [DATA]

A906; Scan for next statement
A928; Perform [IF]
A93B; Perform [REM]
A94B; Perform [ON]
A96B; Get fixed point number
A9A5; Perform [LET]
AA80; Perform [PRINT#]
AA86; Perform [CMD]
AAA0; Perform [PRINT]
AB1E; Print string from (y.a)
AB3B; Print format character
AB4D; Bad input routine
AB7B; Perform [GET]
ABA5; Perform [INPUT#]
ABBF; Perform [INPUT]
ABF9; Prompt & input
AC06; Perform [READ]
ACFC; Input error messages
AD1E; Perform [NEXT]
AD78; Type match check
AD9E; Evaluate expression

AEAB; Constant - pi
AEF1; Evaluate within brackets
AEF7; ') '
AEFF; Comma..
AF08; Syntax error
AF14; Check range
AF28; Search for variable
AFA7; Setup FN reference
AFE9; Perform [OR]
AFF0; Perform [AND]
B016; Compare
B081; Perform [DIM]
B08B; Locate variable
B113; Check alphabetic
B11D; Create variable
B194; Array pointer subroutine
B1A5; Value 32768
B1B2; Float-fixed
B1D1; Set up array
B248; 'bad subscript'
B24D; 'illegal quantity'

B34C; Compute array size
B37D; Perform [FRE]
B391; Fix-float
B39E; Perform [POS]
B3A6; Check direct
B3B3; Perform [DEF]
B3E1; Check fn syntax
B3F4; Perform [FN]
B465; Perform [STR\$]
B475; Calculate string vector
B487; Set up string
B4F4; Make room for string
B526; Garbage collection
B5BD; Check salvageability
B606; Collect string
B63D; Concatenate
B67A; Build string to memory
B6A3; Discard unwanted string
B6DB; Clean descriptor stack
B6EC; Perform [CHR\$]
B700; Perform [LEFT\$]

B72C; Perform [RIGHT\$]
B737; Perform [MID\$]
B761; Pull string parameters
B77C; Perform [LEN]
B782; Exit string-mode
B78B; Perform [ASC]
B79B; Input byte parameter
B7AD; Perform [VAL]
B7EB; Parameters for POKE/WAIT
B7F7; Float-fixed
B80D; Perform [PEEK]
B824; Perform [POKE]
B82D; Perform [WAIT]
B849; Add 0.5
B850; Subtract-from
B853; Perform [subtract]
B86A; Perform [add]
B947; Complement FAC#1
B97E; 'overflow'
B983; Multiply by zero byte
B9EA; Perform [LOG]

BA2B; Perform [multiply]
BA59; Multiply-a-bit
BABC; Memory to FAC#2
BAB7; Adjust FAC#1/#2
BAD4; Underflow/overflow
BAE2; Multiply by 10
BAF9; + 10 in floating pt.
BAFE; Divide by 10
BB12; Perform [divide]
BBA2; Memory to FAC#1
BBC7; FAC#1 to memory
BBFC; FAC#2 to FAC#1
BC0C; FAC#1 to FAC#2
BC1B; Round FAC#1
BC2B; Get sign
BC39; Perform [SGN]
BC5B; Perform [ABS]
BC5B; Compare FAC#1 to mem.
BC9B; Float-fixed
BCCC; Perform [int]
BCF3; String to FAC

BD7E; Get ASCII digit
BDC2; Print 'IN...'
BDCE; Print line number
BDDD; Float to ASCII
BF16; Decimal constants
BF3A; TI constants
BF71; Perform [SQR]
BF7B; Perform [power]
BFB4; Perform [negative]
BFED; Perform [EXP]
E043; Series eval. 1
E059; Series eval. 2
E097; Perform [RND]
E0F9; ?? breakpoints ??
E12A; Perform [SYS]
E156; Perform [SAVE]
E165; Perform [LOAD]
E1BE; Perform [OPEN]
E1C7; Perform [CLOSE]
E1D4; Parameters for LOAD/SAVE
E206; Check default parameters

E20E; Check for comma
E219; Parameters for OPEN/CLOSE
E264; Perform [COS]
E26B; Perform [SIN]
E2B4; Perform [TAN]
E30E; Perform [ATN]
E37B; Warm restart
R394; Initialize
E3A2; CHRGET for zero page
E3BF; Initialize Basic
E447; Vectors for \$300
R453; Initialize vectors
E45F; Power-up message
E500; Get I/O address
E505; Get screen size
E50A; Put/get row/column
E518; Initialize I/O
E544; Clear screen
E566; Home cursor
E56C; Set screen pointers
E5A0; Set I/O defaults

E5B4; Input from keyboard
E632; Input from screen
E684; Quote test
E691; Setup screen print
E6B6; Advance cursor
E6ED; Retreat cursor
E701; Back into previous line
E716; Output to screen
E87C; Go to next line
E891; Perform <return>
E8A1; Check line decrement
E8B3; Check line increment
E8CB; Set colour code
E8DA; Colour code table
E8EA; Scroll screen
E965; Open space on screen
E9C8; Move a screen line
E9E0; Synchronize colour transfer
E9F0; Interrupt - clock etc.
EA87; Read keyboard
EB79; Keyboard select vectors

EB81; Keyboard 1 - unshifted
EBC2; Keyboard 2 - shifted
EC03; Keyboard 3 - 'comm'
EC44; Graphics/text control
EC4F; Set graphics/text mode
EC78; Keyboard 4
ECB9; Video chip setup
ECE7; Shift/run equivalent
ECF9; Screen in address low
ED0B; Send 'talk'
ED11; Send 'listen'
ED40; Send to serial bus
EDB2; Serial timeout
EDB9; Send listen SA
EDBE; Clear ATN
EDC7; Send talk SA
EDCC; Wait for clock
EDDD; Send serial deferred
EDEF; Send 'untalk'
EE03; Send 'unlisten'
EE13; Receive from serial bus

EE85; Serial clock on
EE8E; Serial clock off
EE97; Serial output '1'
EEA0; Serial output '0'
EEA9; Get serial in & clock
EEB3; Delay 1 ms.
EEBB; RS-232 send
EF06; Send new RS-232 byte
EF2E; No - DSR error
EF33; No - CTS error
EF3B; Disable timer
EF4A; Compute bit count
EF59; RS232 receive
EF7E; Setup to receive
EFC4; Receive parity error
EFCC; Receive overflow
EFCF; Receive break
EFD2; Framing error
EFE1; Submit to RS232
F00D; No - DSR error
F017; Send to RS232 buffer

F04D; Input from RS232
F086; Get from RS232
F0A4; Check serial bus idle
F0BD; Messages
F12B; Print if direct
F13E; Get..
F14E; ..from RS232
F157; Input
F199; Get..tape/serial/RS232
F1CA; Output..
F1DD; ..to tape
F20E; Set input device
F250; Set output device
F291; Close file
F30F; Find file
F31F; Set file values
F32F; Abort all files
F333; Restore default I/O
F34A; Do open file
F3D5; Send SA
F409; Open RS232

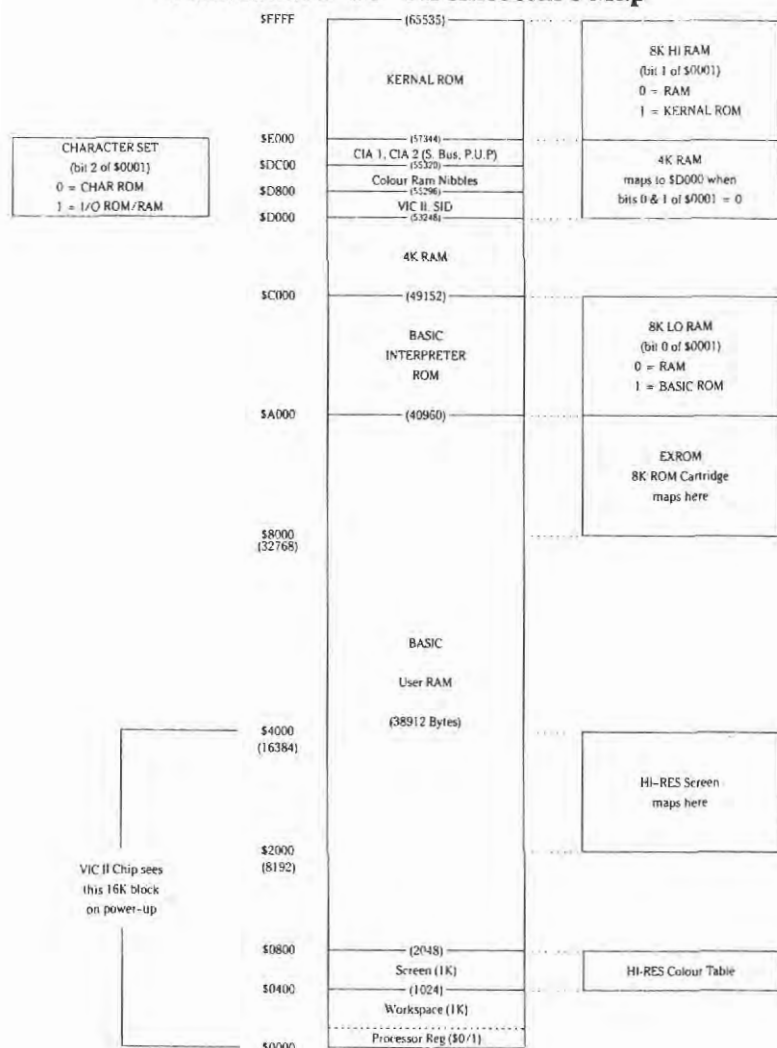
F49E; Load program
F5AF; 'searching'
F5C1; Print filename
F5D2; 'loading/verifying'
F5DD; Save program
F68F; Print 'saving'
F69B; Bump clock
F6BC; Log PIA key reading
F6DD; Get time
F6E4; Set time
F6ED; Check stop key
F6FB; Output error messages
F72C; Find any tape header
F76A; Write tape header
F7D0; Get buffer address
F7D7; Set buffer start/end pointers
F7EA; Find specific header
F80D; Bump tape pointer
F817; 'press play'
F82E; Check tape status
F838; 'press record'

F841; Initiate tape read
F864; Initiate tape write
F875; Common tape code
F8D0; Check tape stop
F8E2; Set read timing
F92C; Read tape bits
FA60; Store tape chars.
FB8E; Reset pointer
FB97; New character setup
FBA6; Send transition to tape
FBC8; Write data to tape
FBCD; IRQ entry point
FC57; Write tape leader
FC93; Restore normal IRQ
FCB8; Set IRQ vector
FCCA; Kill tape motor
FCD1; Check r/w pointer
FCDB; Bump r/w pointer
FCE2; Power reset entry
FD02; Check 8-rom
FD10; 8-rom mask

FD15; Kernal reset
FD1A; Kernal move
FD30; Vectors
FD50; Initialize system consts.
FD9B; IRQ vectors
FDA3; initialize I/O
FDDD; Enable timer
FDF9; Save filename data
FE00; Save file details
FE07; Get status
FE18; Flag status
FE1C; Set status
FE21; Set timeout
FE25; Read/set top of memory
FE27; Read top of memory
FE2D; Set top of memory
FE34; Read/set bottom of memory
FE43; NMI entry
FE66; Warm start
FEB6; Reset IRQ & exit
FEBC; Interrupt exit

FEC2; RS-232 timing table
FED6; NMI RS-232 in
FF07; NMI RS-232 out
FF43; Fake IRQ
FF48; IRQ entry
FF81; Jumbo jump table
FFF6; Hardware vectors

Commodore-64 Architecture Map



Processor I/O Port (6510)

\$0000	IN	IN	OUT	IN	OUT	OUT	OUT	OUT	DDR	0
\$0001			Tape Motor	Tape Sense	Tape Write	D-ROM Switch	EF RAM Switch	AB RAM Switch	PR	1

SID (6581)

Voice 1	Voice 2	Voice 3							Voice 1	Voice 2	Voice 3	
\$D400	\$D407	\$D40E	Frequency						L	54272	54279	54286
\$D401	\$D408	\$D40F							H	54273	54280	54287
\$D402	\$D409	\$D410	Pulse Width						L	54274	54281	54288
\$D403	\$D40A	\$D411	0	0	0	0			H	54275	54282	54289
\$D404	\$D40B	\$D412	NSE	Voice Type: PUL SAW TRI			Key		54276	54283	54290	
\$D405	\$D40C	\$D413	Attack Time 2ms - 8ms			Decay Time 6ms - 24 sec			54277	54284	54291	
\$D406	\$D40D	\$D414	Sustain Level			Release Time 6ms - 24 sec			54278	54285	54292	

Voices (write only)

\$D415	0	0	0	0	0				L	54293
\$D416	Filter Frequency								H	54294
\$D417	Resonance				Ext	Filter Voices V3 V2 V1				54295
\$D418	V3 off	Passband: HI BP LO	Master Volume							54296

Filter & Volume (write only)

\$D419	Paddle X (A/D #1)								54297
\$D41A	Paddle Y (A/D #2)								54298
\$D41B	Noise 3 (random)								54299
\$D41C	Envelope 3								54300

Sense (read only)

Note: Special Voice Features
(TEST, RING MOD, SYNC)
are omitted from the above diagram.

CIA 1 (IRQ) (6526)

\$DC00	Paddle Sel A B		Joystick 0 Fire Right Left Down Up					PRA	56320	
	Keyboard Row Select (inverted)									
\$DC01			Joystick 1 Fire Right Left Down Up					PRB	56321	
	Keyboard Column Read									
\$DC02	\$FF - All Output								DDRA	56322
\$DC03	\$00 - All Input								IDRB	56323
\$DC04	Timer A								TAL	56324
\$DC05									TAH	56325
\$DC06	Timer B								TBL	56326
\$DC07									TBH	56327
~										
\$DC0D			Tape Input			Timer Interrupt B A			ICR	56333
\$DC0E				One Shot	Out Mode	Time PB6 Out	Timer A Start		CRA	56334
\$DC0F				One Shot	Out Mode	Time PB7 Out	Timer B Start		CRB	56335

CIA 2 (NMI) (6526)

\$DD00	Serial IN	Clock IN	Serial OUT	Clock OUT	ATN OUT	RS-232 OUT	VIC II addr 15	VIC II addr 14	PRA	56576
\$DD01	DSR IN	CTS IN		DCD* IN	RI* IN	DTR OUT	RTS OUT	RS-232 IN	PRB	56577
\$DD02	\$3F - Serial								DDRA	56578
\$DD03	\$00 - P.U.P. All Input					or	\$06 - RS-232		DDRB	56579
\$DD04	Timer A								TAL	56580
\$DD05									TAH	56581
\$DD06	Timer B								TBL	56582
\$DD07									TBH	56583
\$DD0D				RS-232 IN			Timer Interrupt B A		ICR	56589
\$DD0E								Timer A Start	CRA	56590
\$DD0F								Timer B Start	CRB	56591

* Connected but not used by O.S.

ROM disassembly

A000; ROM control vectors

A000	94	E3	STY \$E3,X
A002	7B		???
A003	E3		???
A004	43		???
A005	42		???
A006	4D	42 41	EOR \$4142
A009	53		???
A00A	49	43	EOR #\$43

A00C; Keyword action vectors

A00C	30	AB	BMI \$9FB6
A00E	41	A7	EOR (\$A7,X)
A010	1D	AD F7	DRA \$F7AD,X
A013	AB		TAY
A014	A4	AB	LDY \$AB
A016	BE	AB B0	LDX \$B0AB,Y
A019	B0	05	BCS \$A020
A01B	AC	A4 A9	LDY \$A9A4
A01E	9F		???
A01F	AB		TAY
A020	70	AB	BVS \$9FCA
A022	27		???
A023	A9	1C	LDA #\$1C
A025	AB		TAY
A026	B2		???
A027	AB		TAY
A028	D1	AB	CMP (\$AB),Y
A02A	3A		???
A02B	A9	2E	LDA #\$2E
A02D	AB		TAY
A02E	4A		LSR
A02F	A9	2C	LDA #\$2C
A031	BB		CLV
A032	67		???
A033	E1	55	SBC (\$55,X)
A035	E1	64	SBC (\$64,X)
A037	E1	B2	SBC (\$B2,X)
A039	B3		???
A03A	23		???
A03B	BB		CLV
A03C	7F		???
A03D	AA		TAX
A03E	9F		???

A03F	AA		TAX
A040	56	AB	LSR \$AB,X
A042	9B		???
A043	A6	5D	LDX \$5D
A045	A6	85	LDX \$85
A047	AA		TAX
A048	29	E1	AND #\$E1
A04A	BD	E1 C6	LDA \$C6E1,X
A04D	E1	7A	SBC (\$7A,X)
A04F	AB		???
A050	41	A6	EOR (\$A6,X)

A052; Function vectors

A052	39	BC CC	AND \$CCBC,Y
A055	BC	5B BC	LDY \$BC5B,X
A058	10	03	BPL \$A05D
A05A	7D	B3 9E	ADC \$9EB3,X
A05D	B3		???
A05E	71	BF	ADC (\$BF),Y
A060	97		???
A061	E0	EA	CPX #\$EA
A063	B9	ED BF	LDA \$BFED,Y
A066	64		???
A067	E2		???
A068	6B		???
A069	E2		???
A06A	B4	E2	LDY \$E2,X
A06C	0E	E3 0D	ASL \$0DE3
A06F	B8		CLV
A070	7C		???
A071	B7		???
A072	65	B4	ADC \$B4
A074	AD	B7 8B	LDA \$8BB7
A077	B7		???
A07B	EC	B6 00	CPX \$00B6
A07B	B7		???
A07C	2C	B7 37	BIT \$37B7
A07F	B7		???

A080; Operator vectors

A080	79	69 BB	ADC \$BB69,Y
A083	79	52 BB	ADC \$BB52,Y
A086	7B		???

A0B7	2A	ROL	A0D0	C5 47	CMP	\$47
A0B8	BA	TSX	A0D2	4F	???	
A0B9	7B	???	A0D3	53	???	
A0BA	11 BB	ORA (\$BB),Y	A0D4	55 C2	EOR	\$C2,X
A0BC	7F	???	A0D6	52	???	
A0BD	7A	???	A0D7	45 54	EOR	\$54
A0BE	BF	???	A0D9	55 52	EOR	\$52,X
A0BF	50 E8	BVC \$A079	A0DB	CE 52 45	DEC	\$4552
A091	AF	???	A0DE	CD 53 54	CMP	\$5453
A092	46 E5	LSR \$E5	A0E1	4F	???	
A094	AF	???	A0E2	D0 4F	BNE	\$A133
A095	7D B3 BF	ADC \$BFB3,X	A0E4	CE 57 41	DEC	\$4157
A098	5A	???	A0E7	49 D4	EOR	#\$D4
A099	D3	???	A0E9	4C 4F 41	JMP	\$414F
A09A	AE 64 15	LDX \$1564	A0EC	C4 53	CPY	\$53
A09D	B0 45	BCS \$A0E4	A0EE	41 56	EOR	(\$56,X)
			A0F0	C5 56	CMP	\$56
			A0F2	45 52	EOR	\$52
			A0F4	49 46	EOR	#\$46
			A0F6	D9 44 45	CMP	\$4544,Y
			A0F9	C6 50	DEC	\$50
			A0FB	4F	???	
			A0FC	4B	???	
			A0FD	C5 50	CMP	\$50
			A0FF	52	???	
			A100	49 4E	EOR	#\$4E
			A102	54	???	
			A103	A3	???	
			A104	50 52	BVC	\$A158
			A106	49 4E	EOR	#\$4E
			A108	D4	???	
			A109	43	???	
			A10A	4F	???	
			A10B	4E D4 4C	LSR	\$4CD4
			A10E	49 53	EOR	#\$53
			A110	D4	???	
			A111	43	???	
			A112	4C D2 43	JMP	\$43D2
			A115	4D C4 53	EOR	\$53C4
			A118	59 D3 4F	EOR	\$4FD3,Y
			A11B	50 45	BVC	\$A162
			A11D	CE 43 4C	DEC	\$4C43
			A120	4F	???	
			A121	53	???	
			A122	C5 47	CMP	\$47
			A124	45 D4	EOR	\$D4
			A126	4E 45 D7	LSR	\$D745
			A129	54	???	
			A12A	41 42	EOR	(\$42,X)
			A12C	A8	TAY	
			A12D	54	???	
			A12E	CF	???	

A09E; Keywords

A09F	4E C4 46	LSR	\$46C4
A0A2	4F	???	
A0A3	D2	???	
A0A4	4E 45 58	LSR	\$5845
A0A7	D4	???	
A0A8	44	???	
A0A9	41 54	EOR	(\$54,X)
A0AB	C1 49	CMP	(\$49,X)
A0AD	4E 50 55	LSR	\$5550
A0B0	54	???	
A0B1	A3	???	
A0B2	49 4E	EOR	#\$4E
A0B4	50 55	BVC	\$A10B
A0B6	D4	???	
A0B7	44	???	
A0B8	49 CD	EOR	#\$CD
A0BA	52	???	
A0BB	45 41	EOR	\$41
A0BD	C4 4C	CPY	\$4C
A0BF	45 D4	EOR	\$D4
A0C1	47	???	
A0C2	4F	???	
A0C3	54	???	
A0C4	CF	???	
A0C5	52	???	
A0C6	55 CE	EOR	\$CE,X
A0C8	49 C6	EOR	#\$C6
A0CA	52	???	
A0CB	45 53	EOR	\$53
A0CD	54	???	
A0CE	4F	???	
A0CF	52	???	

A12F 46 CE	LSR \$CE	A185 41 53	EOR (\$53,X)
A131 53	???	A187 C3	???
A132 50 43	BVC \$A177	A188 43	???
A134 A8	TAY	A189 48	PHA
A135 54	???	A18A 52	???
A136 48	PHA	A18B A4 4C	LDY \$4C
A137 45 CE	EOR \$CE	A18D 45 46	EOR \$46
A139 4E 4F D4	LSR \$D44F	A18F 54	???
A13C 53	???	A190 A4 52	LDY \$52
A13D 54	???	A192 49 47	EOR \$\$47
A13E 45 D0	EOR \$D0	A194 48	PHA
A140 AB	???	A195 54	???
A141 AD AA AF	LDA \$AFAA	A196 A4 4D	LDY \$4D
A144 DE 41 4E	DEC \$4E41,X	A198 49 44	EOR \$\$44
A147 C4 4F	CPY \$4F	A19A A4 47	LDY \$47
A149 D2	???	A19C CF	???
A14A BE BD BC	LDX \$BCBD,Y	A19D 00	BRK
A14D 53	???		
A14E 47	???		
A14F CE 49 4E	DEC \$4E49	A19E; Error messages	
A152 D4	???		
A153 41 42	EOR (\$42,X)	A19E 54	???
A155 D3	???	A19F 4F	???
A156 55 53	EOR \$53,X	A1A0 4F	???
A158 D2	???	A1A1 20 4D 41	JSR \$414D
A159 46 52	LSR \$52	A1A4 4E 59 20	LSR \$2059
A15B C5 50	CMP \$50	A1A7 46 49	LSR \$49
A15D 4F	???	A1A9 4C 45 D3	JMP \$D345
A15E D3	???	A1AC 46 49	LSR \$49
A15F 53	???	A1AE 4C 45 20	JMP \$2045
A160 51 D2	EOR (\$D2),Y	A1B1 4F	???
A162 52	???	A1B2 50 45	BVC \$A1F9
A163 4E C4 4C	LSR \$4CC4	A1B4 CE 46 49	DEC \$4946
A166 4F	???	A1B7 4C 45 20	JMP \$2045
A167 C7	???	A1BA 4E 4F 54	LSR \$544F
A168 45 58	EOR \$58	A1BD 20 4F 50	JSR \$504F
A16A D0 43	BNE \$A1AF	A1C0 45 CE	EOR \$CE
A16C 4F	???	A1C2 46 49	LSR \$49
A16D D3	???	A1C4 4C 45 20	JMP \$2045
A16E 53	???	A1C7 4E 4F 54	LSR \$544F
A16F 49 CE	EOR \$\$CE	A1CA 20 46 4F	JSR \$4F46
A171 54	???	A1CD 55 4E	EOR \$4E,X
A172 41 CE	EOR (\$CE,X)	A1CF C4 44	CPY \$44
A174 41 54	EOR (\$54,X)	A1D1 45 56	EOR \$56
A176 CE 50 45	DEC \$4550	A1D3 49 43	EOR \$\$43
A179 45 CB	EOR \$CB	A1D5 45 20	EOR \$20
A17B 4C 45 CE	JMP \$CE45	A1D7 4E 4F 54	LSR \$544F
A17E 53	???	A1DA 20 50 52	JSR \$5250
A17F 54	???	A1DD 45 53	EOR \$53
A180 52	???	A1DF 45 4E	EOR \$4E
A181 A4 56	LDY \$56	A1E1 D4	???
A183 41 CC	EOR (\$CC,X)	A1E2 4E 4F 54	LSR \$544F

A1E5	20	49	4E	JSR	\$4E49	A24C	53	???
A1E8	50	55		BVC	\$A23F	A24D	55	C2
A1EA	54			???		A24F	4F	???
A1EB	20	46	49	JSR	\$4946	A250	55	54
A1EE	4C	C5	4E	JMP	\$4EC5	A252	20	4F
A1F1	4F			???		A255	20	44
A1F2	54			???		A258	54	???
A1F3	20	4F	55	JSR	\$554F	A259	C1	49
A1F6	54			???		A25B	4C	4C
A1F7	50	55		BVC	\$A24E	A25E	47	???
A1F9	54			???		A25F	41	4C
A1FA	20	46	49	JSR	\$4946	A261	20	51
A1FD	4C	C5	4D	JMP	\$4DC5	A264	41	4E
A200	49	53		EOR	##53	A266	54	???
A202	53			???		A267	49	54
A203	49	4E		EOR	##4E	A269	D9	4F
A205	47			???		A26C	45	52
A206	20	46	49	JSR	\$4946	A26E	46	4C
A209	4C	45	20	JMP	\$2045	A270	4F	???
A20C	4E	41	4D	LSR	\$4D41	A271	D7	???
A20F	C5	49		CMP	\$49	A272	4F	???
A211	4C	4C	45	JMP	\$454C	A273	55	54
A214	47			???		A275	20	4F
A215	41	4C		EOR	(\$4C,X)	A278	20	4D
A217	20	44	45	JSR	\$4544	A27B	4D	4F
A21A	56	49		LSR	\$49,X	A27E	D9	55
A21C	43			???		A281	44	???
A21D	45	20		EOR	\$20	A282	45	46
A21F	4E	55	4D	LSR	\$4D55	A284	27	???
A222	42			???		A285	44	???
A223	45	D2		EOR	\$D2	A286	20	53
A225	4E	45	58	LSR	\$5845	A289	41	54
A228	54			???		A28B	45	4D
A229	20	57	49	JSR	\$4957	A28D	45	4E
A22C	54			???		A28F	D4	???
A22D	48			PHA		A290	42	???
A22E	4F			???		A291	41	44
A22F	55	54		EOR	\$54,X	A293	20	53
A231	20	46	4F	JSR	\$4F46	A296	42	???
A234	D2			???		A297	53	???
A235	53			???		A298	43	???
A236	59	4E	54	EOR	\$544E,Y	A299	52	???
A239	41	D8		EOR	(\$D8,X)	A29A	49	50
A23B	52			???		A29C	D4	???
A23C	45	54		EOR	\$54	A29D	52	???
A23E	55	52		EOR	\$52,X	A29E	45	44
A240	4E	20	57	LSR	\$5720	A2A0	49	4D
A243	49	54		EOR	##54	A2A2	27	???
A245	48			PHA		A2A3	44	???
A246	4F			???		A2A4	20	41
A247	55	54		EOR	\$54,X	A2A7	52	???
A249	20	47	4F	JSR	\$4F47	A2A8	41	D9
								EOR (\$D9,X)

A2AA	44	???	A30B	4E 55 C5	LSR \$C555
A2AB	49 56	EOR #\$56	A30E	55 4E	EOR \$4E,X
A2AD	49 53	EOR #\$53	A310	44	???
A2AF	49 4F	EOR #\$4F	A311	45 46	EOR \$46
A2B1	4E 20 42	LSR \$4220	A313	27	???
A2B4	59 20 5A	EOR \$5A20,Y	A314	44	???
A2B7	45 52	EOR \$52	A315	20 46 55	JSR \$5546
A2B9	CF	???	A318	4E 43 54	LSR \$5443
A2BA	49 4C	EOR #\$4C	A31B	49 4F	EOR #\$4F
A2BC	4C 45 47	JMP \$4745	A31D	CE 56 45	DEC \$4556
A2BF	41 4C	EOR (\$4C,X)	A320	52	???
A2C1	20 44 49	JSR \$4944	A321	49 46	EOR #\$46
A2C4	52	???	A323	D9 4C 4F	CMP \$4F4C,Y
A2C5	45 43	EOR \$43	A326	41 C4	EOR (\$C4,X)
A2C7	D4	???			
A2C8	54	???			
A2C9	59 50 45	EOR \$4550,Y	A328; Error message vectors		
A2CC	20 4D 49	JSR \$494D	A328	9E	???
A2CF	53	???	A329	A1 AC	LDA (\$AC,X)
A2D0	4D 41 54	EOR \$5441	A32B	A1 B5	LDA (\$B5,X)
A2D3	43	???	A32D	A1 C2	LDA (\$C2,X)
A2D4	C8	INY	A32F	A1 D0	LDA (\$D0,X)
A2D5	53	???	A331	A1 E2	LDA (\$E2,X)
A2D6	54	???	A333	A1 F0	LDA (\$F0,X)
A2D7	52	???	A335	A1 FF	LDA (\$FF,X)
A2D8	49 4E	EOR #\$4E	A337	A1 10	LDA (\$10,X)
A2DA	47	???	A339	A2 25	LDX #\$25
A2DB	20 54 4F	JSR \$4F54	A33B	A2 35	LDX #\$35
A2DE	4F	???	A33D	A2 3B	LDX #\$3B
A2DF	20 4C 4F	JSR \$4F4C	A33F	A2 4F	LDX #\$4F
A2E2	4E C7 46	LSR \$46C7	A341	A2 5A	LDX #\$5A
A2E5	49 4C	EOR #\$4C	A343	A2 6A	LDX #\$6A
A2E7	45 20	EOR \$20	A345	A2 72	LDX #\$72
A2E9	44	???	A347	A2 7F	LDX #\$7F
A2EA	41 54	EOR (\$54,X)	A349	A2 90	LDX #\$90
A2EC	C1 46	CMP (\$46,X)	A34B	A2 9D	LDX #\$9D
A2EE	4F	???	A34D	A2 AA	LDX #\$AA
A2EF	52	???	A34F	A2 BA	LDX #\$BA
A2F0	4D 55 4C	EOR \$4C55	A351	A2 C8	LDX #\$C8
A2F3	41 20	EOR (\$20,X)	A353	A2 D5	LDX #\$D5
A2F5	54	???	A355	A2 E4	LDX #\$E4
A2F6	4F	???	A357	A2 ED	LDX #\$ED
A2F7	4F	???	A359	A2 00	LDX #\$00
A2F8	20 43 4F	JSR \$4F43			
A2FB	4D 50 4C	EOR \$4C50			
A2FE	45 D8	EOR \$D8			
A300	43	???	A35B; Misc. messages		
A301	41 4E	EOR (\$4E,X)	A35B	A3	???
A303	27	???	A35C	0E A3 1E	ASL \$1EA3
A304	54	???	A35F	A3	???
A305	20 43 4F	JSR \$4F43	A360	24 A3	BIT \$A3
A30B	4E 54 49	LSR \$4954			

A362	B3	???
A363	A3	???
A364	0D 4F 4B	DRA \$4B4F
A367	0D 00 20	DRA \$2000
A36A	20 45 52	JSR \$5245
A36D	52	???
A36E	4F	???
A36F	52	???
A370	00	BRK
A371	20 49 4E	JSR \$4E49
A374	20 00 0D	JSR \$0D00
A377	0A	ASL
A378	52	???
A379	45 41	EOR \$41
A37B	44	???
A37C	59 2E 0D	EOR \$0D2E,Y
A37F	0A	ASL
A380	00	BRK
A381	0D 0A 42	DRA \$420A
A384	52	???
A385	45 41	EOR \$41
A387	4B	???
A388	00	BRK

A389; Scan stack for FOR/GOSUB

A389	A0 BA	LDY ##BA
A38B	EB	INX
A38C	EB	INX
A38D	EB	INX
A38E	EB	INX
A38F	BD 01 01	LDA \$0101,X
A392	C9 81	CMP ##81
A394	D0 21	BNE \$A3B7
A396	A5 4A	LDA \$4A
A398	D0 0A	BNE \$A3A4
A39A	BD 02 01	LDA \$0102,X
A39D	B5 49	STA \$49
A39F	BD 03 01	LDA \$0103,X
A3A2	B5 4A	STA \$4A
A3A4	DD 03 01	CMP \$0103,X
A3A7	D0 07	BNE \$A3B0
A3A9	A5 49	LDA \$49
A3AB	DD 02 01	CMP \$0102,X
A3AE	F0 07	BEQ \$A3B7
A3B0	8A	TXA
A3B1	1B	CLC
A3B2	69 12	ADC ##12
A3B4	AA	TAX
A3B5	D0 DB	BNE \$A3BF
A3B7	60	RTS

A3B8; Move memory

A3B8	20 0B A4	JSR \$A40B
A3BB	B5 31	STA \$31
A3BD	B4 32	STY \$32
A3BF	3B	SEC
A3C0	A5 5A	LDA \$5A
A3C2	E5 5F	SBC \$5F
A3C4	B5 22	STA \$22
A3C6	AB	TAY
A3C7	A5 5B	LDA \$5B
A3C9	E5 60	SBC \$60
A3CB	AA	TAX
A3CC	E8	INX
A3CD	9B	TYA
A3CE	F0 23	BEQ \$A3F3
A3D0	A5 5A	LDA \$5A
A3D2	3B	SEC
A3D3	E5 22	SBC \$22
A3D5	B5 5A	STA \$5A
A3D7	B0 03	BCS \$A3DC
A3D9	C6 5B	DEC \$5B
A3DB	3B	SEC
A3DC	A5 5B	LDA \$5B
A3DE	E5 22	SBC \$22
A3E0	B5 5B	STA \$5B
A3E2	B0 0B	BCS \$A3EC
A3E4	C6 59	DEC \$59
A3E6	90 04	BCC \$A3EC
A3E8	B1 5A	LDA (\$5A),Y
A3EA	91 5B	STA (\$5B),Y
A3EC	BB	DEY
A3ED	D0 F9	BNE \$A3EB
A3EF	B1 5A	LDA (\$5A),Y
A3F1	91 5B	STA (\$5B),Y
A3F3	C6 5B	DEC \$5B
A3F5	C6 59	DEC \$59
A3F7	CA	DEX
A3F8	D0 F2	BNE \$A3EC
A3FA	60	RTS

A3FB; Check stack depth

A3FB	0A	ASL
A3FC	69 3E	ADC ##3E
A3FE	B0 35	BCS \$A435
A400	B5 22	STA \$22
A402	BA	TSX
A403	E4 22	CPX \$22

A405 90 2E BCC \$A435
A407 60 RTS

A40B; Check memory space

A40B C4 34 CPY \$34
A40A 90 28 BCC \$A434
A40C D0 04 BNE \$A412
A40E C5 33 CMP \$33
A410 90 22 BCC \$A434
A412 4B PHA
A413 A2 09 LDX #\$09
A415 98 TYA
A416 4B PHA
A417 B5 57 LDA \$57,X
A419 CA DEX
A41A 10 FA BPL \$A416
A41C 20 26 B5 JSR \$B526
A41F A2 F7 LDX #\$F7
A421 68 PLA
A422 95 61 STA \$61,X
A424 E8 INX
A425 30 FA BMI \$A421
A427 68 PLA
A428 A8 TAY
A429 68 PLA
A42A C4 34 CPY \$34
A42C 90 06 BCC \$A434
A42E D0 05 BNE \$A435
A430 C5 33 CMP \$33
A432 B0 01 BCS \$A435
A434 60 RTS

A435; 'out of memory'

A435 A2 10 LDX #\$10

A437; Error routine

A437 6C 00 03 JMP (\$0300)
A43A BA TXA
A43B 0A ASL
A43C AA TAX
A43D BD 26 A3 LDA \$A326,X
A440 B5 22 STA \$22
A442 BD 27 A3 LDA \$A327,X
A445 B5 23 STA \$23
A447 20 CC FF JSR \$FFCC
A44A A9 00 LDA #\$00

A44C B5 13 STA \$13
A44E 20 D7 AA JSR \$AAD7
A451 20 45 AB JSR \$AB45
A454 A0 00 LDY #\$00
A456 B1 22 LDA (\$22),Y
A458 4B PHA
A459 29 7F AND #\$7F
A45B 20 47 AB JSR \$AB47
A45E C8 INY
A45F 68 PLA
A460 10 F4 BPL \$A456
A462 20 7A A6 JSR \$A67A
A465 A9 69 LDA #\$69
A467 A0 A3 LDY #\$A3

A469; BREAK entry

A469 20 1E AB JSR \$AB1E
A46C A4 3A LDY \$3A
A46E C8 INY
A46F F0 03 BEQ \$A474
A471 20 C2 BD JSR \$BDC2

A474; 'ready'

A474 A9 76 LDA #\$76
A476 A0 A3 LDY #\$A3
A47B 20 1E AB JSR \$AB1E
A47B A9 80 LDA #\$80
A47D 20 90 FF JSR \$FF90

A480; Ready for Basic

A480 6C 02 03 JMP (\$0302)
A483 20 60 A5 JSR \$A560
A486 B6 7A STX \$7A
A488 B4 7B STY \$7B
A48A 20 73 00 JSR \$0073
A48D AA TAX
A48E F0 F0 BEQ \$A480
A490 A2 FF LDX \$FFF
A492 B6 3A STX \$3A
A494 90 06 BCC \$A49C
A496 20 79 A5 JSR \$A579
A499 4C E1 A7 JMP \$A7E1

A49C; Handle new line

A49C 20 6B A9	JSR \$A96B	A4FF 85 5B	STA \$5B
A49F 20 79 A5	JSR \$A579	A501 A4 2E	LDY \$2E
A4A2 84 0B	STY \$0B	A503 84 5B	STY \$5B
A4A4 20 13 A6	JSR \$A613	A505 90 01	BCC \$A50B
A4A7 90 44	BCC \$A4ED	A507 C8	INY
A4A9 A0 01	LDY #\$01	A508 84 59	STY \$59
A4AB B1 5F	LDA (\$5F),Y	A50A 20 B8 A3	JSR \$A3B8
A4AD 85 23	STA \$23	A50D A5 14	LDA \$14
A4AF A5 2D	LDA \$2D	A50F A4 15	LDY \$15
A4B1 85 22	STA \$22	A511 8D FE 01	STA \$01FE
A4B3 A5 60	LDA \$60	A514 8C FF 01	STY \$01FF
A4B5 85 25	STA \$25	A517 A5 31	LDA \$31
A4B7 A5 5F	LDA \$5F	A519 A4 32	LDY \$32
A4B9 8B	DEY	A51B 85 2D	STA \$2D
A4BA F1 5F	SBC (\$5F),Y	A51D 84 2E	STY \$2E
A4BC 1B	CLC	A51F A4 0B	LDY \$0B
A4BD 65 2D	ADC \$2D	A521 8B	DEY
A4BF 85 2D	STA \$2D	A522 B9 FC 01	LDA \$01FC,Y
A4C1 85 24	STA \$24	A525 91 5F	STA (\$5F),Y
A4C3 A5 2E	LDA \$2E	A527 8B	DEY
A4C5 69 FF	ADC #\$FF	A528 10 FB	BPL \$A522
A4C7 85 2E	STA \$2E	A52A 20 59 A6	JSR \$A659
A4C9 E5 60	SBC \$60	A52D 20 33 A5	JSR \$A533
A4CB AA	TAX	A530 4C B0 A4	JMP \$A4B0
A4CC 3B	SEC		
A4CD A5 5F	LDA \$5F		
A4CF E5 2D	SBC \$2D		
A4D1 AB	TAY		
A4D2 B0 03	BCS \$A4D7		
A4D4 EB	INX		
A4D5 C6 25	DEC \$25		
A4D7 1B	CLC		
A4D8 65 22	ADC \$22		
A4DA 90 03	BCC \$A4DF		
A4DC C6 23	DEC \$23		
A4DE 1B	CLC		
A4DF B1 22	LDA (\$22),Y		
A4E1 91 24	STA (\$24),Y		
A4E3 C8	INY		
A4E4 D0 F9	BNE \$A4DF		
A4E6 E6 23	INC \$23		
A4E8 E6 25	INC \$25		
A4EA CA	DEX		
A4EB D0 F2	BNE \$A4DF		
A4ED 20 59 A6	JSR \$A659		
A4F0 20 33 A5	JSR \$A533		
A4F3 AD 00 02	LDA \$0200		
A4F6 F0 8B	BEQ \$A4B0		
A4F8 1B	CLC		
A4F9 A5 2D	LDA \$2D		
A4FB 85 5A	STA \$5A		
A4FD 65 0B	ADC \$0B		

A533; Re-chain lines			
A533 A5 2B	LDA \$2B		
A535 A4 2C	LDY \$2C		
A537 85 22	STA \$22		
A539 84 23	STY \$23		
A53B 1B	CLC		
A53C A0 01	LDY #\$01		
A53E B1 22	LDA (\$22),Y		
A540 F0 1D	BEQ \$A55F		
A542 A0 04	LDY \$04		
A544 C8	INY		
A545 B1 22	LDA (\$22),Y		
A547 D0 FB	BNE \$A544		
A549 C8	INY		
A54A 9B	TYA		
A54B 65 22	ADC \$22		
A54D AA	TAX		
A54E A0 00	LDY #\$00		
A550 91 22	STA (\$22),Y		
A552 A5 23	LDA \$23		
A554 69 00	ADC #\$00		
A556 C8	INY		
A557 91 22	STA (\$22),Y		
A559 86 22	STX \$22		
A55B 85 23	STA \$23		

A55D 90 DD	BCC \$A53C	A5B6 C8	INX
A55F 60	RTS	A5B7 E8	INX
		A5B8 BD 00 02	LDA \$0200,X
		A5B8 38	SEC
A560; Receive input line		A5BC F9 9E A0	SBC \$A09E,Y
		A5BF F0 F5	BEQ \$A5B6
A560 A2 00	LDX ##00	A5C1 C9 80	CMP ##80
A562 20 12 E1	JSR \$E112	A5C3 D0 30	BNE \$A5F5
A565 C9 0D	CMP ##0D	A5C5 05 0B	ORA \$0B
A567 F0 0D	BEQ \$A576	A5C7 A4 71	LDY \$71
A569 9D 00 02	STA \$0200,X	A5C9 E8	INX
A56C EB	INX	A5CA C8	INX
A56D E0 59	CPX ##59	A5CB 99 FB 01	STA \$01FB,Y
A56F 90 F1	BCC \$A562	A5CE B9 FB 01	LDA \$01FB,Y
A571 A2 17	LDX ##17	A5D1 F0 36	BEQ \$A609
A573 4C 37 A4	JMP \$A437	A5D3 38	SEC
A576 4C CA AA	JMP \$AACA	A5D4 E9 3A	SBC ##3A
		A5D6 F0 04	BEQ \$A5DC
		A5D8 C9 49	CMP ##49
A579; Crunch tokens		A5DA D0 02	BNE \$A5DE
		A5DC B5 0F	STA \$0F
A579 6C 04 03	JMP (\$0304)	A5DE 38	SEC
A57C A6 7A	LDX \$7A	A5DF E9 55	SBC ##55
A57E A0 04	LDY ##04	A5E1 D0 9F	BNE \$A5B2
A580 B4 0F	STY \$0F	A5E3 B5 0B	STA \$0B
A582 BD 00 02	LDA \$0200,X	A5E5 BD 00 02	LDA \$0200,X
A585 10 07	BPL \$A5BE	A5E8 F0 DF	BEQ \$A5C9
A587 C9 FF	CMP ##FF	A5EA C5 0B	CMP \$0B
A589 F0 3E	BEQ \$A5C9	A5EC F0 DB	BEQ \$A5C9
A58B EB	INX	A5EE C8	INX
A58C D0 F4	BNE \$A5B2	A5EF 99 FB 01	STA \$01FB,Y
A58E C9 20	CMP ##20	A5F2 E8	INX
A590 F0 37	BEQ \$A5C9	A5F3 D0 F0	BNE \$A5E5
A592 B5 0B	STA \$0B	A5F5 A6 7A	LDX \$7A
A594 C9 22	CMP ##22	A5F7 E6 0B	INC \$0B
A596 F0 56	BEQ \$A5EE	A5F9 C8	INX
A598 24 0F	BIT \$0F	A5FA B9 9D A0	LDA \$A09D,Y
A59A 70 2D	BVS \$A5C9	A5FD 10 FA	BPL \$A5F9
A59C C9 3F	CMP ##3F	A5FF B9 9E A0	LDA \$A09E,Y
A59E D0 04	BNE \$A5A4	A602 D0 B4	BNE \$A5B8
A5A0 A9 99	LDA ##99	A604 BD 00 02	LDA \$0200,X
A5A2 D0 25	BNE \$A5C9	A607 10 BE	BPL \$A5C7
A5A4 C9 30	CMP ##30	A609 99 FD 01	STA \$01FD,Y
A5A6 90 04	BCC \$A5AC	A60C C6 7B	DEC \$7B
A5A8 C9 3C	CMP ##3C	A60E A9 FF	LDA ##FF
A5AA 90 1D	BCC \$A5C9	A610 B5 7A	STA \$7A
A5AC B4 71	STY \$71	A612 60	RTS
A5AE A0 00	LDY ##00		
A5B0 B4 0B	STY \$0B		
A5B2 BB	DEY	A613; Find Basic line	
A5B3 B6 7A	STX \$7A		
A5B5 CA	DEX	A613 A5 2B	LDA \$2B

A615	A6	2C	LDX	\$2C	A663	A5	37	LDA	\$37	
A617	A0	01	LDY	#\$01	A665	A4	38	LDY	\$38	
A619	B5	5F	STA	\$5F	A667	B5	33	STA	\$33	
A61B	B6	60	STX	\$60	A669	B4	34	STY	\$34	
A61D	B1	5F	LDA	(\$5F),Y	A66B	A5	2D	LDA	\$2D	
A61F	F0	1F	BEQ	\$A640	A66D	A4	2E	LDY	\$2E	
A621	C8		INY		A66F	B5	2F	STA	\$2F	
A622	C8		INY		A671	B4	30	STY	\$30	
A623	A5	15	LDA	\$15	A673	B5	31	STA	\$31	
A625	D1	5F	CMP	(\$5F),Y	A675	B4	32	STY	\$32	
A627	90	18	BCC	\$A641	A677	20	1D	AB	JSR	\$AB1D
A629	F0	03	BEQ	\$A62E	A67A	A2	19	LDX	##19	
A62B	BB		DEY		A67C	B6	16	STX	\$16	
A62C	D0	09	BNE	\$A637	A67E	68		PLA		
A62E	A5	14	LDA	\$14	A67F	A8		TAY		
A630	BB		DEY		A680	68		PLA		
A631	D1	5F	CMP	(\$5F),Y	A681	A2	FA	LDX	##FA	
A633	90	0C	BCC	\$A641	A683	9A		TXS		
A635	F0	0A	BEQ	\$A641	A684	48		PHA		
A637	BB		DEY		A685	98		TYA		
A638	B1	5F	LDA	(\$5F),Y	A686	48		PHA		
A63A	AA		TAX		A687	A9	00	LDA	##00	
A63B	BB		DEY		A689	B5	3E	STA	\$3E	
A63C	B1	5F	LDA	(\$5F),Y	A68B	B5	10	STA	\$10	
A63E	B0	D7	BCS	\$A617	A68D	60		RTS		
A640	1B		CLC							
A641	60		RTS							

A68E; Back up text pointer

A642; Perform [NEW]

A642	D0	FD	BNE	\$A641	
A644	A9	00	LDA	##00	
A646	A8		TAY		
A647	91	2B	STA	(\$2B),Y	
A649	C8		INY		
A64A	91	2B	STA	(\$2B),Y	
A64C	A5	2B	LDA	\$2B	
A64E	18		CLC		
A64F	69	02	ADC	##02	
A651	B5	2D	STA	\$2D	
A653	A5	2C	LDA	\$2C	
A655	69	00	ADC	##00	
A657	B5	2E	STA	\$2E	
A659	20	BE	A6	JSR	\$A68E
A65C	A9	00	LDA	##00	

A65E; Perform [CLR]

A65E	D0	2D	BNE	\$A68D	
A660	20	E7	FF	JSR	##FE7

A68E	18		CLC	
A68F	A5	2B	LDA	\$2B
A691	69	FF	ADC	##FF
A693	B5	7A	STA	\$7A
A695	A5	2C	LDA	\$2C
A697	69	FF	ADC	##FF
A699	B5	7B	STA	\$7B
A69B	60		RTS	

A69C; Perform [LIST]

A69C	90	06	BCC	\$A6A4	
A69E	F0	04	BEQ	\$A6A4	
A6A0	C9	AB	CMP	##AB	
A6A2	D0	E9	BNE	\$A68D	
A6A4	20	6B	A9	JSR	\$A96B
A6A7	20	13	A6	JSR	\$A613
A6AA	20	79	00	JSR	\$0079
A6AD	F0	0C	BEQ	\$A6BB	
A6AF	C9	AB	CMP	##AB	
A6B1	D0	BE	BNE	\$A641	
A6B3	20	73	00	JSR	\$0073

A6B6 20 6B A9	JSR \$A96B	A71C C9 FF	CMP #\$FF
A6B9 D0 86	BNE \$A641	A71E F0 D3	BEQ \$A6F3
A6BB 68	PLA	A720 24 0F	BIT \$0F
A6BC 68	PLA	A722 30 CF	BMI \$A6F3
A6BD A5 14	LDA \$14	A724 38	SEC
A6BF 05 15	ORA \$15	A725 E9 7F	SBC #\$7F
A6C1 D0 06	BNE \$A6C9	A727 AA	TAX
A6C3 A9 FF	LDA #\$FF	A728 B4 49	STY \$49
A6C5 B5 14	STA \$14	A72A A0 FF	LDY #\$FF
A6C7 B5 15	STA \$15	A72C CA	DEX
A6C9 A0 01	LDY #\$01	A72D F0 08	BEQ \$A737
A6CB B4 0F	STY \$0F	A72F C8	INY
A6CD B1 5F	LDA (\$5F),Y	A730 B9 9E A0	LDA \$A09E,Y
A6CF F0 43	BEQ \$A714	A733 10 FA	BPL \$A72F
A6D1 20 2C AB	JSR \$AB2C	A735 30 F5	BMI \$A72C
A6D4 20 D7 AA	JSR \$AAD7	A737 C8	INY
A6D7 C8	INY	A738 B9 9E A0	LDA \$A09E,Y
A6DB B1 5F	LDA (\$5F),Y	A73B 30 B2	BMI \$A6EF
A6DA AA	TAX	A73D 20 47 AB	JSR \$AB47
A6DB C8	INY	A740 D0 F5	BNE \$A737
A6DC B1 5F	LDA (\$5F),Y		
A6DE C5 15	CMP \$15		
A6E0 D0 04	BNE \$A6E6	A742; Perform [FOR]	
A6E2 E4 14	CPX \$14		
A6E4 F0 02	BEQ \$A6E8	A742 A9 B0	LDA #\$80
A6E6 B0 2C	BCS \$A714	A744 B5 10	STA \$10
A6E8 B4 49	STY \$49	A746 20 A5 A9	JSR \$A9A5
A6EA 20 CD BD	JSR \$BDCD	A749 20 BA A3	JSR \$A38A
A6ED A9 20	LDA #\$20	A74C D0 05	BNE \$A753
A6EF A4 49	LDY \$49	A74E BA	TXA
A6F1 29 7F	AND #\$7F	A74F 69 0F	ADC #\$0F
A6F3 20 47 AB	JSR \$AB47	A751 AA	TAX
A6F6 C9 22	CMP #\$22	A752 9A	TXS
A6F8 D0 06	BNE \$A700	A753 68	PLA
A6FA A5 0F	LDA \$0F	A754 68	PLA
A6FC 49 FF	EOR #\$FF	A755 A9 09	LDA #\$09
A6FE B5 0F	STA \$0F	A757 20 FB A3	JSR \$A3FB
A700 C8	INY	A75A 20 06 A9	JSR \$A906
A701 F0 11	BEQ \$A714	A75D 18	CLC
A703 B1 5F	LDA (\$5F),Y	A75E 98	TYA
A705 D0 10	BNE \$A717	A75F 65 7A	ADC \$7A
A707 A8	TAY	A761 48	PHA
A708 B1 5F	LDA (\$5F),Y	A762 A5 7B	LDA \$7B
A70A AA	TAX	A764 69 00	ADC #\$00
A70B C8	INY	A766 48	PHA
A70C B1 5F	LDA (\$5F),Y	A767 A5 3A	LDA \$3A
A70E B6 5F	STX \$5F	A769 48	PHA
A710 B5 60	STA \$60	A76A A5 39	LDA \$39
A712 D0 B5	BNE \$A6C9	A76C 48	PHA
A714 4C B6 E3	JMP \$E386	A76D A9 A4	LDA \$A4
A717 6C 06 03	JMP (\$0306)	A76F 20 FF AE	JSR \$AEFF
A71A 10 D7	BPL \$A6F3	A772 20 BD AD	JSR \$ADBD

A775	20	BA	AD	JSR \$AD8A	A7DF	E6	7B	INC \$7B
A778	A5	66		LDA \$66	A7E1	6C	08 03	JMP (\$030B)
A77A	09	7F		ORA #\$7F	A7E4	20	73 00	JSR \$0073
A77C	25	62		AND \$62	A7E7	20	ED A7	JSR \$A7ED
A77E	B5	62		STA \$62	A7EA	4C	AE A7	JMP \$A7AE
A780	A9	8B		LDA #\$8B				
A782	A0	A7		LDY #\$A7				
A784	B5	22		STA \$22	A7ED; Execute statement			
A786	B4	23		STY \$23				
A788	4C	43	AE	JMP \$AE43	A7ED	F0	3C	BEQ \$A82B
A78B	A9	BC		LDA #\$BC	A7EF	E9	B0	SBC #\$80
A78D	A0	B9		LDY #\$B9	A7F1	90	11	BCC \$A804
A78F	20	A2	BB	JSR \$BBA2	A7F3	C9	23	CMP #\$23
A792	20	79	00	JSR \$0079	A7F5	B0	17	BCS \$A80E
A795	C9	A9		CMP #\$A9	A7F7	0A		ASL
A797	D0	06		BNE \$A79F	A7F8	AB		TAY
A799	20	73	00	JSR \$0073	A7F9	B9	0D A0	LDA \$A00D,Y
A79C	20	BA	AD	JSR \$AD8A	A7FC	4B		PHA
A79F	20	2B	BC	JSR \$BC2B	A7FD	B9	0C A0	LDA \$A00C,Y
A7A2	20	3B	AE	JSR \$AE3B	AB00	4B		PHA
A7A5	A5	4A		LDA \$4A	AB01	4C	73 00	JMP \$0073
A7A7	4B			PHA	AB04	4C	A5 A9	JMP \$A9A5
A7AB	A5	49		LDA \$49	AB07	C9	3A	CMP #\$3A
A7AA	4B			PHA	AB09	F0	D6	BEQ \$A7E1
A7AB	A9	B1		LDA #\$B1	AB0B	4C	0B AF	JMP \$AF0B
A7AD	4B			PHA	AB0E	C9	4B	CMP #\$4B
A7AE	20	2C	AB	JSR \$AB2C	AB10	D0	F9	BNE \$AB0B
A7B1	A5	7A		LDA \$7A	AB12	20	73 00	JSR \$0073
A7B3	A4	7B		LDY \$7B	AB15	A9	A4	LDA #\$A4
A7B5	C0	02		CPY #\$02	AB17	20	FF AE	JSR \$AEFF
A7B7	EA			NOP	AB1A	4C	A0 AB	JMP \$ABAO
A7B8	F0	04		BEQ \$A7BE				
A7BA	B5	3D		STA \$3D	AB1D; Perform [RESTORE]			
A7BC	B4	3E		STY \$3E				
A7BE	A0	00		LDY #\$00	AB1D	3B		SEC
A7C0	B1	7A		LDA (\$7A),Y	AB1E	A5	2B	LDA \$2B
A7C2	D0	43		BNE \$AB07	AB20	E9	01	SBC #\$01
A7C4	A0	02		LDY #\$02	AB22	A4	2C	LDY \$2C
A7C6	B1	7A		LDA (\$7A),Y	AB24	B0	01	BCS \$AB27
A7C8	1B			CLC	AB26	B8		DEY
A7C9	D0	03		BNE \$A7CE	AB27	B5	41	STA \$41
A7CB	4C	4B	AB	JMP \$AB4B	AB29	B4	42	STY \$42
A7CE	C8			INY	AB2B	60		RTS
A7CF	B1	7A		LDA (\$7A),Y				
A7D1	B5	39		STA \$39	AB2C; Break			
A7D3	C8			INY				
A7D4	B1	7A		LDA (\$7A),Y	AB2C	20	E1 FF	JSR \$FFE1
A7D6	B5	3A		STA \$3A				
A7DB	9B			TYA				
A7D9	65	7A		ADC \$7A				
A7DB	B5	7A		STA \$7A				
A7DD	90	02		BCC \$A7E1	AB2F; Perform [STOP]			

AB2F B0 01 BCS \$AB32

AB7D 20 60 A6 JSR \$A660

AB80 4C 97 AB JMP \$AB97

AB31; Perform [END]

AB31 18 CLC
 AB32 D0 3C BNE \$AB70
 AB34 A5 7A LDA \$7A
 AB36 A4 7B LDY \$7B
 AB38 A6 3A LDX \$3A
 AB3A E8 INX
 AB3B F0 0C BEQ \$AB49
 AB3D B5 3D STA \$3D
 AB3F B4 3E STY \$3E
 AB41 A5 39 LDA \$39
 AB43 A4 3A LDY \$3A
 AB45 B5 3B STA \$3B
 AB47 B4 3C STY \$3C
 AB49 68 PLA
 AB4A 68 PLA
 AB4B A9 B1 LDA #\$B1
 AB4D A0 A3 LDY #\$A3
 AB4F 90 03 BCC \$AB54
 AB51 4C 69 A4 JMP \$A469
 AB54 4C B6 E3 JMP \$E3B6

AB57; Perform [CONT]

AB57 D0 17 BNE \$AB70
 AB59 A2 1A LDX #\$1A
 AB5B A4 3E LDY \$3E
 AB5D D0 03 BNE \$AB62
 AB5F 4C 37 A4 JMP \$A437
 AB62 A5 3D LDA \$3D
 AB64 B5 7A STA \$7A
 AB66 B4 7B STY \$7B
 AB68 A5 3B LDA \$3B
 AB6A A4 3C LDY \$3C
 AB6C B5 39 STA \$39
 AB6E B4 3A STY \$3A
 AB70 60 RTS

AB71; Perform [RUN]

AB71 0B PHP
 AB72 A9 00 LDA #\$00
 AB74 20 90 FF JSR \$FF90
 AB77 2B PLP
 AB7B D0 03 BNE \$AB7D
 AB7A 4C 59 A6 JMP \$A659

AB83; Perform [GOSUB]

AB83 A9 03 LDA #\$03
 AB85 20 FB A3 JSR \$A3FB
 AB8B A5 7B LDA \$7B
 AB8A 4B PHA
 AB8B A5 7A LDA \$7A
 AB8D 4B PHA
 AB8E A5 3A LDA \$3A
 AB90 4B PHA
 AB91 A5 39 LDA \$39
 AB93 4B PHA
 AB94 A9 BD LDA #\$BD
 AB96 4B PHA
 AB97 20 79 00 JSR \$0079
 AB9A 20 A0 AB JSR \$ABAO
 AB9D 4C AE A7 JMP \$A7AE

ABA0; Perform [GOTO]

ABA0 20 6B A9 JSR \$A96B
 ABA3 20 09 A9 JSR \$A909
 ABA6 3B SEC
 ABA7 A5 39 LDA \$39
 ABA9 E5 14 SBC \$14
 ABAB A5 3A LDA \$3A
 ABAD E5 15 SBC \$15
 ABAF B0 0B BCS \$ABBC
 ABB1 9B TYA
 ABB2 3B SEC
 ABB3 65 7A ADC \$7A
 ABB5 A6 7B LDX \$7B
 ABB7 90 07 BCC \$ABCO
 ABB9 EB INX
 ABBA B0 04 BCS \$ABCO
 ABBC A5 2B LDA \$2B
 ABBE A6 2C LDX \$2C
 ABC0 20 17 A6 JSR \$A617
 ABC3 90 1E BCC \$ABE3
 ABC5 A5 5F LDA \$5F
 ABC7 E9 01 SBC #\$01
 ABC9 B5 7A STA \$7A
 ABCB A5 60 LDA \$60
 ABCD E9 00 SBC #\$00
 ABCF B5 7B STA \$7B
 ABD1 60 RTS

ABD2; Perform [RETURN]

```

ABD2 D0 FD      BNE $ABD1
ABD4 A9 FF      LDA #$FF
ABD6 85 4A      STA $4A
ABD8 20 8A A3   JSR $A3BA
ABDB 9A         TXS
ABDC C9 8D      CMP #$8D
ABDE F0 0B      BEQ $ABEB
ABE0 A2 0C      LDX #$0C
ABE2 2C A2 11   BIT $11A2
ABE4 4C 37 A4   JMP $A437
ABE6 4C 0B AF   JMP $AF0B
ABE8 68         PLA
ABEC 68         PLA
ABED 85 39      STA $39
ABEF 68         PLA
ABF0 85 3A      STA $3A
ABF2 68         PLA
ABF3 85 7A      STA $7A
ABF5 68         PLA
ABF6 85 7B      STA $7B

```

ABFB; Perform [DATA]

```

ABFB 20 06 A9   JSR $A906
ABFB 98         TYA
ABFC 18         CLC
ABFD 65 7A      ADC $7A
ABFF 85 7A      STA $7A
A901 90 02      BCC $A905
A903 E6 7B      INC $7B
A905 60         RTS

```

A906; Scan for next statement

```

A906 A2 3A      LDX #$3A
A908 2C A2 00   BIT $00A2
A90B 86 07      STX $07
A90D A0 00      LDY #$00
A90F 84 0B      STY $0B
A911 A5 0B      LDA $0B
A913 A6 07      LDX $07
A915 85 07      STA $07
A917 86 0B      STX $0B
A919 B1 7A      LDA ($7A),Y
A91B F0 EB      BEQ $A905
A91D C5 0B      CMP $0B

```

```

A91F F0 E4      BEQ $A905
A921 C8         INY
A922 C9 22      CMP #$22
A924 D0 F3      BNE $A919
A926 F0 E9      BEQ $A911

```

A928; Perform [IF]

```

A928 20 9E AD   JSR $AD9E
A92B 20 79 00   JSR $0079
A92E C9 89      CMP #$89
A930 F0 05      BEQ $A937
A932 A9 A7      LDA $A7
A934 20 FF AE   JSR $AEFF
A937 A5 61      LDA $61
A939 D0 05      BNE $A940

```

A93B; Perform [REM]

```

A93B 20 09 A9   JSR $A909
A93E F0 BB      BEQ $ABFB
A940 20 79 00   JSR $0079
A943 B0 03      BCS $A948
A945 4C A0 AB   JMP $ABA0

```

A94B; Perform [ON]

```

A94B 4C ED A7   JMP $A7ED
A94B 20 9E B7   JSR $B79E
A94E 48         PHA
A94F C9 8D      CMP #$8D
A951 F0 04      BEQ $A957
A953 C9 89      CMP #$89
A955 D0 91      BNE $ABEB
A957 C6 65      DEC $65
A959 D0 04      BNE $A95F
A95B 68         PLA
A95C 4C EF A7   JMP $A7EF
A95F 20 73 00   JSR $0073
A962 20 6B A9   JSR $A96B
A965 C9 2C      CMP #$2C
A967 F0 EE      BEQ $A957
A969 68         PLA
A96A 60         RTS

```

A96B; Get fixed point number

```

A96B A2 00      LDX #$00

```

A96D 86 14	STX \$14	A9CE 91 49	STA (\$49),Y
A96F 86 15	STX \$15	A9D0 C8	INY
A971 B0 F7	BCS \$A96A	A9D1 A5 65	LDA \$65
A973 E9 2F	SBC #\$2F	A9D3 91 49	STA (\$49),Y
A975 85 07	STA \$07	A9D5 60	RTS
A977 A5 15	LDA \$15	A9D6 4C D0 BB	JMP \$BBD0
A979 85 22	STA \$22	A9D9 68	PLA
A97B C9 19	CMP #\$19	A9DA A4 4A	LDY \$4A
A97D B0 D4	BCS \$A953	A9DC C0 BF	CPY #\$BF
A97F A5 14	LDA \$14	A9DE D0 4C	BNE \$AA2C
A981 0A	ASL	A9E0 20 A6 B6	JSR \$B6A6
A982 26 22	ROL \$22	A9E3 C9 06	CMP #\$06
A984 0A	ASL	A9E5 D0 3D	BNE \$AA24
A985 26 22	ROL \$22	A9E7 A0 00	LDY #\$00
A987 65 14	ADC \$14	A9E9 84 61	STY \$61
A989 85 14	STA \$14	A9EB 84 66	STY \$66
A98B A5 22	LDA \$22	A9ED 84 71	STY \$71
A98D 65 15	ADC \$15	A9EF 20 1D AA	JSR \$AA1D
A98F 85 15	STA \$15	A9F2 20 E2 BA	JSR \$BAE2
A991 06 14	ASL \$14	A9F5 E6 71	INC \$71
A993 26 15	ROL \$15	A9F7 A4 71	LDY \$71
A995 A5 14	LDA \$14	A9F9 20 1D AA	JSR \$AA1D
A997 65 07	ADC \$07	A9FC 20 0C BC	JSR \$BC0C
A999 85 14	STA \$14	A9FF AA	TAX
A99B 90 02	BCC \$A99F	AA00 F0 05	BEQ \$AA07
A99D E6 15	INC \$15	AA02 E8	INX
A99F 20 73 00	JSR \$0073	AA03 8A	TXA
A9A2 4C 71 A9	JMP \$A971	AA04 20 ED BA	JSR \$BAED
		AA07 A4 71	LDY \$71
		AA09 C8	INY
		AA0A C0 06	CPY #\$06
		AA0C D0 DF	BNE \$A9ED
		AA0E 20 E2 BA	JSR \$BAE2
		AA11 20 9B BC	JSR \$BC9B
		AA14 A6 64	LDX \$64
		AA16 A4 63	LDY \$63
		AA18 A5 65	LDA \$65
		AA1A 4C DB FF	JMP \$FFDB
		AA1D B1 22	LDA (\$22),Y
		AA1F 20 80 00	JSR \$0080
		AA22 90 03	BCC \$AA27
		AA24 4C 48 B2	JMP \$B248
		AA27 E9 2F	SBC #\$2F
		AA29 4C 7E BD	JMP \$BD7E
		AA2C A0 02	LDY #\$02
		AA2E B1 64	LDA (\$64),Y
		AA30 C5 34	CMP \$34
		AA32 90 17	BCC \$AA4B
		AA34 D0 07	BNE \$AA3D
		AA36 B8	DEY
		AA37 B1 64	LDA (\$64),Y
		AA39 C5 33	CMP \$33

A9A5; Perform [LET]

A9A5 20 8B B0	JSR \$B0BB
A9A8 85 49	STA \$49
A9AA 84 4A	STY \$4A
A9AC A9 B2	LDA #\$B2
A9AE 20 FF AE	JSR \$AEFF
A9B1 A5 0E	LDA \$0E
A9B3 48	PHA
A9B4 A5 0D	LDA \$0D
A9B6 48	PHA
A9B7 20 9E AD	JSR \$AD9E
A9BA 68	PLA
A9BB 2A	ROL
A9BC 20 90 AD	JSR \$AD90
A9BF D0 18	BNE \$A9D9
A9C1 68	PLA
A9C2 10 12	BPL \$A9D6
A9C4 20 1B BC	JSR \$BC1B
A9C7 20 BF B1	JSR \$B1BF
A9CA A0 00	LDY #\$00
A9CC A5 64	LDA \$64

AA3B	90	0E	BCC \$AA4B
AA3D	A4	65	LDY \$65
AA3F	C4	2E	CPY \$2E
AA41	90	0B	BCC \$AA4B
AA43	D0	0D	BNE \$AA52
AA45	A5	64	LDA \$64
AA47	C5	2D	CMP \$2D
AA49	B0	07	BCS \$AA52
AA4B	A5	64	LDA \$64
AA4D	A4	65	LDY \$65
AA4F	4C	68 AA	JMP \$AA6B
AA52	A0	00	LDY #\$00
AA54	B1	64	LDA (\$64),Y
AA56	20	75 B4	JSR \$B475
AA59	A5	50	LDA \$50
AA5B	A4	51	LDY \$51
AA5D	B5	6F	STA \$6F
AA5F	B4	70	STY \$70
AA61	20	7A B6	JSR \$B67A
AA64	A9	61	LDA #\$61
AA66	A0	00	LDY #\$00
AA68	B5	50	STA \$50
AA6A	B4	51	STY \$51
AA6C	20	DB B6	JSR \$B6DB
AA6F	A0	00	LDY #\$00
AA71	B1	50	LDA (\$50),Y
AA73	91	49	STA (\$49),Y
AA75	C8		INY
AA76	B1	50	LDA (\$50),Y
AA78	91	49	STA (\$49),Y
AA7A	CB		INY
AA7B	B1	50	LDA (\$50),Y
AA7D	91	49	STA (\$49),Y
AA7F	60		RTS

AAB0; Perform [PRINT#]

AAB0	20	86 AA	JSR \$AAB6
AAB3	4C	B5 AB	JMP \$ABB5

AAB6; Perform [CMD]

AAB6	20	9E B7	JSR \$B79E
AAB9	F0	05	BEQ \$AA90
AABB	A9	2C	LDA #\$2C
AABD	20	FF AE	JSR \$AEFF
AA90	0B		PHP
AA91	86	13	STX \$13
AA93	20	18 E1	JSR \$E11B
AA96	2B		PLP

AA97	4C	A0 AA	JMP \$AAA0
AA9A	20	21 AB	JSR \$AB21
AA9D	20	79 00	JSR \$0079

AAA0; Perform [PRINT]

AAA0	F0	35	BEQ \$AAD7
AAA2	F0	43	BEQ \$AAE7
AAA4	C9	A3	CMP #\$A3
AAA6	F0	50	BEQ \$AAFB
AAA8	C9	A6	CMP #\$A6
AAAA	1B		CLC
AAAB	F0	4B	BEQ \$AAFB
AAAD	C9	2C	CMP #\$2C
AAAF	F0	37	BEQ \$AAEB
AAB1	C9	3B	CMP #\$3B
AAB3	F0	5E	BEQ \$AB13
AAB5	20	9E AD	JSR \$AD9E
AAB8	24	0D	BIT \$0D
AABA	30	DE	BMI \$AA9A
AABC	20	DD BD	JSR \$BDDDD
AABF	20	87 B4	JSR \$B4B7
AAC2	20	21 AB	JSR \$AB21
AAC5	20	3B AB	JSR \$AB3B
AAC8	D0	D3	BNE \$AA9D
AACA	A9	00	LDA #\$00
AACC	9D	00 02	STA \$0200,X
AACF	A2	FF	LDX \$FF
AAD1	A0	01	LDY \$01
AAD3	A5	13	LDA \$13
AAD5	D0	10	BNE \$AAE7
AAD7	A9	0D	LDA \$0D
AAD9	20	47 AB	JSR \$AB47
AADC	24	13	BIT \$13
AADE	10	05	BPL \$AAE5
AAE0	A9	0A	LDA \$0A
AAE2	20	47 AB	JSR \$AB47
AAE5	49	FF	EOR \$FF
AAE7	60		RTS
AAEB	3B		SEC
AAE9	20	F0 FF	JSR \$FFF0
AAEC	9B		TYA
AAED	3B		SEC
AAEE	E9	0A	SBC \$0A
AAFO	B0	FC	BCS \$AAEE
AAF2	49	FF	EOR \$FF
AAF4	69	01	ADC \$01
AAF6	D0	16	BNE \$AB0E
AAF8	0B		PHP
AAF9	3B		SEC
Aafa	20	F0 FF	JSR \$FFF0

```

AAFD B4 09      STY $09
AAFF 20 9B B7   JSR $B79B
AB02 C9 29      CMP #$29
AB04 D0 59      BNE $AB5F
AB06 2B         PLP
AB07 90 06      BCC $AB0F
AB09 BA         TXA
AB0A E5 09      SBC $09
AB0C 90 05      BCC $AB13
AB0E AA         TAX
AB0F E8         INX
AB10 CA         DEX
AB11 D0 06      BNE $AB19
AB13 20 73 00   JSR $0073
AB16 4C A2 AA   JMP $AAA2
AB19 20 3B AB   JSR $AB3B
AB1C D0 F2      BNE $AB10

```

AB1E; Print string from (y.a)

```

AB1E 20 B7 B4   JSR $B4B7
AB21 20 A6 B6   JSR $B6A6
AB24 AA         TAX
AB25 A0 00      LDY #$00
AB27 E8         INX
AB28 CA         DEX
AB29 F0 BC      BEQ $AAE7
AB2B B1 22      LDA ($22),Y
AB2D 20 47 AB   JSR $AB47
AB30 CB         INY
AB31 C9 0D      CMP #$0D
AB33 D0 F3      BNE $AB2B
AB35 20 E5 AA   JSR $AAE5
AB3B 4C 2B AB   JMP $AB2B

```

AB3B; Print format character

```

AB3B A5 13      LDA $13
AB3D F0 03      BEQ $AB42
AB3F A9 20      LDA #$20
AB41 2C A9 1D   BIT $1DA9
AB44 2C A9 3F   BIT $3FA9
AB47 20 0C E1   JSR $E10C
AB4A 29 FF      AND #$FF
AB4C 60         RTS

```

AB4D; Bad input routine

```

AB4D A5 11      LDA $11

```

```

AB4F F0 11      BEQ $AB62
AB51 30 04      BMI $AB57
AB53 A0 FF      LDY #$FF
AB55 D0 04      BNE $AB5B
AB57 A5 3F      LDA $3F
AB59 A4 40      LDY $40
AB5B 85 39      STA $39
AB5D 84 3A      STY $3A
AB5F 4C 0B AF   JMP $AF0B
AB62 A5 13      LDA $13
AB64 F0 05      BEQ $AB6B
AB66 A2 18      LDX #$18
AB68 4C 37 A4   JMP $A437
AB6B A9 0C      LDA #$0C
AB6D A0 AD      LDY #$AD
AB6F 20 1E AB   JSR $AB1E
AB72 A5 3D      LDA $3D
AB74 A4 3E      LDY $3E
AB76 B5 7A      STA $7A
AB7B 84 7B      STY $7B
AB7A 60         RTS

```

AB7B; Perform [GET]

```

AB7B 20 A6 B3   JSR $B3A6
AB7E C9 23      CMP #$23
AB80 D0 10      BNE $AB92
AB82 20 73 00   JSR $0073
AB85 20 9E B7   JSR $B79E
AB88 A9 2C      LDA #$2C
AB8A 20 FF AE   JSR $AEFF
AB8D 86 13      STX $13
AB8F 20 1E E1   JSR $E11E
AB92 A2 01      LDX #$01
AB94 A0 02      LDY #$02
AB96 A9 00      LDA #$00
AB9B 8D 01 02   STA $0201
AB9B A9 40      LDA #$40
AB9D 20 0F AC   JSR $AC0F
ABA0 A6 13      LDX $13
ABA2 D0 13      BNE $ABB7
ABA4 60         RTS

```

ABA5; Perform [INPUT#]

```

ABA5 20 9E B7   JSR $B79E
ABAB A9 2C      LDA #$2C
ABAA 20 FF AE   JSR $AEFF
ABAD 86 13      STX $13
ABAF 20 1E E1   JSR $E11E

```

ABB2 20 CE AB JSR \$ABCE
 ABB5 A5 13 LDA \$13
 ABB7 20 CC FF JSR \$FFCC
 ABBA A2 00 LDX #\$00
 ABBC B6 13 STX \$13
 ABBE 60 RTS

ABBF; Perform [INPUT]

ABBF C9 22 CMP #\$22
 ABC1 D0 0B BNE \$ABCE
 ABC3 20 BD AE JSR \$AEBD
 ABC6 A9 3B LDA #\$3B
 ABC8 20 FF AE JSR \$AEFF
 ABCB 20 21 AB JSR \$AB21
 ABCE 20 A6 B3 JSR \$B3A6
 ABD1 A9 2C LDA #\$2C
 ABD3 BD FF 01 STA \$01FF
 ABD6 20 F9 AB JSR \$ABF9
 ABD9 A5 13 LDA \$13
 ABDB F0 0D BEQ \$ABEA
 ABDD 20 B7 FF JSR \$FFB7
 ABE0 29 02 AND #\$02
 ABE2 F0 06 BEQ \$ABEA
 ABE4 20 B5 AB JSR \$ABB5
 ABE7 4C F8 AB JMP \$ABF8
 ABEA AD 00 02 LDA \$0200
 ABED D0 1E BNE \$AC0D
 ABEF A5 13 LDA \$13
 ABF1 D0 E3 BNE \$ABD6
 ABF3 20 06 A9 JSR \$A906
 ABF6 4C FB AB JMP \$ABF8

ABF9; Prompt & input

ABF9 A5 13 LDA \$13
 ABFB D0 06 BNE \$AC03
 ABFD 20 45 AB JSR \$AB45
 AC00 20 3B AB JSR \$AB3B
 AC03 4C 60 A5 JMP \$A560

AC06; Perform [READ]

AC06 A6 41 LDX \$41
 AC08 A4 42 LDY \$42
 AC0A A9 98 LDA #\$98
 AC0C 2C A9 00 BIT \$00A9
 AC0F B5 11 STA \$11
 AC11 B6 43 STX \$43

AC13 B4 44 STY \$44
 AC15 20 8B B0 JSR \$B0BB
 AC18 B5 49 STA \$49
 AC1A B4 4A STY \$4A
 AC1C A5 7A LDA \$7A
 AC1E A4 7B LDY \$7B
 AC20 B5 4B STA \$4B
 AC22 B4 4C STY \$4C
 AC24 A6 43 LDX \$43
 AC26 A4 44 LDY \$44
 AC28 B6 7A STX \$7A
 AC2A B4 7B STY \$7B
 AC2C 20 79 00 JSR \$0079
 AC2F D0 20 BNE \$AC51
 AC31 24 11 BIT \$11
 AC33 50 0C BVC \$AC41
 AC35 20 24 E1 JSR \$E124
 AC38 BD 00 02 STA \$0200
 AC3B A2 FF LDX #\$FF
 AC3D A0 01 LDY #\$01
 AC3F D0 0C BNE \$AC4D
 AC41 30 75 BMI \$ACB8
 AC43 A5 13 LDA \$13
 AC45 D0 03 BNE \$AC4A
 AC47 20 45 AB JSR \$AB45
 AC4A 20 F9 AB JSR \$ABF9
 AC4D B6 7A STX \$7A
 AC4F B4 7B STY \$7B
 AC51 20 73 00 JSR \$0073
 AC54 24 0D BIT \$0D
 AC56 10 31 BPL \$ACB9
 AC58 24 11 BIT \$11
 AC5A 50 09 BVC \$AC65
 AC5C E8 INX
 AC5D B6 7A STX \$7A
 AC5F A9 00 LDA #\$00
 AC61 B5 07 STA \$07
 AC63 F0 0C BEQ \$AC71
 AC65 B5 07 STA \$07
 AC67 C9 22 CMP #\$22
 AC69 F0 07 BEQ \$AC72
 AC6B A9 3A LDA #\$3A
 AC6D B5 07 STA \$07
 AC6F A9 2C LDA #\$2C
 AC71 18 CLC
 AC72 B5 08 STA \$08
 AC74 A5 7A LDA \$7A
 AC76 A4 7B LDY \$7B
 AC78 69 00 ADC #\$00
 AC7A 90 01 BCC \$AC7D
 AC7C C8 INY
 AC7D 20 BD B4 JSR \$B4BD

ACB0	20	E2	B7	JSR	\$B7E2	ACF0	A5	13	LDA	\$13
ACB3	20	DA	A9	JSR	\$A9DA	ACF2	D0	07	BNE	\$ACFB
ACB6	4C	91	AC	JMP	\$AC91	ACF4	A9	FC	LDA	\$\$FC
ACB9	20	F3	BC	JSR	\$BCF3	ACF6	A0	AC	LDY	\$\$AC
ACBC	A5	0E		LDA	\$0E	ACF8	4C	1E AB	JMP	\$AB1E
ACBE	20	C2	A9	JSR	\$A9C2	ACFB	60		RTS	
AC91	20	79	00	JSR	\$0079					
AC94	F0	07		BEQ	\$AC9D					
AC96	C9	2C		CMF	#\$2C					
AC98	F0	03		BEQ	\$AC9D					
AC9A	4C	4D	AB	JMP	\$AB4D					
AC9D	A5	7A		LDA	\$7A					
AC9F	A4	7B		LDY	\$7B					
ACA1	B5	43		STA	\$43					
ACA3	B4	44		STY	\$44					
ACA5	A5	4B		LDA	\$4B					
ACA7	A4	4C		LDY	\$4C					
ACA9	B5	7A		STA	\$7A					
ACAB	B4	7B		STY	\$7B					
ACAD	20	79	00	JSR	\$0079					
ACB0	F0	2D		BEQ	\$ACDF					
ACB2	20	FD	AE	JSR	\$AEFD					
ACB5	4C	15	AC	JMP	\$AC15					
ACB8	20	06	A9	JSR	\$A906					
ACBB	C8			INY						
ACBC	AA			TAX						
ACBD	D0	12		BNE	\$ACD1					
ACBF	A2	0D		LDX	#\$0D					
ACC1	C8			INY						
ACC2	B1	7A		LDA	(\$7A),Y					
ACC4	F0	6C		BEQ	\$AD32					
ACC6	C8			INY						
ACC7	B1	7A		LDA	(\$7A),Y					
ACC9	B5	3F		STA	\$3F					
ACCB	C8			INY						
ACCC	B1	7A		LDA	(\$7A),Y					
ACCE	C8			INY						
ACCF	B5	40		STA	\$40					
ACD1	20	FB	AB	JSR	\$ABFB					
ACD4	20	79	00	JSR	\$0079					
ACD7	AA			TAX						
ACD8	E0	83		CPX	#\$83					
ACDA	D0	DC		BNE	\$ACB8					
ACDC	4C	51	AC	JMP	\$AC51					
ACDF	A5	43		LDA	\$43					
ACE1	A4	44		LDY	\$44					
ACE3	A6	11		LDX	\$11					
ACE5	10	03		BPL	\$ACEA					
ACE7	4C	27	AB	JMP	\$AB27					
ACEA	A0	00		LDY	#\$00					
ACEC	B1	43		LDA	(\$43),Y					
ACEE	F0	0B		BEQ	\$ACFB					

ACFC; Input error messages

ACFC	3F			???	
ACFD	45	58		EDR	\$58
ACFF	54			???	
AD00	52			???	
AD01	41	20		EDR	(\$20,X)
AD03	49	47		EDR	\$\$47
AD05	4E	4F	52	LSR	\$524F
AD08	45	44		EDR	\$44
AD0A	0D	00	3F	DRA	\$3F00
AD0D	52			???	
AD0E	45	44		EDR	\$44
AD10	4F			???	
AD11	20	46	52	JSR	\$5246
AD14	4F			???	
AD15	4D	20	53	EDR	\$5320
AD18	54			???	
AD19	41	52		EDR	(\$52,X)
AD1B	54			???	
AD1C	0D	00	D0	DRA	\$D000

AD1E; Perform [NEXT]

AD1E	D0	04		BNE	\$AD24
AD20	A0	00		LDY	#\$00
AD22	F0	03		BEQ	\$AD27
AD24	20	8B	B0	JSR	\$B08B
AD27	B5	49		STA	\$49
AD29	B4	4A		STY	\$4A
AD2B	20	8A	A3	JSR	\$A38A
AD2E	F0	05		BEQ	\$AD35
AD30	A2	0A		LDX	#\$0A
AD32	4C	37	A4	JMP	\$A437
AD35	9A			TXS	
AD36	8A			TXA	
AD37	18			CLC	
AD38	69	04		ADC	#\$04
AD3A	48			PHA	
AD3B	69	06		ADC	#\$06
AD3D	B5	24		STA	\$24
AD3F	68			PLA	
AD40	A0	01		LDY	#\$01

AD42	20	A2	BB	JSR	\$BBA2	ADA2	C6	7B	DEC	\$7B
AD45	BA			TSX		ADA4	C6	7A	DEC	\$7A
AD46	BD	09	01	LDA	\$0109,X	ADA6	A2	00	LDX	#\$00
AD49	85	66		STA	\$66	ADAB	24	48	BIT	\$48
AD4B	A5	49		LDA	\$49	ADAA	BA		TXA	
AD4D	A4	4A		LDY	\$4A	ADAB	48		PHA	
AD4F	20	67	B8	JSR	\$B867	ADAC	A9	01	LDA	#\$01
AD52	20	D0	BB	JSR	\$BBD0	ADAE	20	FB A3	JSR	\$A3FB
AD55	A0	01		LDY	#\$01	ADB1	20	B3 AE	JSR	\$AE83
AD57	20	5D	BC	JSR	\$BC5D	ADB4	A9	00	LDA	#\$00
AD5A	BA			TSX		ADB6	85	4D	STA	\$4D
AD5B	38			SEC		ADB8	20	79 00	JSR	\$0079
AD5C	FD	09	01	SBC	\$0109,X	ADBB	38		SEC	
AD5F	F0	17		BEQ	\$AD7B	ADBC	E9	B1	SBC	#\$B1
AD61	BD	0F	01	LDA	\$010F,X	ADBE	90	17	BCC	\$ADD7
AD64	85	39		STA	\$39	ADC0	C9	03	CMP	#\$03
AD66	BD	10	01	LDA	\$0110,X	ADC2	B0	13	BCS	\$ADD7
AD69	85	3A		STA	\$3A	ADC4	C9	01	CMP	#\$01
AD6B	BD	12	01	LDA	\$0112,X	ADC6	2A		ROL	
AD6E	85	7A		STA	\$7A	ADC7	49	01	EOR	#\$01
AD70	BD	11	01	LDA	\$0111,X	ADC9	45	4D	EOR	\$4D
AD73	85	7B		STA	\$7B	ADCB	C5	4D	CMP	\$4D
AD75	4C	AE	A7	JMP	\$A7AE	ADCD	90	61	BCC	\$AE30
						ADCF	85	4D	STA	\$4D
						ADD1	20	73 00	JSR	\$0073
						ADD4	4C	BB AD	JMP	\$ADBB
						ADD7	A6	4D	LDX	\$4D
						ADD9	D0	2C	BNE	\$AE07
						ADDB	B0	7B	BCS	\$AE58
						ADDD	69	07	ADC	#\$07
						ADDF	90	77	BCC	\$AE58
						ADE1	65	0D	ADC	\$0D
						ADE3	D0	03	BNE	\$ADEB
						ADE5	4C	3D B6	JMP	\$B63D
						ADE8	69	FF	ADC	#\$FF
						ADEA	85	22	STA	\$22
						ADEC	0A		ASL	
						ADED	65	22	ADC	\$22
						ADEF	A8		TAY	
						ADF0	68		PLA	
						ADF1	D9	80 A0	CMP	\$A080,Y
						ADF4	B0	67	BCS	\$AE5D
						ADF6	20	8D AD	JSR	\$AD8D
						ADF9	48		PHA	
						ADFA	20	20 AE	JSR	\$AE20
						ADFD	68		PLA	
						ADFE	A4	4B	LDY	\$4B
						AE00	10	17	BPL	\$AE19
						AE02	AA		TAX	
						AE03	F0	56	BEQ	\$AE5B
						AE05	D0	5F	BNE	\$AE66
						AE07	46	0D	LSR	\$0D

AD78; Type match check

AD78	8A			TXA	
AD79	69	11		ADC	#\$11
AD7B	AA			TAX	
AD7C	9A			TXS	
AD7D	20	79	00	JSR	\$0079
AD80	C9	2C		CMP	#\$2C
AD82	D0	F1		BNE	\$AD75
AD84	20	73	00	JSR	\$0073
AD87	20	24	AD	JSR	\$AD24
AD8A	20	9E	AD	JSR	\$AD9E
AD8D	18			CLC	
AD8E	24	38		BIT	\$38
AD90	24	0D		BIT	\$0D
AD92	30	03		BMI	\$AD97
AD94	B0	03		BCS	\$AD99
AD96	60			RTS	
AD97	B0	FD		BCS	\$AD96
AD99	A2	16		LDX	#\$16
AD9B	4C	37	A4	JMP	\$A437

AD9E; Evaluate expression

AD9E	A6	7A		LDX	\$7A
ADA0	D0	02		BNE	\$ADA4

AE09 BA	TXA	AE6A 68	PLA
AE0A 2A	ROL	AE6B 85 69	STA \$69
AE0B A6 7A	LDX \$7A	AE6D 68	PLA
AE0D D0 02	BNE \$AE11	AE6E 85 6A	STA \$6A
AE0F C6 7B	DEC \$7B	AE70 68	PLA
AE11 C6 7A	DEC \$7A	AE71 85 6B	STA \$6B
AE13 A0 1B	LDY #\$1B	AE73 68	PLA
AE15 B5 4D	STA \$4D	AE74 85 6C	STA \$6C
AE17 D0 D7	BNE \$ADF0	AE76 68	PLA
AE19 D9 80 A0	CMP \$A0B0,Y	AE77 85 6D	STA \$6D
AE1C B0 48	BCS \$AE66	AE79 68	PLA
AE1E 90 D9	BCC \$ADF9	AE7A 85 6E	STA \$6E
AE20 B9 82 A0	LDA \$A0B2,Y	AE7C 45 66	EOR \$66
AE23 48	PHA	AE7E 85 6F	STA \$6F
AE24 B9 B1 A0	LDA \$A0B1,Y	AE80 A5 61	LDA \$61
AE27 48	PHA	AE82 60	RTS
AE28 20 33 AE	JSR \$AE33	AE83 6C 0A 03	JMP (\$030A)
AE2B A5 4D	LDA \$4D	AE86 A9 00	LDA #\$00
AE2D 4C A9 AD	JMP \$ADA9	AE88 85 0D	STA \$0D
AE30 4C 08 AF	JMP \$AF08	AE8A 20 73 00	JSR \$0073
AE33 A5 66	LDA \$66	AE8D B0 03	BCS \$AE92
AE35 BE 80 A0	LDX \$A0B0,Y	AE8F 4C F3 BC	JMP \$BCF3
AE38 A8	TAY	AE92 20 13 B1	JSR \$B113
AE39 68	PLA	AE95 90 03	BCC \$AE9A
AE3A 85 22	STA \$22	AE97 4C 28 AF	JMP \$AF28
AE3C E6 22	INC \$22	AE9A C9 FF	CMP \$FF
AE3E 68	PLA	AE9C D0 0F	BNE \$AEAD
AE3F 85 23	STA \$23	AE9E A9 AB	LDA \$AB
AE41 98	TYA	AEA0 A0 AE	LDY \$AE
AE42 48	PHA	AEA2 20 A2 BB	JSR \$BBA2
AE43 20 1B BC	JSR \$BC1B	AEA5 4C 73 00	JMP \$0073
AE46 A5 65	LDA \$65		
AE48 48	PHA		
AE49 A5 64	LDA \$64	AEAB; Constant - pi	
AE4B 48	PHA		
AE4C A5 63	LDA \$63	AEAB B2	???
AE4E 48	PHA	AEA9 49 0F	EOR \$F0F
AE4F A5 62	LDA \$62	AEAB DA	???
AE51 48	PHA	AEAC A1 C9	LDA (\$C9,X)
AE52 A5 61	LDA \$61	AEA E 2E F0 DE	ROL \$DEF0
AE54 48	PHA	AEB1 C9 AB	CMP \$AB
AE55 6C 22 00	JMP (\$0022)	AEB3 F0 58	BEQ \$AF0D
AE58 A0 FF	LDY \$FF	AEB5 C9 AA	CMP \$AA
AE5A 68	PLA	AEB7 F0 D1	BEQ \$AEBA
AE5B F0 23	BEQ \$AEB0	AEB9 C9 22	CMP \$22
AE5D C9 64	CMP \$64	AEBB D0 0F	BNE \$AECC
AE5F F0 03	BEQ \$AE64	AEBD A5 7A	LDA \$7A
AE61 20 BD AD	JSR \$ADBD	AEBF A4 7B	LDY \$7B
AE64 B4 4B	STY \$4B	AEC1 69 00	ADC \$00
AE66 68	PLA	AEC3 90 01	BCC \$AEC6
AE67 4A	LSR	AEC5 C8	INY
AE68 B5 12	STA \$12	AEC6 20 87 B4	JSR \$B4B7

```

AEC9 4C E2 B7      JMP $B7E2
AECC C9 A8         CMP ##A8
AECE D0 13         BNE $AEE3
AED0 A0 18         LDY ##18
AED2 D0 3B         BNE $AF0F
AED4 20 BF B1      JSR $B1BF
AED7 A5 65         LDA $65
AED9 49 FF         EOR ##FF
AEDB A8            TAY
AEDC A5 64         LDA $64
AEDE 49 FF         EOR ##FF
AEE0 4C 91 B3      JMP $B391
AEE3 C9 A5         CMP ##A5
AEE5 D0 03         BNE $AEEA
AEE7 4C F4 B3      JMP $B3F4
AEEA C9 B4         CMP ##B4
AEEC 90 03         BCC $AEF1
AEEE 4C A7 AF      JMP $AFA7

```

AF14; Check range

```

AF14 38            SEC
AF15 A5 64         LDA $64
AF17 E9 00         SBC ##$00
AF19 A5 65         LDA $65
AF1B E9 A0         SBC ##A0
AF1D 90 08         BCC $AF27
AF1F A9 A2         LDA ##A2
AF21 E5 64         SBC $64
AF23 A9 E3         LDA ##E3
AF25 E5 65         SBC $65
AF27 60            RTS

```

AF28; Search for variable

```

AF28 20 8B B0      JSR $B08B
AF2B 85 64         STA $64
AF2D 84 65         STY $65
AF2F A6 45         LDX $45
AF31 A4 46         LDY $46
AF33 A5 0D         LDA $0D
AF35 F0 26         BEQ $AF5D
AF37 A9 00         LDA ##$00
AF39 85 70         STA $70
AF3B 20 14 AF      JSR $AF14
AF3E 90 1C         BCC $AF5C
AF40 E0 54         CPX ##$54
AF42 D0 18         BNE $AF5C
AF44 C0 C9         CPY ##C9
AF46 D0 14         BNE $AF5C
AF48 20 84 AF      JSR $AFB4
AF4B 84 5E         STY $5E
AF4D 88            DEY
AF4E 84 71         STY $71
AF50 A0 06         LDY ##$06
AF52 84 5D         STY $5D
AF54 A0 24         LDY ##$24
AF56 20 68 BE      JSR $BE6B
AF59 4C 6F B4      JMP $B46F
AF5C 60            RTS
AF5D 24 0E         BIT $0E
AF5F 10 0D         BPL $AF6E
AF61 A0 00         LDY ##$00
AF63 B1 64         LDA ($64),Y
AF65 AA            TAX
AF66 CB            INY
AF67 B1 64         LDA ($64),Y
AF69 AB            TAY

```

AEF1; Evaluate within brackets

```

AEF1 20 FA AE      JSR $AEFA
AEF4 20 9E AD      JSR $AD9E

```

AEF7; ')'

```

AEF7 A9 29         LDA ##$29
AEF9 2C A9 2B      BIT $28A9
AEFC 2C A9 2C      BIT $2CA9

```

AEFF; Comma...

```

AEFF A0 00         LDY ##$00
AF01 D1 7A         CMP ($7A),Y
AF03 D0 03         BNE $AF0B
AF05 4C 73 00      JMP $0073

```

AF0B; Syntax error

```

AF0B A2 0B         LDX ##$0B
AF0A 4C 37 A4      JMP $A437
AF0D A0 15         LDY ##$15
AF0F 68            PLA
AF10 68            PLA
AF11 4C FA AD      JMP $ADFA

```

AF6A	8A		TXA
AF6B	4C	91 B3	JMP \$B391
AF6E	20	14 AF	JSR \$AF14
AF71	90	2D	BCC \$AFA0
AF73	E0	54	CPX #\$54
AF75	D0	1B	BNE \$AF92
AF77	C0	49	CPY #\$49
AF79	D0	25	BNE \$AFA0
AF7B	20	84 AF	JSR \$AFB4
AF7E	98		TYA
AF7F	A2	A0	LDX #\$A0
AF81	4C	4F BC	JMP \$BC4F
AF84	20	DE FF	JSR \$FFDE
AF87	86	64	STX \$64
AF89	84	63	STY \$63
AF8B	85	65	STA \$65
AF8D	A0	00	LDY #\$00
AF8F	84	62	STY \$62
AF91	60		RTS
AF92	E0	53	CPX #\$53
AF94	D0	0A	BNE \$AFA0
AF96	C0	54	CPY #\$54
AF98	D0	06	BNE \$AFA0
AF9A	20	B7 FF	JSR \$FFB7
AF9D	4C	3C BC	JMP \$BC3C
AFA0	A5	64	LDA \$64
AFA2	A4	65	LDY \$65
AFA4	4C	A2 BB	JMP \$BBA2

AFA7; Setup FN reference

AFA7	0A		ASL
AFAB	48		PHA
AFA9	AA		TAX
AFAA	20	73 00	JSR \$0073
AFAD	E0	8F	CPX #\$8F
AFAF	90	20	BCC \$AFD1
AFB1	20	FA AE	JSR \$AEFA
AFB4	20	9E AD	JSR \$AD9E
AFB7	20	FD AE	JSR \$AEFD
AFBA	20	8F AD	JSR \$AD8F
AFBD	68		PLA
AFBE	AA		TAX
AFBF	A5	65	LDA \$65
AFC1	48		PHA
AFC2	A5	64	LDA \$64
AFC4	48		PHA
AFC5	8A		TXA
AFC6	48		PHA
AFC7	20	9E B7	JSR \$B79E
AFCA	68		PLA

AFCB	AB		TAY
AFCC	8A		TXA
AFCD	48		PHA
AFCE	4C	D6 AF	JMP \$AFD6
AFD1	20	F1 AE	JSR \$AEF1
AFD4	68		PLA
AFD5	AB		TAY
AFD6	B9	EA 9F	LDA \$9FEA,Y
AFD9	85	55	STA \$55
AFDB	B9	EB 9F	LDA \$9FEB,Y
AFDE	85	56	STA \$56
AFE0	20	54 00	JSR \$0054
AFE3	4C	8D AD	JMP \$AD8D
AFE6	A0	FF	LDY #\$FF

AFE9; Perform [OR]

AFE9	A0	00	LDY #\$00
AFEB	84	0B	STY \$0B
AFED	20	BF B1	JSR \$B1BF

AFF0; Perform [AND]

AFF0	A5	64	LDA \$64
AFF2	45	0B	EOR \$0B
AFF4	B5	07	STA \$07
AFF6	A5	65	LDA \$65
AFF8	45	0B	EOR \$0B
AFFA	B5	08	STA \$08
AFFC	20	FC BB	JSR \$BBFC
AFFF	20	BF B1	JSR \$B1BF
B002	A5	65	LDA \$65
B004	45	0B	EOR \$0B
B006	25	08	AND \$08
B008	45	0B	EOR \$0B
B00A	A8		TAY
B00B	A5	64	LDA \$64
B00D	45	0B	EOR \$0B
B00F	25	07	AND \$07
B011	45	0B	EOR \$0B
B013	4C	91 B3	JMP \$B391

B016; Compare

B016	20	90 AD	JSR \$AD90
B019	B0	13	BCS \$B02E
B01B	A5	6E	LDA \$6E
B01D	09	7F	ORA #\$7F
B01F	25	6A	AND \$6A

B021	85	6A	STA \$6A
B023	A9	69	LDA ##69
B025	A0	00	LDY ##00
B027	20	5B BC	JSR \$BC5B
B02A	AA		TAX
B02B	4C	61 B0	JMP \$B061
B02E	A9	00	LDA ##00
B030	85	0D	STA \$0D
B032	C6	4D	DEC \$4D
B034	20	A6 B6	JSR \$B6A6
B037	85	61	STA \$61
B039	86	62	STX \$62
B03B	84	63	STY \$63
B03D	A5	6C	LDA \$6C
B03F	A4	6D	LDY \$6D
B041	20	AA B6	JSR \$B6AA
B044	86	6C	STX \$6C
B046	84	6D	STY \$6D
B048	AA		TAX
B049	3B		SEC
B04A	E5	61	SBC \$61
B04C	F0	0B	BEQ \$B056
B04E	A9	01	LDA ##01
B050	90	04	BCC \$B056
B052	A6	61	LDX \$61
B054	A9	FF	LDA ##FF
B056	85	66	STA \$66
B058	A0	FF	LDY ##FF
B05A	E8		INX
B05B	C8		INY
B05C	CA		DEX
B05D	D0	07	BNE \$B066
B05F	A6	66	LDX \$66
B061	30	0F	BMI \$B072
B063	18		CLC
B064	90	0C	BCC \$B072
B066	B1	6C	LDA (\$6C),Y
B068	D1	62	CMP (\$62),Y
B06A	F0	EF	BEQ \$B05B
B06C	A2	FF	LDX ##FF
B06E	B0	02	BCS \$B072
B070	A2	01	LDX ##01
B072	E8		INX
B073	8A		TXA
B074	2A		ROL
B075	25	12	AND \$12
B077	F0	02	BEQ \$B07B
B079	A9	FF	LDA ##FF
B07B	4C	3C BC	JMP \$BC3C
B07E	20	FD AE	JSR \$AEFD

B081; Perform [DIM]

B081	AA		TAX
B082	20	90 B0	JSR \$B090
B085	20	79 00	JSR \$0079
B088	D0	F4	BNE \$B07E
B08A	60		RTS

B08B; Locate variable

B08B	A2	00	LDX ##00
B08D	20	79 00	JSR \$0079
B090	86	0C	STX \$0C
B092	85	45	STA \$45
B094	20	79 00	JSR \$0079
B097	20	13 B1	JSR \$B113
B09A	B0	03	BCS \$B09F
B09C	4C	0B AF	JMP \$AF0B
B09F	A2	00	LDX ##00
B0A1	86	0D	STX \$0D
B0A3	86	0E	STX \$0E
B0A5	20	73 00	JSR \$0073
B0A8	90	05	BCC \$B0AF
B0AA	20	13 B1	JSR \$B113
B0AD	90	0B	BCC \$B0BA
B0AF	AA		TAX
B0B0	20	73 00	JSR \$0073
B0B3	90	FB	BCC \$B0B0
B0B5	20	13 B1	JSR \$B113
B0B8	B0	F6	BCS \$B0B0
B0BA	C9	24	CMP ##24
B0BC	D0	06	BNE \$B0C4
B0BE	A9	FF	LDA ##FF
B0C0	85	0D	STA \$0D
B0C2	D0	10	BNE \$B0D4
B0C4	C9	25	CMP ##25
B0C6	D0	13	BNE \$B0DB
B0C8	A5	10	LDA \$10
B0CA	D0	D0	BNE \$B09C
B0CC	A9	80	LDA ##80
B0CE	85	0E	STA \$0E
B0D0	05	45	ORA \$45
B0D2	85	45	STA \$45
B0D4	8A		TXA
B0D5	09	80	ORA ##80
B0D7	AA		TAX
B0D8	20	73 00	JSR \$0073

B0DB 86 46	STX \$46	B12A A4 46	LDY \$46
B0DD 38	SEC	B12C C9 54	CMP ##54
B0DE 05 10	ORA \$10	B12E D0 08	BNE \$B13B
B0E0 E9 28	SBC ##28	B130 C0 C9	CPY ##C9
B0E2 D0 03	BNE \$B0E7	B132 F0 EF	BEQ \$B123
B0E4 4C D1 B1	JMP \$B1D1	B134 C0 49	CPY ##49
B0E7 A0 00	LDY ##00	B136 D0 03	BNE \$B13B
B0E9 84 10	STY \$10	B138 4C 08 AF	JMP \$AF08
B0EB A5 2D	LDA \$2D	B13B C9 53	CMP ##53
B0ED A6 2E	LDX \$2E	B13D D0 04	BNE \$B143
B0EF 86 60	STX \$60	B13F C0 54	CPY ##54
B0F1 85 5F	STA \$5F	B141 F0 F5	BEQ \$B138
B0F3 E4 30	CPX \$30	B143 A5 2F	LDA \$2F
B0F5 D0 04	BNE \$B0FB	B145 A4 30	LDY \$30
B0F7 C5 2F	CMP \$2F	B147 85 5F	STA \$5F
B0F9 F0 22	BEQ \$B11D	B149 84 60	STY \$60
B0FB A5 45	LDA \$45	B14B A5 31	LDA \$31
B0FD D1 5F	CMP (\$5F),Y	B14D A4 32	LDY \$32
B0FF D0 08	BNE \$B109	B14F 85 5A	STA \$5A
B101 A5 46	LDA \$46	B151 84 58	STY \$5B
B103 C8	INX	B153 18	CLC
B104 D1 5F	CMP (\$5F),Y	B154 69 07	ADC ##07
B106 F0 7D	BEQ \$B185	B156 90 01	BCC \$B159
B108 88	DEY	B158 C8	INX
B109 18	CLC	B159 85 58	STA \$58
B10A A5 5F	LDA \$5F	B15B 84 59	STY \$59
B10C 69 07	ADC ##07	B15D 20 88 A3	JSR \$A3B8
B10E 90 E1	BCC \$B0F1	B160 A5 58	LDA \$58
B110 E8	INX	B162 A4 59	LDY \$59
B111 D0 DC	BNE \$B0EF	B164 C8	INX
		B165 85 2F	STA \$2F
		B167 84 30	STY \$30
		B169 A0 00	LDY ##00
		B16B A5 45	LDA \$45
		B16D 91 5F	STA (\$5F),Y
		B16F C8	INX
		B170 A5 46	LDA \$46
		B172 91 5F	STA (\$5F),Y
		B174 A9 00	LDA ##00
		B176 C8	INX
		B177 91 5F	STA (\$5F),Y
		B179 C8	INX
		B17A 91 5F	STA (\$5F),Y
		B17C C8	INX
		B17D 91 5F	STA (\$5F),Y
		B17F C8	INX
		B180 91 5F	STA (\$5F),Y
		B182 C8	INX
		B183 91 5F	STA (\$5F),Y
		B185 A5 5F	LDA \$5F
		B187 18	CLC
		B188 69 02	ADC ##02

B113; Check alphabetic

B113 C9 41	CMP ##41
B115 90 05	BCC \$B11C
B117 E9 5B	SBC ##5B
B119 38	SEC
B11A E9 A5	SBC ##A5
B11C 60	RTS

B11D; Create variable

B11D 68	PLA
B11E 48	PHA
B11F C9 2A	CMP ##2A
B121 D0 05	BNE \$B128
B123 A9 13	LDA ##13
B125 A0 BF	LDY ##BF
B127 60	RTS
B128 A5 45	LDA \$45

B18A A4 60	LDY \$60	B1D1 A5 0C	LDA \$0C
B18C 90 01	BCC \$B18F	B1D3 05 0E	ORA \$0E
B18E C8	INY	B1D5 48	PHA
B18F 85 47	STA \$47	B1D6 A5 0D	LDA \$0D
B191 84 48	STY \$48	B1D8 48	PHA
B193 60	RTS	B1D9 A0 00	LDY \$\$00
		B1DB 98	TYA
		B1DC 48	PHA
		B1DD A5 46	LDA \$46
		B1DF 48	PHA
		B1E0 A5 45	LDA \$45
		B1E2 48	PHA
		B1E3 20 B2 B1	JSR \$B1B2
		B1E6 68	PLA
		B1E7 85 45	STA \$45
		B1E9 68	PLA
		B1EA 85 46	STA \$46
		B1EC 68	PLA
		B1ED A8	TAY
		B1EE BA	TSX
		B1EF BD 02 01	LDA \$0102,X
		B1F2 48	PHA
		B1F3 BD 01 01	LDA \$0101,X
		B1F6 48	PHA
		B1F7 A5 64	LDA \$64
		B1F9 9D 02 01	STA \$0102,X
		B1FC A5 65	LDA \$65
		B1FE 9D 01 01	STA \$0101,X
		B201 C8	INY
		B202 20 79 00	JSR \$0079
		B205 C9 2C	CMP \$\$2C
		B207 F0 D2	BEQ \$B1DB
		B209 84 0B	STY \$0B
		B20B 20 F7 AE	JSR \$AEF7
		B20E 68	PLA
		B20F 85 0D	STA \$0D
		B211 68	PLA
		B212 85 0E	STA \$0E
		B214 29 7F	AND \$\$7F
		B216 85 0C	STA \$0C
		B218 A6 2F	LDX \$2F
		B21A A5 30	LDA \$30
		B21C 86 5F	STX \$5F
		B21E 85 60	STA \$60
		B220 C5 32	CMP \$32
		B222 D0 04	BNE \$B228
		B224 E4 31	CPX \$31
		B226 F0 39	BEQ \$B261
		B228 A0 00	LDY \$\$00
		B22A B1 5F	LDA (\$5F),Y
		B22C C8	INY
		B22D C5 45	CMP \$45

B194; Array pointer subroutine

B194 A5 0B	LDA \$0B
B196 0A	ASL
B197 69 05	ADC \$\$05
B199 65 5F	ADC \$5F
B19B A4 60	LDY \$60
B19D 90 01	BCC \$B1A0
B19F C8	INY
B1A0 85 58	STA \$58
B1A2 84 59	STY \$59
B1A4 60	RTS

B1A5; Value 32768

B1A5 90 80	BCC \$B127
B1A7 00	BRK
B1A8 00	BRK
B1A9 00	BRK
B1AA 20 BF B1	JSR \$B1BF
B1AD A5 64	LDA \$64
B1AF A4 65	LDY \$65
B1B1 60	RTS

B1B2; Float-fixed

B1B2 20 73 00	JSR \$0073
B1B5 20 7E AD	JSR \$AD7E
B1B8 20 8D AD	JSR \$AD8D
B1BB A5 66	LDA \$66
B1BD 30 0D	BMI \$B1CC
B1BF A5 61	LDA \$61
B1C1 C9 90	CMP \$\$90
B1C3 90 09	BCC \$B1CE
B1C5 A9 A5	LDA \$\$A5
B1C7 A0 B1	LDY \$\$B1
B1C9 20 5B BC	JSR \$BC5B
B1CC D0 7A	BNE \$B248
B1CE 4C 9B BC	JMP \$BC9B

B1D1; Set up array

B22F D0 06	BNE \$B237	B283 C8	INY
B231 A5 46	LDA \$46	B284 91 5F	STA (\$5F),Y
B233 D1 5F	CMP (\$5F),Y	B286 A2 0B	LDX ##0B
B235 F0 16	BEQ \$B24D	B288 A9 00	LDA ##00
B237 C8	INY	B28A 24 0C	BIT \$0C
B238 B1 5F	LDA (\$5F),Y	B28C 50 0B	BVC \$B296
B23A 18	CLC	B28E 68	PLA
B23B 65 5F	ADC \$5F	B28F 18	CLC
B23D AA	TAX	B290 69 01	ADC ##01
B23E C8	INY	B292 AA	TAX
B23F B1 5F	LDA (\$5F),Y	B293 68	PLA
B241 65 60	ADC \$60	B294 69 00	ADC ##00
B243 90 D7	BCC \$B21C	B296 C8	INY
B245 A2 12	LDX ##12	B297 91 5F	STA (\$5F),Y
		B299 C8	INY
		B29A 8A	TXA
B248; 'bad subscript'		B29B 91 5F	STA (\$5F),Y
		B29D 20 4C B3	JSR \$B34C
B248 A2 0E	LDX ##0E	B2A0 86 71	STX \$71
B24A 4C 37 A4	JMP \$A437	B2A2 85 72	STA \$72
		B2A4 A4 22	LDY \$22
B24D; 'illegal quantity'		B2A6 C6 0B	DEC \$0B
		B2AB D0 DC	BNE \$B286
B24D A2 13	LDX ##13	B2AA 65 59	ADC \$59
B24F A5 0C	LDA \$0C	B2AC B0 5D	BCS \$B30B
B251 D0 F7	BNE \$B24A	B2AE 85 59	STA \$59
B253 20 94 B1	JSR \$B194	B2B0 A8	TAY
B256 A5 0B	LDA \$0B	B2B1 8A	TXA
B258 A0 04	LDY ##04	B2B2 65 58	ADC \$58
B25A D1 5F	CMP (\$5F),Y	B2B4 90 03	BCC \$B2B9
B25C D0 E7	BNE \$B245	B2B6 C8	INY
B25E 4C EA B2	JMP \$B2EA	B2B7 F0 52	BEQ \$B30B
B261 20 94 B1	JSR \$B194	B2B9 20 0B A4	JSR \$A40B
B264 20 0B A4	JSR \$A40B	B2BC 85 31	STA \$31
B267 A0 00	LDY ##00	B2BE 84 32	STY \$32
B269 B4 72	STY \$72	B2C0 A9 00	LDA ##00
B26B A2 05	LDX ##05	B2C2 E6 72	INC \$72
B26D A5 45	LDA \$45	B2C4 A4 71	LDY \$71
B26F 91 5F	STA (\$5F),Y	B2C6 F0 05	BEQ \$B2CD
B271 10 01	BPL \$B274	B2C8 8B	DEY
B273 CA	DEX	B2C9 91 58	STA (\$58),Y
B274 C8	INY	B2CB D0 FB	BNE \$B2CB
B275 A5 46	LDA \$46	B2CD C6 59	DEC \$59
B277 91 5F	STA (\$5F),Y	B2CF C6 72	DEC \$72
B279 10 02	BPL \$B27D	B2D1 D0 F5	BNE \$B2CB
B27B CA	DEX	B2D3 E6 59	INC \$59
B27C CA	DEX	B2D5 38	SEC
B27D 86 71	STX \$71	B2D6 A5 31	LDA \$31
B27F A5 0B	LDA \$0B	B2D8 E5 5F	SBC \$5F
B281 C8	INY	B2DA A0 02	LDY ##02
B282 C8	INY	B2DC 91 5F	STA (\$5F),Y
		B2DE A5 32	LDA \$32

B2E0 C8	INY	B33B 20 55 B3	JSR \$B355
B2E1 E5 60	SBC \$60	B33E 8A	TXA
B2E3 91 5F	STA (\$5F),Y	B33F 65 58	ADC \$58
B2E5 A5 0C	LDA \$0C	B341 85 47	STA \$47
B2E7 D0 62	BNE \$B34B	B343 98	TYA
B2E9 C8	INY	B344 65 59	ADC \$59
B2EA B1 5F	LDA (\$5F),Y	B346 85 48	STA \$48
B2EC 85 0B	STA \$0B	B348 A8	TAY
B2EE A9 00	LDA #\$00	B349 A5 47	LDA \$47
B2F0 85 71	STA \$71	B34B 60	RTS
B2F2 85 72	STA \$72		
B2F4 C8	INY		
B2F5 68	PLA	B34C; Compute array size	
B2F6 AA	TAX		
B2F7 85 64	STA \$64	B34C 84 22	STY \$22
B2F9 68	PLA	B34E B1 5F	LDA (\$5F),Y
B2FA 85 65	STA \$65	B350 85 28	STA \$28
B2FC D1 5F	CMP (\$5F),Y	B352 88	DEY
B2FE 90 0E	BCC \$B30E	B353 B1 5F	LDA (\$5F),Y
B300 D0 06	BNE \$B30B	B355 85 29	STA \$29
B302 C8	INY	B357 A9 10	LDA #\$10
B303 8A	TXA	B359 85 5D	STA \$5D
B304 D1 5F	CMP (\$5F),Y	B35B A2 00	LDX #\$00
B306 90 07	BCC \$B30F	B35D A0 00	LDY #\$00
B308 4C 45 B2	JMP \$B245	B35F 8A	TXA
B30B 4C 35 A4	JMP \$A435	B360 0A	ASL
B30E C8	INY	B361 AA	TAX
B30F A5 72	LDA \$72	B362 98	TYA
B311 05 71	ORA \$71	B363 2A	ROL
B313 18	CLC	B364 A8	TAY
B314 F0 0A	BEQ \$B320	B365 B0 A4	BCS \$B30B
B316 20 4C B3	JSR \$B34C	B367 06 71	ASL \$71
B319 8A	TXA	B369 26 72	ROL \$72
B31A 65 64	ADC \$64	B36B 90 0B	BCC \$B37B
B31C AA	TAX	B36D 18	CLC
B31D 98	TYA	B36E 8A	TXA
B31E A4 22	LDY \$22	B36F 65 28	ADC \$28
B320 65 65	ADC \$65	B371 AA	TAX
B322 86 71	STX \$71	B372 98	TYA
B324 C6 0B	DEC \$0B	B373 65 29	ADC \$29
B326 D0 CA	BNE \$B2F2	B375 A8	TAY
B328 85 72	STA \$72	B376 B0 93	BCS \$B30B
B32A A2 05	LDX #\$05	B378 C6 5D	DEC \$5D
B32C A5 45	LDA \$45	B37A D0 E3	BNE \$B35F
B32E 10 01	BPL \$B331	B37C 60	RTS
B330 CA	DEX		
B331 A5 46	LDA \$46		
B333 10 02	BPL \$B337	B37D; Perform [FRE]	
B335 CA	DEX		
B336 CA	DEX	B37D A5 0D	LDA \$0D
B337 86 28	STX \$28	B37F F0 03	BEQ \$B384
B339 A9 00	LDA #\$00	B381 20 A6 B6	JSR \$B6A6

B384 20 26 B5 JSR \$B526
 B387 38 SEC
 B388 A5 33 LDA \$33
 B38A E5 31 SBC \$31
 B38C A8 TAY
 B38D A5 34 LDA \$34
 B38F E5 32 SBC \$32

B391; Fix-float

B391 A2 00 LDX ##00
 B393 86 0D STX \$0D
 B395 85 62 STA \$62
 B397 84 63 STY \$63
 B399 A2 90 LDX ##90
 B39B 4C 44 BC JMP \$BC44

B39E; Perform [POS]

B39E 38 SEC
 B39F 20 F0 FF JSR \$FFF0
 B3A2 A9 00 LDA ##00
 B3A4 F0 EB BEQ \$B391

B3A6; Check direct

B3A6 A6 3A LDX \$3A
 B3A8 E8 INX
 B3A9 D0 A0 BNE \$B34B
 B3AB A2 15 LDX ##15
 B3AD 2C A2 1B BIT \$1BA2
 B3B0 4C 37 A4 JMP \$A437

B3B3; Perform [DEF]

B3B3 20 E1 B3 JSR \$B3E1
 B3B6 20 A6 B3 JSR \$B3A6
 B3B9 20 FA AE JSR \$AEFA
 B3BC A9 B0 LDA ##80
 B3BE 85 10 STA \$10
 B3C0 20 8B B0 JSR \$B08B
 B3C3 20 8D AD JSR \$AD8D
 B3C6 20 F7 AE JSR \$AEF7
 B3C9 A9 B2 LDA ##82
 B3CB 20 FF AE JSR \$AEFF
 B3CE 48 PHA
 B3CF A5 48 LDA \$48
 B3D1 48 PHA

B3D2 A5 47 LDA \$47
 B3D4 48 PHA
 B3D5 A5 7B LDA \$7B
 B3D7 48 PHA
 B3D8 A5 7A LDA \$7A
 B3DA 48 PHA
 B3DB 20 FB AB JSR \$ABFB
 B3DE 4C 4F B4 JMP \$B44F

B3E1; Check fn syntax

B3E1 A9 A5 LDA ##A5
 B3E3 20 FF AE JSR \$AEFF
 B3E6 09 B0 ORA ##B0
 B3E8 85 10 STA \$10
 B3EA 20 92 B0 JSR \$B092
 B3ED 85 4E STA \$4E
 B3EF 84 4F STY \$4F
 B3F1 4C BD AD JMP \$ADBD

B3F4; Perform [FN]

B3F4 20 E1 B3 JSR \$B3E1
 B3F7 A5 4F LDA \$4F
 B3F9 48 PHA
 B3FA A5 4E LDA \$4E
 B3FC 48 PHA
 B3FD 20 F1 AE JSR \$AEF1
 B400 20 8D AD JSR \$AD8D
 B403 68 PLA
 B404 85 4E STA \$4E
 B406 68 PLA
 B407 85 4F STA \$4F
 B409 A0 02 LDY ##02
 B40B B1 4E LDA (\$4E),Y
 B40D 85 47 STA \$47
 B40F AA TAX
 B410 C8 INY
 B411 B1 4E LDA (\$4E),Y
 B413 F0 99 BEQ \$B3AE
 B415 85 48 STA \$48
 B417 C8 INY
 B418 B1 47 LDA (\$47),Y
 B41A 48 PHA
 B41B 88 DEY
 B41C 10 FA BPL \$B41B
 B41E A4 48 LDY \$48
 B420 20 D4 BB JSR \$BBD4
 B423 A5 7B LDA \$7B
 B425 48 PHA

B426 A5 7A	LDA \$7A		
B428 4B	PHA		
B429 B1 4E	LDA (\$4E),Y	B475;	Calculate string vector
B42B B5 7A	STA \$7A		
B42D CB	INY	B475 A6 64	LDX \$64
B42E B1 4E	LDA (\$4E),Y	B477 A4 65	LDY \$65
B430 B5 7B	STA \$7B	B479 B6 50	STX \$50
B432 A5 4B	LDA \$4B	B47B B4 51	STY \$51
B434 4B	PHA	B47D 20 F4 B4	JSR \$B4F4
B435 A5 47	LDA \$47	B480 B6 62	STX \$62
B437 4B	PHA	B482 B4 63	STY \$63
B438 20 BA AD	JSR \$ADBA	B484 B5 61	STA \$61
B43B 6B	PLA	B486 60	RTS
B43C B5 4E	STA \$4E		
B43E 6B	PLA	B487;	Set up string
B43F B5 4F	STA \$4F		
B441 20 79 00	JSR \$0079	B487 A2 22	LDX #\$22
B444 F0 03	BEQ \$B449	B489 B6 07	STX \$07
B446 4C 0B AF	JMP \$AF0B	B48B B6 0B	STX \$0B
B449 6B	PLA	B48D B5 6F	STA \$6F
B44A B5 7A	STA \$7A	B48F B4 70	STY \$70
B44C 6B	PLA	B491 B5 62	STA \$62
B44D B5 7B	STA \$7B	B493 B4 63	STY \$63
B44F A0 00	LDY #\$00	B495 A0 FF	LDY \$FFF
B451 6B	PLA	B497 CB	INY
B452 91 4E	STA (\$4E),Y	B49B B1 6F	LDA (\$6F),Y
B454 6B	PLA	B49A F0 0C	BEQ \$B4AB
B455 CB	INY	B49C C5 07	CMP \$07
B456 91 4E	STA (\$4E),Y	B49E F0 04	BEQ \$B4A4
B45B 6B	PLA	B4A0 C5 0B	CMP \$0B
B459 CB	INY	B4A2 D0 F3	BNE \$B497
B45A 91 4E	STA (\$4E),Y	B4A4 C9 22	CMP #\$22
B45C 6B	PLA	B4A6 F0 01	BEQ \$B4A9
B45D CB	INY	B4AB 1B	CLC
B45E 91 4E	STA (\$4E),Y	B4A9 B4 61	STY \$61
B460 6B	PLA	B4AB 9B	TYA
B461 CB	INY	B4AC 65 6F	ADC \$6F
B462 91 4E	STA (\$4E),Y	B4AE B5 71	STA \$71
B464 60	RTS	B4B0 A6 70	LDX \$70
		B4B2 90 01	BCC \$B4B5
		B4B4 EB	INX
		B4B5 B6 72	STX \$72
		B4B7 A5 70	LDA \$70
		B4B9 F0 04	BEQ \$B4BF
		B4BB C9 02	CMP #\$02
		B4BD D0 0B	BNE \$B4CA
		B4BF 9B	TYA
		B4C0 20 75 B4	JSR \$B475
		B4C3 A6 6F	LDX \$6F
		B4C5 A4 70	LDY \$70
		B4C7 20 8B B6	JSR \$B6B8

B465; Perform [STR\$]

B465 20 BD AD	JSR \$ADBD
B46B A0 00	LDY #\$00
B46A 20 DF BD	JSR \$BDDF
B46D 6B	PLA
B46E 6B	PLA
B46F A9 FF	LDA \$FFF
B471 A0 00	LDY #\$00
B473 F0 12	BEQ \$B4B7

B4CA A6 16	LDX \$16	B521 B5 0F	STA \$0F
B4CC E0 22	CPX #\$22	B523 68	PLA
B4CE D0 05	BNE \$B4D5	B524 D0 D0	BNE \$B4F6
B4D0 A2 19	LDX #\$19		
B4D2 4C 37 A4	JMP \$A437		
B4D5 A5 61	LDA \$61	B526; Garbage collection	
B4D7 95 00	STA \$00,X		
B4D9 A5 62	LDA \$62	B526 A6 37	LDX \$37
B4DB 95 01	STA \$01,X	B528 A5 38	LDA \$38
B4DD A5 63	LDA \$63	B52A B6 33	STX \$33
B4DF 95 02	STA \$02,X	B52C B5 34	STA \$34
B4E1 A0 00	LDY #\$00	B52E A0 00	LDY #\$00
B4E3 B6 64	STX \$64	B530 B4 4F	STY \$4F
B4E5 B4 65	STY \$65	B532 B4 4E	STY \$4E
B4E7 B4 70	STY \$70	B534 A5 31	LDA \$31
B4E9 B8	DEY	B536 A6 32	LDX \$32
B4EA B4 0D	STY \$0D	B538 B5 5F	STA \$5F
B4EC B6 17	STX \$17	B53A B6 60	STX \$60
B4EE E8	INX	B53C A9 19	LDA #\$19
B4EF E8	INX	B53E A2 00	LDX #\$00
B4F0 E8	INX	B540 B5 22	STA \$22
B4F1 B6 16	STX \$16	B542 B6 23	STX \$23
B4F3 60	RTS	B544 C5 16	CMP \$16
		B546 F0 05	BEQ \$B54D
B4F4; Make room for string		B548 20 C7 B5	JSR \$B5C7
		B54B F0 F7	BEQ \$B544
B4F4 46 0F	LSR \$0F	B54D A9 07	LDA #\$07
B4F6 48	PHA	B54F B5 53	STA \$53
B4F7 49 FF	EOR #\$FF	B551 A5 2D	LDA \$2D
B4F9 38	SEC	B553 A6 2E	LDX \$2E
B4FA 65 33	ADC \$33	B555 B5 22	STA \$22
B4FC A4 34	LDY \$34	B557 B6 23	STX \$23
B4FE B0 01	BCS \$B501	B559 E4 30	CPX \$30
B500 B8	DEY	B55B D0 04	BNE \$B561
B501 C4 32	CPY \$32	B55D C5 2F	CMP \$2F
B503 90 11	BCC \$B516	B55F F0 05	BEQ \$B566
B505 D0 04	BNE \$B50B	B561 20 BD B5	JSR \$B5BD
B507 C5 31	CMP \$31	B564 F0 F3	BEQ \$B559
B509 90 0B	BCC \$B516	B566 B5 58	STA \$58
B50B B5 33	STA \$33	B568 B6 59	STX \$59
B50D B4 34	STY \$34	B56A A9 03	LDA #\$03
B50F B5 35	STA \$35	B56C B5 53	STA \$53
B511 B4 36	STY \$36	B56E A5 58	LDA \$58
B513 AA	TAX	B570 A6 59	LDX \$59
B514 68	PLA	B572 E4 32	CPX \$32
B515 60	RTS	B574 D0 07	BNE \$B57D
B516 A2 10	LDX #\$10	B576 C5 31	CMP \$31
B518 A5 0F	LDA \$0F	B57B D0 03	BNE \$B57D
B51A 30 B6	BMI \$B4D2	B57A 4C 06 B6	JMP \$B606
B51C 20 26 B5	JSR \$B526	B57D B5 22	STA \$22
B51F A9 B0	LDA #\$B0	B57F B6 23	STX \$23
		B581 A0 00	LDY #\$00

B632	AA		TAX
B633	E6	59	INC \$59
B635	A5	59	LDA \$59
B637	C8		INY
B638	91	4E	STA (\$4E),Y
B63A	4C	2A B5	JMP \$B52A

B63D; Concatenate

B63D	A5	65	LDA \$65
B63F	48		PHA
B640	A5	64	LDA \$64
B642	48		PHA
B643	20	83 AE	JSR \$AE83
B646	20	8F AD	JSR \$AD8F
B649	68		PLA
B64A	85	6F	STA \$6F
B64C	68		PLA
B64D	85	70	STA \$70
B64F	A0	00	LDY #\$00
B651	B1	6F	LDA (\$6F),Y
B653	18		CLC
B654	71	64	ADC (\$64),Y
B656	90	05	BCC \$B65D
B658	A2	17	LDX #\$17
B65A	4C	37 A4	JMP \$A437
B65D	20	75 B4	JSR \$B475
B660	20	7A B6	JSR \$B67A
B663	A5	50	LDA \$50
B665	A4	51	LDY \$51
B667	20	AA B6	JSR \$B6AA
B66A	20	8C B6	JSR \$B68C
B66D	A5	6F	LDA \$6F
B66F	A4	70	LDY \$70
B671	20	AA B6	JSR \$B6AA
B674	20	CA B4	JSR \$B4CA
B677	4C	B8 AD	JMP \$ADB8

B67A; Build string to memory

B67A	A0	00	LDY #\$00
B67C	B1	6F	LDA (\$6F),Y
B67E	48		PHA
B67F	C8		INY
B680	B1	6F	LDA (\$6F),Y
B682	AA		TAX
B683	C8		INY
B684	B1	6F	LDA (\$6F),Y
B686	A8		TAY
B687	68		PLA

B688	86	22	STX \$22
B68A	84	23	STY \$23
B68C	A8		TAY
B68D	F0	0A	BEQ \$B699
B68F	48		PHA
B690	88		DEY
B691	B1	22	LDA (\$22),Y
B693	91	35	STA (\$35),Y
B695	98		TYA
B696	D0	FB	BNE \$B690
B698	68		PLA
B699	18		CLC
B69A	65	35	ADC \$35
B69C	85	35	STA \$35
B69E	90	02	BCC \$B6A2
B6A0	E6	36	INC \$36
B6A2	60		RTS

B6A3; Discard unwanted string

B6A3	20	8F AD	JSR \$AD8F
B6A6	A5	64	LDA \$64
B6A8	A4	65	LDY \$65
B6AA	85	22	STA \$22
B6AC	84	23	STY \$23
B6AE	20	DB B6	JSR \$B6DB
B6B1	08		PHP
B6B2	A0	00	LDY #\$00
B6B4	B1	22	LDA (\$22),Y
B6B6	48		PHA
B6B7	C8		INY
B6B8	B1	22	LDA (\$22),Y
B6BA	AA		TAX
B6BB	C8		INY
B6BC	B1	22	LDA (\$22),Y
B6BE	A8		TAY
B6BF	68		PLA
B6C0	28		PLP
B6C1	D0	13	BNE \$B6D6
B6C3	C4	34	CPY \$34
B6C5	D0	0F	BNE \$B6D6
B6C7	E4	33	CPX \$33
B6C9	D0	0B	BNE \$B6D6
B6CB	48		PHA
B6CC	18		CLC
B6CD	65	33	ADC \$33
B6CF	85	33	STA \$33
B6D1	90	02	BCC \$B6D5
B6D3	E6	34	INC \$34
B6D5	68		PLA
B6D6	86	22	STX \$22

B6D8 B4 23 STY \$23
B6DA 60 RTS

B6DB; Clean descriptor stack

B6DB C4 18 CPY \$18
B6DD D0 0C BNE \$B6EB
B6DF C5 17 CMP \$17
B6E1 D0 08 BNE \$B6EB
B6E3 85 16 STA \$16
B6E5 E9 03 SBC #\$03
B6E7 85 17 STA \$17
B6E9 A0 00 LDY #\$00
B6EB 60 RTS

B6EC; Perform [CHR\$]

B6EC 20 A1 B7 JSR \$B7A1
B6EF 8A TXA
B6F0 48 PHA
B6F1 A9 01 LDA #\$01
B6F3 20 7D B4 JSR \$B47D
B6F6 68 PLA
B6F7 A0 00 LDY #\$00
B6F9 91 62 STA (\$62),Y
B6FB 68 PLA
B6FC 68 PLA
B6FD 4C CA B4 JMP \$B4CA

B700; Perform [LEFT\$]

B700 20 61 B7 JSR \$B761
B703 D1 50 CMP (\$50),Y
B705 98 TYA
B706 90 04 BCC \$B70C
B708 B1 50 LDA (\$50),Y
B70A AA TAX
B70B 98 TYA
B70C 48 PHA
B70D 8A TXA
B70E 48 PHA
B70F 20 7D B4 JSR \$B47D
B712 A5 50 LDA \$50
B714 A4 51 LDY \$51
B716 20 AA B6 JSR \$B6AA
B719 68 PLA
B71A AB TAY
B71B 68 PLA
B71C 18 CLC

B71D 65 22 ADC \$22
B71F 85 22 STA \$22
B721 90 02 BCC \$B725
B723 E6 23 INC \$23
B725 98 TYA
B726 20 8C B6 JSR \$B68C
B729 4C CA B4 JMP \$B4CA

B72C; Perform [RIGHT\$]

B72C 20 61 B7 JSR \$B761
B72F 18 CLC
B730 F1 50 SBC (\$50),Y
B732 49 FF EOR \$FF
B734 4C 06 B7 JMP \$B706

B737; Perform [MID\$]

B737 A9 FF LDA \$FF
B739 85 65 STA \$65
B73B 20 79 00 JSR \$0079
B73E C9 29 CMP #\$29
B740 F0 06 BEQ \$B748
B742 20 FD AE JSR \$AEFD
B745 20 9E B7 JSR \$B79E
B748 20 61 B7 JSR \$B761
B74B F0 4B BEQ \$B798
B74D CA DEX
B74E 8A TXA
B74F 48 PHA
B750 18 CLC
B751 A2 00 LDX #\$00
B753 F1 50 SBC (\$50),Y
B755 B0 B6 BCS \$B70D
B757 49 FF EOR \$FF
B759 C5 65 CMP \$65
B75B 90 B1 BCC \$B70E
B75D A5 65 LDA \$65
B75F B0 AD BCS \$B70E

B761; Pull string parameters

B761 20 F7 AE JSR \$AEF7
B764 68 PLA
B765 AB TAY
B766 68 PLA
B767 85 55 STA \$55
B769 68 PLA
B76A 68 PLA

B76B 6B PLA
 B76C AA TAX
 B76D 6B PLA
 B76E 85 50 STA \$50
 B770 6B PLA
 B771 85 51 STA \$51
 B773 A5 55 LDA \$55
 B775 4B PHA
 B776 9B TYA
 B777 4B PHA
 B778 A0 00 LDY #\$00
 B77A 8A TXA
 B77B 60 RTS

B77C; Perform [LEN]

B77C 20 B2 B7 JSR \$B7B2
 B77F 4C A2 B3 JMP \$B3A2

B7B2; Exit string-mode

B7B2 20 A3 B6 JSR \$B6A3
 B7B5 A2 00 LDX #\$00
 B7B7 86 0D STX \$0D
 B7B9 AB TAY
 B7BA 60 RTS

B7BB; Perform [ASC]

B7BB 20 B2 B7 JSR \$B7B2
 B7BE F0 0B BEQ \$B79B
 B790 A0 00 LDY #\$00
 B792 B1 22 LDA (\$22),Y
 B794 AB TAY
 B795 4C A2 B3 JMP \$B3A2
 B798 4C 4B B2 JMP \$B24B

B79B; Input byte parameter

B79B 20 73 00 JSR \$0073
 B79E 20 8A AD JSR \$AD8A
 B7A1 20 B8 B1 JSR \$B1B8
 B7A4 A6 64 LDX \$64
 B7A6 D0 F0 BNE \$B79B
 B7A8 A6 65 LDX \$65
 B7AA 4C 79 00 JMP \$0079

B7AD; Perform [VAL]

B7AD 20 B2 B7 JSR \$B7B2
 B7B0 D0 03 BNE \$B7B5
 B7B2 4C F7 B8 JMP \$B8F7
 B7B5 A6 7A LDX \$7A
 B7B7 A4 7B LDY \$7B
 B7B9 86 71 STX \$71
 B7BB 84 72 STY \$72
 B7BD A6 22 LDX \$22
 B7BF 86 7A STX \$7A
 B7C1 1B CLC
 B7C2 65 22 ADC \$22
 B7C4 85 24 STA \$24
 B7C6 A6 23 LDX \$23
 B7C8 86 7B STX \$7B
 B7CA 90 01 BCC \$B7CD
 B7CC EB INX
 B7CD 86 25 STX \$25
 B7CF A0 00 LDY #\$00
 B7D1 B1 24 LDA (\$24),Y
 B7D3 4B PHA
 B7D4 9B TYA
 B7D5 91 24 STA (\$24),Y
 B7D7 20 79 00 JSR \$0079
 B7DA 20 F3 BC JSR \$BCF3
 B7DD 6B PLA
 B7DE A0 00 LDY #\$00
 B7E0 91 24 STA (\$24),Y
 B7E2 A6 71 LDX \$71
 B7E4 A4 72 LDY \$72
 B7E6 86 7A STX \$7A
 B7E8 84 7B STY \$7B
 B7EA 60 RTS

B7EB; Parameters for POKE/WAIT

B7EB 20 8A AD JSR \$AD8A
 B7EE 20 F7 B7 JSR \$B7F7
 B7F1 20 FD AE JSR \$AEFD
 B7F4 4C 9E B7 JMP \$B79E

B7F7; Float-fixed

B7F7 A5 66 LDA \$66
 B7F9 30 9D BMI \$B79B
 B7FB A5 61 LDA \$61
 B7FD C9 91 CMP #\$91

B7FF B0 97 BCS \$B798
 B801 20 9B BC JSR \$BC9B
 B804 A5 64 LDA \$64
 B806 A4 65 LDY \$65
 B808 B4 14 STY \$14
 B80A B5 15 STA \$15
 B80C 60 RTS

B849; Add 0.5

B849 A9 11 LDA #\$11
 B84B A0 BF LDY #\$BF
 B84D 4C 67 B8 JMP \$B867

B80D; Perform [PEEK]

B80D A5 15 LDA \$15
 B80F 48 PHA
 B810 A5 14 LDA \$14
 B812 48 PHA
 B813 20 F7 B7 JSR \$B7F7
 B816 A0 00 LDY #\$00
 B818 B1 14 LDA (\$14),Y
 B81A A8 TAY
 B81B 68 PLA
 B81C B5 14 STA \$14
 B81E 68 PLA
 B81F B5 15 STA \$15
 B821 4C A2 B3 JMP \$B3A2

B850; Subtract-from

B850 20 8C BA JSR \$B8BC

B853; Perform [subtract]

B853 A5 66 LDA \$66
 B855 49 FF EOR #\$FF
 B857 B5 66 STA \$66
 B859 45 6E EOR \$6E
 B85B B5 6F STA \$6F
 B85D A5 61 LDA \$61
 B85F 4C 6A B8 JMP \$B86A
 B862 20 99 B9 JSR \$B999
 B865 90 3C BCC \$B8A3
 B867 20 8C BA JSR \$B8BC

B824; Perform [POKE]

B824 20 EB B7 JSR \$B7EB
 B827 BA TXA
 B828 A0 00 LDY #\$00
 B82A 91 14 STA (\$14),Y
 B82C 60 RTS

B86A; Perform [add]

B86A D0 03 BNE \$B86F
 B86C 4C FC BB JMP \$B8FC
 B86F A6 70 LDX \$70
 B871 B6 56 STX \$56
 B873 A2 69 LDX #\$69
 B875 A5 69 LDA \$69
 B877 A8 TAY
 B878 F0 CE BEQ \$B848
 B87A 38 SEC
 B87B E5 61 SBC \$61
 B87D F0 24 BEQ \$B8A3
 B87F 90 12 BCC \$B893
 B881 B4 61 STY \$61
 B883 A4 6E LDY \$6E
 B885 B4 66 STY \$66
 B887 49 FF EOR #\$FF
 B889 69 00 ADC #\$00
 B88B A0 00 LDY #\$00
 B88D B4 56 STY \$56
 B88F A2 61 LDX #\$61
 B891 D0 04 BNE \$B897
 B893 A0 00 LDY #\$00

B82D; Perform [WAIT]

B82D 20 EB B7 JSR \$B7EB
 B830 B6 49 STX \$49
 B832 A2 00 LDX #\$00
 B834 20 79 00 JSR \$0079
 B837 F0 03 BEQ \$B83C
 B839 20 F1 B7 JSR \$B7F1
 B83C B6 4A STX \$4A
 B83E A0 00 LDY #\$00
 B840 B1 14 LDA (\$14),Y
 B842 45 4A EOR \$4A
 B844 25 49 AND \$49
 B846 F0 F8 BEQ \$B840
 B848 60 RTS

B895	84	70	STY	\$70	B8FE	65	56	ADC	\$56
B897	C9	F9	CMP	#\$F9	B900	85	70	STA	\$70
B899	30	C7	BMI	\$B862	B902	A5	65	LDA	\$65
B89B	A8		TAY		B904	65	6D	ADC	\$6D
B89C	A5	70	LDA	\$70	B906	85	65	STA	\$65
B89E	56	01	LSR	\$01,X	B908	A5	64	LDA	\$64
B8A0	20	B0	JSR	\$B9B0	B90A	65	6C	ADC	\$6C
B8A3	24	6F	BIT	\$6F	B90C	85	64	STA	\$64
B8A5	10	57	BPL	\$B8FE	B90E	A5	63	LDA	\$63
B8A7	A0	61	LDY	#\$61	B910	65	6B	ADC	\$6B
B8A9	E0	69	CPX	#\$69	B912	85	63	STA	\$63
B8AB	F0	02	BEQ	\$B8AF	B914	A5	62	LDA	\$62
B8AD	A0	69	LDY	#\$69	B916	65	6A	ADC	\$6A
B8AF	38		SEC		B918	85	62	STA	\$62
B8B0	49	FF	EOR	#\$FF	B91A	4C	36	JMP	\$B936
B8B2	65	56	ADC	\$56	B91D	69	01	ADC	#\$01
B8B4	85	70	STA	\$70	B91F	06	70	ASL	\$70
B8B6	B9	04	LDA	\$0004,Y	B921	26	65	ROL	\$65
B8B9	F5	04	SBC	\$04,X	B923	26	64	ROL	\$64
B8BB	85	65	STA	\$65	B925	26	63	ROL	\$63
B8BD	B9	03	LDA	\$0003,Y	B927	26	62	ROL	\$62
B8C0	F5	03	SBC	\$03,X	B929	10	F2	BPL	\$B91D
B8C2	85	64	STA	\$64	B92B	38		SEC	
B8C4	B9	02	LDA	\$0002,Y	B92C	E5	61	SBC	\$61
B8C7	F5	02	SBC	\$02,X	B92E	B0	C7	BCS	\$B8F7
B8C9	85	63	STA	\$63	B930	49	FF	EOR	#\$FF
B8CB	B9	01	LDA	\$0001,Y	B932	69	01	ADC	#\$01
B8CE	F5	01	SBC	\$01,X	B934	85	61	STA	\$61
B8D0	85	62	STA	\$62	B936	90	0E	BCC	\$B946
B8D2	B0	03	BCS	\$B8D7	B938	E6	61	INC	\$61
B8D4	20	47	JSR	\$B947	B93A	F0	42	BEQ	\$B97E
B8D7	A0	00	LDY	#\$00	B93C	66	62	ROR	\$62
B8D9	98		TYA		B93E	66	63	ROR	\$63
B8DA	18		CLC		B940	66	64	ROR	\$64
B8DB	A6	62	LDX	\$62	B942	66	65	ROR	\$65
B8DD	D0	4A	BNE	\$B929	B944	66	70	ROR	\$70
B8DF	A6	63	LDX	\$63	B946	60		RTS	
B8E1	86	62	STX	\$62					
B8E3	A6	64	LDX	\$64					
B8E5	86	63	STX	\$63					
B8E7	A6	65	LDX	\$65					
B8E9	86	64	STX	\$64					
B8EB	A6	70	LDX	\$70					
B8ED	86	65	STX	\$65					
B8EF	84	70	STY	\$70					
B8F1	69	08	ADC	#\$08					
B8F3	C9	20	CMP	#\$20					
B8F5	D0	E4	BNE	\$B8DB					
B8F7	A9	00	LDA	#\$00					
B8F9	85	61	STA	\$61					
B8FB	85	66	STA	\$66					
B8FD	60		RTS						

B947; Complement FAC#1									
B947	A5	66	LDA	\$66					
B949	49	FF	EOR	#\$FF					
B94B	85	66	STA	\$66					
B94D	A5	62	LDA	\$62					
B94F	49	FF	EOR	#\$FF					
B951	85	62	STA	\$62					
B953	A5	63	LDA	\$63					
B955	49	FF	EOR	#\$FF					
B957	85	63	STA	\$63					
B959	A5	64	LDA	\$64					
B95B	49	FF	EOR	#\$FF					

B95D 85 64	STA \$64	B9B4 76 04	ROR \$04,X
B95F A5 65	LDA \$65	B9B6 6A	ROR
B961 49 FF	EOR \$\$FF	B9B7 C8	INY
B963 85 65	STA \$65	B9B8 D0 EC	BNE \$B9A6
B965 A5 70	LDA \$70	B9BA 18	CLC
B967 49 FF	EOR \$\$FF	B9BB 60	RTS
B969 85 70	STA \$70	B9BC 81 00	STA (\$00,X)
B96B E6 70	INC \$70	B9BE 00	BRK
B96D D0 0E	BNE \$B97D	B9BF 00	BRK
B96F E6 65	INC \$65	B9C0 00	BRK
B971 D0 0A	BNE \$B97D	B9C1 03	???
B973 E6 64	INC \$64	B9C2 7F	???
B975 D0 06	BNE \$B97D	B9C3 5E 56 CB	LSR \$CB56,X
B977 E6 63	INC \$63	B9C6 79 80 13	ADC \$1380,Y
B979 D0 02	BNE \$B97D	B9C9 9B	???
B97B E6 62	INC \$62	B9CA 0B	???
B97D 60	RTS	B9CB 64	???
		B9CC 80	???
		B9CD 76 38	ROR \$38,X
		B9CF 93	???
B97E; 'overflow'		B9D0 16 82	ASL \$82,X
B97E A2 0F	LDX \$\$0F	B9D2 38	SEC
B980 4C 37 A4	JMP \$A437	B9D3 AA	TAX
		B9D4 3B	???
B983; Multiply by zero byte		B9D5 20 80 35	JSR \$3580
		B9D8 04	???
		B9D9 F3	???
B983 A2 25	LDX \$\$25	B9DA 34	???
B985 B4 04	LDY \$04,X	B9DB 81 35	STA (\$35,X)
B987 84 70	STY \$70	B9DD 04	???
B989 B4 03	LDY \$03,X	B9DE F3	???
B98B 74 04	STY \$04,X	B9DF 34	???
B98D B4 02	LDY \$02,X	B9E0 80	???
B98F 74 03	STY \$03,X	B9E1 80	???
B991 B4 01	LDY \$01,X	B9E2 00	BRK
B993 74 02	STY \$02,X	B9E3 00	BRK
B995 A4 68	LDY \$68	B9E4 00	BRK
B997 74 01	STY \$01,X	B9E5 80	???
B999 69 08	ADC #\$08	B9E6 31 72	AND (\$72),Y
B99B 30 E8	BMI \$B985	B9E8 17	???
B99D F0 E6	BEQ \$B985	B9E9 F8	SED
B99F E9 08	SBC #\$08		
B9A1 A8	TAY		
B9A2 A5 70	LDA \$70	B9EA; Perform [LOG]	
B9A4 B0 14	BCS \$B9BA	B9EA 20 2B BC	JSR \$BC2B
B9A6 16 01	ASL \$01,X	B9ED F0 02	BEQ \$B9F1
B9A8 90 02	BCC \$B9AC	B9EF 10 03	BPL \$B9F4
B9AA F6 01	INC \$01,X	B9F1 4C 4B B2	JMP \$B24B
B9AC 76 01	ROR \$01,X	B9F4 A5 61	LDA \$61
B9AE 76 01	ROR \$01,X	B9F6 E9 7F	SBC #\$7F
B9B0 76 02	ROR \$02,X	B9F8 4B	PHA
B9B2 76 03	ROR \$03,X		

```

B9F9 A9 B0      LDA #$B0
B9FB B5 61      STA $61
B9FD A9 D6      LDA #$D6
B9FF A0 B9      LDY #$B9
BA01 20 67 BB   JSR $BB67
BA04 A9 DB      LDA #$DB
BA06 A0 B9      LDY #$B9
BA08 20 0F BB   JSR $BB0F
BA0B A9 BC      LDA #$BC
BA0D A0 B9      LDY #$B9
BA0F 20 50 BB   JSR $BB50
BA12 A9 C1      LDA #$C1
BA14 A0 B9      LDY #$B9
BA16 20 43 E0   JSR $E043
BA19 A9 E0      LDA #$E0
BA1B A0 B9      LDY #$B9
BA1D 20 67 BB   JSR $BB67
BA20 68         PLA
BA21 20 7E BD   JSR $BD7E
BA24 A9 E5      LDA #$E5
BA26 A0 B9      LDY #$B9
BA28 20 BC BA   JSR $BABC

```

BA2B; Perform [multiply]

```

BA2B D0 03      BNE $BA30
BA2D 4C 8B BA   JMP $BABB
BA30 20 B7 BA   JSR $BAB7
BA33 A9 00      LDA #$00
BA35 B5 26      STA $26
BA37 B5 27      STA $27
BA39 B5 28      STA $28
BA3B B5 29      STA $29
BA3D A5 70      LDA $70
BA3F 20 59 BA   JSR $BA59
BA42 A5 65      LDA $65
BA44 20 59 BA   JSR $BA59
BA47 A5 64      LDA $64
BA49 20 59 BA   JSR $BA59
BA4C A5 63      LDA $63
BA4E 20 59 BA   JSR $BA59
BA51 A5 62      LDA $62
BA53 20 5E BA   JSR $BA5E
BA56 4C 8F BB   JMP $BBBF

```

BA59; Multiply-a-bit

```

BA59 D0 03      BNE $BASE
BA5B 4C 83 B9   JMP $B9B3
BA5E 4A         LSR

```

```

BA5F 09 B0      ORA #$B0
BA61 A8         TAY
BA62 90 19      BCC $BA7D
BA64 18         CLC
BA65 A5 29      LDA $29
BA67 65 6D      ADC $6D
BA69 B5 29      STA $29
BA6B A5 28      LDA $28
BA6D 65 6C      ADC $6C
BA6F B5 28      STA $28
BA71 A5 27      LDA $27
BA73 65 6B      ADC $6B
BA75 B5 27      STA $27
BA77 A5 26      LDA $26
BA79 65 6A      ADC $6A
BA7B B5 26      STA $26
BA7D 66 26      ROR $26
BA7F 66 27      ROR $27
BA81 66 28      ROR $28
BA83 66 29      ROR $29
BA85 66 70      ROR $70
BA87 98         TYA
BA88 4A         LSR
BA89 D0 D6      BNE $BA61
BA8B 60         RTS

```

BABC; Memory to FAC#2

```

BABC B5 22      STA $22
BA8E B4 23      STY $23
BA90 A0 04      LDY #$04
BA92 B1 22      LDA ($22),Y
BA94 B5 6D      STA $6D
BA96 B8         DEY
BA97 B1 22      LDA ($22),Y
BA99 B5 6C      STA $6C
BA9B B8         DEY
BA9C B1 22      LDA ($22),Y
BA9E B5 6B      STA $6B
BAA0 B8         DEY
BAA1 B1 22      LDA ($22),Y
BAA3 B5 6E      STA $6E
BAA5 45 66      EOR $66
BAA7 B5 6F      STA $6F
BAA9 A5 6E      LDA $6E
BAAB 09 B0      ORA #$B0
BAAD B5 6A      STA $6A
BAAF B8         DEY
BAB0 B1 22      LDA ($22),Y
BAB2 B5 69      STA $69
BAB4 A5 61      LDA $61

```

BAB6 60	RTS	BAF9 84 20	STY \$20
		BAFB 00	BRK
		BAFC 00	BRK
BAB7; Adjust FAC#1/#2		BAFD 00	BRK

BAB7 A5 69	LDA \$69
BAB9 F0 1F	BEQ \$BADA
BABB 18	CLC
BABC 65 61	ADC \$61
BABE 90 04	BCC \$BAC4
BAC0 30 1D	BMI \$BADF
BAC2 18	CLC
BAC3 2C 10 14	BIT \$1410
BAC6 69 80	ADC \$80
BAC8 85 61	STA \$61
BACA D0 03	BNE \$BACF
BACC 4C FB B8	JMP \$BBFB
BACF A5 6F	LDA \$6F
BAD1 85 66	STA \$66
BAD3 60	RTS

BAD4; Underflow/overflow

BAD4 A5 66	LDA \$66
BAD6 49 FF	EOR \$FF
BAD8 30 05	BMI \$BADF
BADA 68	PLA
BADB 68	PLA
BADC 4C F7 B8	JMP \$BBF7
BADF 4C 7E B9	JMP \$B97E

BAE2; Multiply by 10

BAE2 20 0C BC	JSR \$BC0C
BAE5 AA	TAX
BAE6 F0 10	BEQ \$BAFB
BAE8 18	CLC
BAE9 69 02	ADC \$02
BAEB B0 F2	BCS \$BADF
BAED A2 00	LDX \$00
BAEF 86 6F	STX \$6F
BAF1 20 77 B8	JSR \$BB77
BAF4 E6 61	INC \$61
BAF6 F0 E7	BEQ \$BADF
BAFB 60	RTS

BAF9; + 10 in floating pt.

BAFE; Divide by 10

BAFE 20 0C BC	JSR \$BC0C
BB01 A9 F9	LDA \$F9
BB03 A0 BA	LDY \$BA
BB05 A2 00	LDX \$00
BB07 86 6F	STX \$6F
BB09 20 A2 BB	JSR \$BBA2
BB0C 4C 12 BB	JMP \$BB12
BB0F 20 BC BA	JSR \$BABC

BB12; Perform [divide]

BB12 F0 76	BEQ \$BBBA
BB14 20 1B BC	JSR \$BC1B
BB17 A9 00	LDA \$00
BB19 38	SEC
BB1A E5 61	SBC \$61
BB1C 85 61	STA \$61
BB1E 20 B7 BA	JSR \$BAB7
BB21 E6 61	INC \$61
BB23 F0 BA	BEQ \$BADF
BB25 A2 FC	LDX \$FC
BB27 A9 01	LDA \$01
BB29 A4 6A	LDY \$6A
BB2B C4 62	CPY \$62
BB2D D0 10	BNE \$BB3F
BB2F A4 6B	LDY \$6B
BB31 C4 63	CPY \$63
BB33 D0 0A	BNE \$BB3F
BB35 A4 6C	LDY \$6C
BB37 C4 64	CPY \$64
BB39 D0 04	BNE \$BB3F
BB3B A4 6D	LDY \$6D
BB3D C4 65	CPY \$65
BB3F 08	PHP
BB40 2A	ROL
BB41 90 09	BCC \$BB4C
BB43 E8	INX
BB44 95 29	STA \$29,X
BB46 F0 32	BEQ \$BB7A
BB48 10 34	BPL \$BB7E
BB4A A9 01	LDA \$01
BB4C 28	PLP
BB4D B0 0E	BCS \$BB5D


```

BBFC A5 6E      LDA $6E
BBFE B5 66      STA $66
BC00 A2 05      LDX #$05
BC02 B5 68      LDA $68,X
BC04 95 60      STA $60,X
BC06 CA         DEX
BC07 D0 F9      BNE $BC02
BC09 86 70      STX $70
BC0B 60         RTS

```

```

BC42 A2 88      LDX #$88
BC44 A5 62      LDA $62
BC46 49 FF      EOR $FF
BC48 2A         ROL
BC49 A9 00      LDA #$00
BC4B 85 65      STA $65
BC4D 85 64      STA $64
BC4F 86 61      STX $61
BC51 85 70      STA $70
BC53 85 66      STA $66
BC55 4C D2 B8   JMP $B8D2

```

BC0C; FAC#1 to FAC#2

```

BC0C 20 1B BC   JSR $BC1B
BC0F A2 06      LDX #$06
BC11 B5 60      LDA $60,X
BC13 95 68      STA $68,X
BC15 CA         DEX
BC16 D0 F9      BNE $BC11
BC18 86 70      STX $70
BC1A 60         RTS

```

BC5B; Perform [ABS]

```

BC5B 46 66      LSR $66
BC5A 60         RTS

```

BC5B; Compare FAC#1 to mem.

```

BC5B 85 24      STA $24
BC5D 84 25      STY $25
BC5F A0 00      LDY #$00
BC61 B1 24      LDA ($24),Y
BC63 C8         INY
BC64 AA         TAX
BC65 F0 C4      BEQ $BC2B
BC67 B1 24      LDA ($24),Y
BC69 45 66      EOR $66
BC6B 30 C2      BMI $BC2F
BC6D E4 61      CPX $61
BC6F D0 21      BNE $BC92
BC71 B1 24      LDA ($24),Y
BC73 09 80      ORA #$80
BC75 C5 62      CMP $62
BC77 D0 19      BNE $BC92
BC79 C8         INY
BC7A B1 24      LDA ($24),Y
BC7C C5 63      CMP $63
BC7E D0 12      BNE $BC92
BC80 C8         INY
BC81 B1 24      LDA ($24),Y
BC83 C5 64      CMP $64
BC85 D0 0B      BNE $BC92
BC87 C8         INY
BC88 A9 7F      LDA #$7F
BC8A C5 70      CMP $70
BC8C B1 24      LDA ($24),Y
BC8E E5 65      SBC $65
BC90 F0 2B      BEQ $BCBA
BC92 A5 66      LDA $66

```

BC1B; Round FAC#1

```

BC1B A5 61      LDA $61
BC1D F0 FB      BEQ $BC1A
BC1F 06 70      ASL $70
BC21 90 F7      BCC $BC1A
BC23 20 6F B9   JSR $B96F
BC26 D0 F2      BNE $BC1A
BC28 4C 3B B9   JMP $B93B

```

BC2B; Get sign

```

BC2B A5 61      LDA $61
BC2D F0 09      BEQ $BC3B
BC2F A5 66      LDA $66
BC31 2A         ROL
BC32 A9 FF      LDA $FF
BC34 B0 02      BCS $BC3B
BC36 A9 01      LDA $01
BC38 60         RTS

```

BC39; Perform [SGN]

```

BC39 20 2B BC   JSR $BC2B
BC3C 85 62      STA $62
BC3E A9 00      LDA #$00
BC40 85 63      STA $63

```

BC94 90 02 BCC \$BC9B
 BC96 49 FF EOR \$FF
 BC9B 4C 31 BC JMP \$BC31

BC9B 85 63 STA \$63
 BCED 85 64 STA \$64
 BCEF 85 65 STA \$65
 BCF1 A8 TAY
 BCF2 60 RTS

BC9B; Float-fixed

BC9B A5 61 LDA \$61
 BC9D F0 4A BEQ \$BCE9
 BC9F 38 SEC
 BCA0 E9 A0 SBC \$A0
 BCA2 24 66 BIT \$66
 BCA4 10 09 BPL \$BCAF
 BCA6 AA TAX
 BCA7 A9 FF LDA \$FF
 BCA9 85 68 STA \$68
 BCAB 20 4D B9 JSR \$B94D
 BCAF 8A TXA
 BCAF A2 61 LDX \$61
 BCB1 C9 F9 CMP \$F9
 BCB3 10 06 BPL \$BCBB
 BCB5 20 99 B9 JSR \$B999
 BCB8 84 68 STY \$68
 BCBA 60 RTS
 BCB8 A8 TAY
 BCBC A5 66 LDA \$66
 BCBE 29 80 AND \$80
 BCC0 46 62 LSR \$62
 BCC2 05 62 ORA \$62
 BCC4 85 62 STA \$62
 BCC6 20 B0 B9 JSR \$B9B0
 BCC9 84 68 STY \$68
 BCCB 60 RTS

BCCC; Perform [int]

BCCC A5 61 LDA \$61
 BCCE C9 A0 CMP \$A0
 BCD0 B0 20 BCS \$BCF2
 BCD2 20 9B BC JSR \$BC9B
 BCD5 84 70 STY \$70
 BCD7 A5 66 LDA \$66
 BCD9 84 66 STY \$66
 BCDB 49 B0 EOR \$B0
 BCDD 2A ROL
 BCDE A9 A0 LDA \$A0
 BCE0 85 61 STA \$61
 BCE2 A5 65 LDA \$65
 BCE4 85 07 STA \$07
 BCE6 4C D2 B8 JMP \$B8D2
 BCE9 85 62 STA \$62

BCF3; String to FAC

BCF3 A0 00 LDY \$00
 BCF5 A2 0A LDX \$0A
 BCF7 94 5D STY \$5D, X
 BCF9 CA DEX
 BCFA 10 FB BPL \$BCF7
 BCFD 90 0F BCC \$BD0D
 BCFE C9 2D CMP \$2D
 BD00 D0 04 BNE \$BD06
 BD02 86 67 STX \$67
 BD04 F0 04 BEQ \$BD0A
 BD06 C9 2B CMP \$2B
 BD08 D0 05 BNE \$BD0F
 BD0A 20 73 00 JSR \$0073
 BD0D 90 5B BCC \$BD6A
 BD0F C9 2E CMP \$2E
 BD11 F0 2E BEQ \$BD41
 BD13 C9 45 CMP \$45
 BD15 D0 30 BNE \$BD47
 BD17 20 73 00 JSR \$0073
 BD1A 90 17 BCC \$BD33
 BD1C C9 AB CMP \$AB
 BD1E F0 0E BEQ \$BD2E
 BD20 C9 2D CMP \$2D
 BD22 F0 0A BEQ \$BD2E
 BD24 C9 AA CMP \$AA
 BD26 F0 0B BEQ \$BD30
 BD28 C9 2B CMP \$2B
 BD2A F0 04 BEQ \$BD30
 BD2C D0 07 BNE \$BD35
 BD2E 66 60 ROR \$60
 BD30 20 73 00 JSR \$0073
 BD33 90 5C BCC \$BD91
 BD35 24 60 BIT \$60
 BD37 10 0E BPL \$BD47
 BD39 A9 00 LDA \$00
 BD3B 38 SEC
 BD3C E5 5E SBC \$5E
 BD3E 4C 49 BD JMP \$BD49
 BD41 66 5F ROR \$5F
 BD43 24 5F BIT \$5F
 BD45 50 C3 BVC \$BD0A
 BD47 A5 5E LDA \$5E
 BD49 38 SEC

BD4A E5 5D	SBC \$5D	BDA9 71 7A	ADC (\$7A),Y
BD4C 85 5E	STA \$5E	BDAB 38	SEC
BD4E F0 12	BEQ \$BD62	BDAC E9 30	SBC #\$30
BD50 10 09	BPL \$BD5B	BDAE 85 5E	STA \$5E
BD52 20 FE BA	JSR \$BAFE	BDB0 4C 30 BD	JMP \$BD30
BD55 E6 5E	INC \$5E	BDB3 9B	???
BD57 D0 F9	BNE \$BD52	BDB4 3E BC 1F	ROL \$1FBC,X
BD59 F0 07	BEQ \$BD62	BDB7 FD 9E 6E	SBC \$6E9E,X
BD5B 20 E2 BA	JSR \$BAE2	BDBA 6B	???
BD5E C6 5E	DEC \$5E	BDBB 27	???
BD60 D0 F9	BNE \$BD5B	BDBC FD 9E 6E	SBC \$6E9E,X
BD62 A5 67	LDA \$67	BDBF 6B	???
BD64 30 01	BMI \$BD67	BDC0 28	PLP
BD66 60	RTS	BDC1 00	BRK
BD67 4C B4 BF	JMP \$BFB4		
BD6A 48	PHA		
BD6B 24 5F	BIT \$5F		
BD6D 10 02	BPL \$BD71		
BD6F E6 5D	INC \$5D		
BD71 20 E2 BA	JSR \$BAE2		
BD74 68	PLA		
BD75 38	SEC		
BD76 E9 30	SBC #\$30		
BD78 20 7E BD	JSR \$BD7E		
BD7B 4C 0A BD	JMP \$BD0A		

BDC2; Print 'IN...'

BDC2 A9 71	LDA #\$71
BDC4 A0 A3	LDY #\$A3
BDC6 20 DA BD	JSR \$BDDB
BDC9 A5 3A	LDA \$3A
BDCB A6 39	LDX \$39

BDCD; Print line number

BDCD 85 62	STA \$62
BDCF 86 63	STX \$63
BDD1 A2 90	LDX #\$90
BDD3 38	SEC
BDD4 20 49 BC	JSR \$BC49
BDD7 20 DF BD	JSR \$BDDF
BDDA 4C 1E AB	JMP \$AB1E

BDDD; Float to ASCII

BDDD A0 01	LDY #\$01
BDDF A9 20	LDA #\$20
BDE1 24 66	BIT \$66
BDE3 10 02	BPL \$BDE7
BDE5 A9 2D	LDA #\$2D
BDE7 99 FF 00	STA \$00FF,Y
BDEA 85 66	STA \$66
BDEC 84 71	STY \$71
BDEE C8	INY
BDEF A9 30	LDA #\$30
BDF1 A6 61	LDX \$61
BDF3 D0 03	BNE \$BDF8
BDF5 4C 04 BF	JMP \$BF04
BDF8 A9 00	LDA #\$00

BD7E; Get ASCII digit

BD7E 48	PHA
BD7F 20 0C BC	JSR \$BC0C
BD82 68	PLA
BD83 20 3C BC	JSR \$BC3C
BD86 A5 6E	LDA \$6E
BD88 45 66	EOR \$66
BD8A 85 6F	STA \$6F
BD8C A6 61	LDX \$61
BD8E 4C 6A BB	JMP \$B86A
BD91 A5 5E	LDA \$5E
BD93 C9 0A	CMP #\$0A
BD95 90 09	BCC \$BDA0
BD97 A9 64	LDA #\$64
BD99 24 60	BIT \$60
BD9B 30 11	BMI \$BDAE
BD9D 4C 7E B9	JMP \$B97E
BDA0 0A	ASL
BDA1 0A	ASL
BDA2 18	CLC
BDA3 65 5E	ADC \$5E
BDA5 0A	ASL
BDA6 18	CLC
BDA7 A0 00	LDY #\$00

BDF A E0 80	CPX ##80	BE64 B4 71	STY \$71
BDFC F0 02	BEQ \$BE00	BE66 A0 00	LDY ##00
BDFE B0 09	BCS \$BE09	BE68 A2 80	LDX ##80
BE00 A9 BD	LDA ##BD	BE6A A5 65	LDA \$65
BE02 A0 BD	LDY ##BD	BE6C 18	CLC
BE04 20 28 BA	JSR \$BA28	BE6D 79 19 BF	ADC \$BF19,Y
BE07 A9 F7	LDA ##F7	BE70 85 65	STA \$65
BE09 B5 5D	STA \$5D	BE72 A5 64	LDA \$64
BE0B A9 B8	LDA ##B8	BE74 79 18 BF	ADC \$BF18,Y
BE0D A0 BD	LDY ##BD	BE77 85 64	STA \$64
BE0F 20 5B BC	JSR \$BC5B	BE79 A5 63	LDA \$63
BE12 F0 1E	BEQ \$BE32	BE7B 79 17 BF	ADC \$BF17,Y
BE14 10 12	BPL \$BE28	BE7E 85 63	STA \$63
BE16 A9 B3	LDA ##B3	BE80 A5 62	LDA \$62
BE18 A0 BD	LDY ##BD	BE82 79 16 BF	ADC \$BF16,Y
BE1A 20 5B BC	JSR \$BC5B	BE85 85 62	STA \$62
BE1D F0 02	BEQ \$BE21	BE87 E8	INX
BE1F 10 0E	BPL \$BE2F	BE8B B0 04	BCS \$BE8E
BE21 20 E2 BA	JSR \$BAE2	BE8A 10 DE	BPL \$BE6A
BE24 C6 5D	DEC \$5D	BE8C 30 02	BMI \$BE90
BE26 D0 EE	BNE \$BE16	BE8E 30 DA	BMI \$BE6A
BE28 20 FE BA	JSR \$BAFE	BE90 BA	TXA
BE2B E6 5D	INC \$5D	BE91 90 04	BCC \$BE97
BE2D D0 DC	BNE \$BE0B	BE93 49 FF	EOR ##FF
BE2F 20 49 B8	JSR \$BB49	BE95 69 0A	ADC ##0A
BE32 20 9B BC	JSR \$BC9B	BE97 69 2F	ADC ##2F
BE35 A2 01	LDX ##01	BE99 C8	INX
BE37 A5 5D	LDA \$5D	BE9A C8	INX
BE39 18	CLC	BE9B C8	INX
BE3A 69 0A	ADC ##0A	BE9C C8	INX
BE3C 30 09	BMI \$BE47	BE9D B4 47	STY \$47
BE3E C9 0B	CMP ##0B	BE9F A4 71	LDY \$71
BE40 B0 06	BCS \$BE48	BEA1 C8	INX
BE42 69 FF	ADC ##FF	BEA2 AA	TAX
BE44 AA	TAX	BEA3 29 7F	AND ##7F
BE45 A9 02	LDA ##02	BEA5 99 FF 00	STA \$00FF,Y
BE47 38	SEC	BEA8 C6 5D	DEC \$5D
BE48 E9 02	SBC ##02	BEAA D0 06	BNE \$BEB2
BE4A B5 5E	STA \$5E	BEAC A9 2E	LDA ##2E
BE4C B6 5D	STX \$5D	BEAE C8	INX
BE4E BA	TXA	BEAF 99 FF 00	STA \$00FF,Y
BE4F F0 02	BEQ \$BE53	BEB2 B4 71	STY \$71
BE51 10 13	BPL \$BE66	BEB4 A4 47	LDY \$47
BE53 A4 71	LDY \$71	BEB6 BA	TXA
BE55 A9 2E	LDA ##2E	BEB7 49 FF	EOR ##FF
BE57 C8	INX	BEB9 29 80	AND ##80
BE58 99 FF 00	STA \$00FF,Y	BEBB AA	TAX
BE5B BA	TXA	BEBC C0 24	CPY ##24
BE5C F0 06	BEQ \$BE64	BEBE F0 04	BEQ \$BEC4
BE5E A9 30	LDA ##30	BEC0 C0 3C	CPY ##3C
BE60 C8	INX	BEC2 D0 A6	BNE \$BE6A
BE61 99 FF 00	STA \$00FF,Y	BEC4 A4 71	LDY \$71

BEC6 B9 FF 00	LDA \$00FF,Y	BF1B 98	TYA
BEC9 88	DEY	BF1C 96 80	STX \$B0,Y
BECA C9 30	CMP #\$30	BF1E FF	???
BECC F0 F8	BEQ \$BEC6	BF1F F0 BD	BEQ \$BEDE
BECE C9 2E	CMP #\$2E	BF21 C0 00	CPY #\$00
BED0 F0 01	BEQ \$BED3	BF23 01 86	DRA (\$B6,X)
BED2 C8	INY	BF25 A0 FF	LDY #\$FF
BED3 A9 2B	LDA #\$2B	BF27 FF	???
BED5 A6 5E	LDX \$5E	BF28 D8	CLD
BED7 F0 2E	BEQ \$BF07	BF29 F0 00	BEQ \$BF2B
BED9 10 08	BPL \$BEE3	BF2B 00	BRK
BEDB A9 00	LDA #\$00	BF2C 03	???
BEDD 38	SEC	BF2D EB	INX
BEDE E5 5E	SBC \$5E	BF2E FF	???
BEE0 AA	TAX	BF2F FF	???
BEE1 A9 2D	LDA #\$2D	BF30 FF	???
BEE3 99 01 01	STA \$0101,Y	BF31 9C	???
BEE6 A9 45	LDA #\$45	BF32 00	BRK
BEE8 99 00 01	STA \$0100,Y	BF33 00	BRK
BEEB 8A	TXA	BF34 00	BRK
BEEC A2 2F	LDX #\$2F	BF35 0A	ASL
BEEE 38	SEC	BF36 FF	???
BEEF EB	INX	BF37 FF	???
BEF0 E9 0A	SBC #\$0A	BF38 FF	???
BEF2 B0 FB	BCS \$BEEF	BF39 FF	???
BEF4 69 3A	ADC #\$3A		
BEF6 99 03 01	STA \$0103,Y		
BEF9 8A	TXA	BF3A; TI constants	
BEFA 99 02 01	STA \$0102,Y	BF3A FF	???
BEFD A9 00	LDA #\$00	BF3B DF	???
BEFF 99 04 01	STA \$0104,Y	BF3C 0A	ASL
BF02 F0 08	BEQ \$BF0C	BF3D B0	???
BF04 99 FF 00	STA \$00FF,Y	BF3E 00	BRK
BF07 A9 00	LDA #\$00	BF3F 03	???
BF09 99 00 01	STA \$0100,Y	BF40 4B	???
BF0C A9 00	LDA #\$00	BF41 C0 FF	CPY #\$FF
BF0E A0 01	LDY #\$01	BF43 FF	???
BF10 60	RTS	BF44 73	???
BF11 B0	???	BF45 60	RTS
BF12 00	BRK	BF46 00	BRK
BF13 00	BRK	BF47 00	BRK
BF14 00	BRK	BF48 0E 10 FF	ASL \$FF10
BF15 00	BRK	BF4B FF	???
		BF4C FD AB 00	SBC \$00AB,X
		BF4F 00	BRK
		BF50 00	BRK
		BF51 3C	???
		BF52 EC AA AA	CPX \$AAAA
		BF55 AA	TAX
		BF56 AA	TAX
		BF57 AA	TAX

BF16; Decimal constants	
BF16 FA	???
BF17 0A	ASL
BF18 1F	???
BF19 00	BRK
BF1A 00	BRK

BF5B AA	TAX	BF9C A4 07	LDY \$07
BF59 AA	TAX	BF9E 20 FE BB	JSR \$BBFE
BF5A AA	TAX	BFA1 98	TYA
BF5B AA	TAX	BFA2 4B	PHA
BF5C AA	TAX	BFA3 20 EA B9	JSR \$B9EA
BF5D AA	TAX	BFA6 A9 4E	LDA #\$4E
BF5E AA	TAX	BFA8 A0 00	LDY #\$00
BF5F AA	TAX	BFAA 20 2B BA	JSR \$BA2B
BF60 AA	TAX	BFAD 20 ED BF	JSR \$BFED
BF61 AA	TAX	BFBO 6B	PLA
BF62 AA	TAX	BFB1 4A	LSR
BF63 AA	TAX	BFB2 90 0A	BCC \$BFBE
BF64 AA	TAX		
BF65 AA	TAX		
BF66 AA	TAX		
BF67 AA	TAX		
BF68 AA	TAX		
BF69 AA	TAX		
BF6A AA	TAX		
BF6B AA	TAX		
BF6C AA	TAX		
BF6D AA	TAX		
BF6E AA	TAX		
BF6F AA	TAX		
BF70 AA	TAX		
BF71; Perform [SQR]			
BF71 20 0C BC	JSR \$BC0C	BF84 A5 61	LDA \$61
BF74 A9 11	LDA #\$11	BF86 F0 06	BEQ \$BFBE
BF76 A0 BF	LDY #\$BF	BF88 A5 66	LDA \$66
BF7B 20 A2 BB	JSR \$BBA2	BF8A 49 FF	EOR \$FF
BF7B; Perform [power]			
BF7B F0 70	BEQ \$BFED	BF8C 85 66	STA \$66
BF7D A5 69	LDA \$69	BFB6 60	RTS
BF7F D0 03	BNE \$BF84	BFBF 81 3B	STA (\$3B,X)
BF81 4C F9 BB	JMP \$B8F9	BFC1 AA	TAX
BF84 A2 4E	LDX #\$4E	BFC2 3B	???
BF86 A0 00	LDY #\$00	BFC3 29 07	AND #\$07
BF8B 20 D4 BB	JSR \$BBD4	BFC5 71 34	ADC (\$34),Y
BF8B A5 6E	LDA \$6E	BFC7 5B	CLI
BF8D 10 0F	BPL \$BF9E	BFC8 3E 56 74	ROL \$7456,X
BF8F 20 CC BC	JSR \$BCCC	BFCB 16 7E	ASL \$7E,X
BF92 A9 4E	LDA #\$4E	BFCD B3	???
BF94 A0 00	LDY #\$00	BFCE 1B	???
BF96 20 5B BC	JSR \$BC5B	BFCF 77	???
BF99 D0 03	BNE \$BF9E	BFD0 2F	???
BF9B 9B	TYA	BFD1 EE E3 85	INC \$85E3
		BFD4 7A	???
		BFD5 1D 84 1C	ORA \$1C84,X
		BFD8 2A	ROL
		BFD9 7C	???
		BFDA 63	???
		BFDB 59 5B 0A	EOR \$0A5B,Y
		BFDE 7E 75 FD	ROR \$FD75,X
		BFE1 E7	???
		BFE2 C6 80	DEC \$80
		BFE4 31 72	AND (\$72),Y
		BFE6 1B	CLC
		BFE7 10 81	BPL \$BF6A
		BFE9 00	BRK
		BFEA 00	BRK
		BFEB 00	BRK
		BFEC 00	BRK

BFED; Perform [EXP]

BFED	A9	BF	LDA	##BF
BFEF	A0	BF	LDY	##BF
BFF1	20	28 BA	JSR	\$BA28
BFF4	A5	70	LDA	\$70
BFF6	69	50	ADC	##50
BFF8	90	03	BCC	\$BFFD
BFFA	20	23 BC	JSR	\$BC23
BFFD	4C	00 E0	JMP	\$E000
E000	85	56	STA	\$56
E002	20	0F BC	JSR	\$BC0F
E005	A5	61	LDA	\$61
E007	C9	88	CMP	##88
E009	90	03	BCC	\$E00E
E00B	20	D4 BA	JSR	\$BAD4
E00E	20	CC BC	JSR	\$BCCC
E011	A5	07	LDA	\$07
E013	18		CLC	
E014	69	81	ADC	##81
E016	F0	F3	BEQ	\$E00B
E018	38		SEC	
E019	E9	01	SBC	##01
E01B	48		PHA	
E01C	A2	05	LDX	##05
E01E	B5	69	LDA	\$69,X
E020	B4	61	LDY	\$61,X
E022	95	61	STA	\$61,X
E024	94	69	STY	\$69,X
E026	CA		DEX	
E027	10	F5	BPL	\$E01E
E029	A5	56	LDA	\$56
E02B	85	70	STA	\$70
E02D	20	53 B8	JSR	\$B853
E030	20	B4 BF	JSR	\$BFB4
E033	A9	C4	LDA	##C4
E035	A0	BF	LDY	##BF
E037	20	59 E0	JSR	\$E059
E03A	A9	00	LDA	##00
E03C	85	6F	STA	\$6F
E03E	68		PLA	
E03F	20	B9 BA	JSR	\$BAB9
E042	60		RTS	

E04A	A9	57	LDA	##57
E04C	20	28 BA	JSR	\$BA28
E04F	20	5D E0	JSR	\$E05D
E052	A9	57	LDA	##57
E054	A0	00	LDY	##00
E056	4C	28 BA	JMP	\$BA28

E059; Series eval. 2

E059	85	71	STA	\$71
E05B	84	72	STY	\$72
E05D	20	C7 BB	JSR	\$BBC7
E060	B1	71	LDA	(\$71),Y
E062	85	67	STA	\$67
E064	A4	71	LDY	\$71
E066	C8		INY	
E067	98		TYA	
E068	D0	02	BNE	\$E06C
E06A	E6	72	INC	\$72
E06C	85	71	STA	\$71
E06E	A4	72	LDY	\$72
E070	20	28 BA	JSR	\$BA28
E073	A5	71	LDA	\$71
E075	A4	72	LDY	\$72
E077	18		CLC	
E078	69	05	ADC	##05
E07A	90	01	BCC	\$E07D
E07C	C8		INY	
E07D	85	71	STA	\$71
E07F	84	72	STY	\$72
E081	20	67 BB	JSR	\$B867
E084	A9	5C	LDA	##5C
E086	A0	00	LDY	##00
E088	C6	67	DEC	\$67
E08A	D0	E4	BNE	\$E070
E08C	60		RTS	
E08D	98		TYA	
E08E	35	44	AND	\$44,X
E090	7A		???	
E091	00		BRK	
E092	68		PLA	
E093	28		PLP	
E094	B1	46	LDA	(\$46),Y
E096	00		BRK	

E043; Series eval. 1

E043	85	71	STA	\$71
E045	84	72	STY	\$72
E047	20	CA BB	JSR	\$BBCA

E097; Perform [RND]

E097	20	2B BC	JSR	\$BC2B
E09A	30	37	BMI	\$E0D3
E09C	D0	20	BNE	\$E0BE

E09E 20 F3 FF	JSR \$FFF3	E104 AA	TAX
E0A1 86 22	STX \$22	E105 D0 02	BNE \$E109
E0A3 84 23	STY \$23	E107 A2 1E	LDX #\$1E
E0A5 A0 04	LDY #\$04	E109 4C 37 A4	JMP \$A437
E0A7 B1 22	LDA (\$22),Y	E10C 20 D2 FF	JSR \$FFD2
E0A9 85 62	STA \$62	E10F B0 E8	BCS \$E0F9
E0AB C8	INY	E111 60	RTS
E0AC B1 22	LDA (\$22),Y	E112 20 CF FF	JSR \$FFCF
E0AE 85 64	STA \$64	E115 B0 E2	BCS \$E0F9
E0B0 A0 08	LDY #\$08	E117 60	RTS
E0B2 B1 22	LDA (\$22),Y	E118 20 AD E4	JSR \$E4AD
E0B4 85 63	STA \$63	E11B B0 DC	BCS \$E0F9
E0B6 C8	INY	E11D 60	RTS
E0B7 B1 22	LDA (\$22),Y	E11E 20 C6 FF	JSR \$FFC6
E0B9 85 65	STA \$65	E121 B0 D6	BCS \$E0F9
E0BB 4C E3 E0	JMP \$E0E3	E123 60	RTS
E0BE A9 8B	LDA #\$8B	E124 20 E4 FF	JSR \$FFE4
E0C0 A0 00	LDY #\$00	E127 B0 D0	BCS \$E0F9
E0C2 20 A2 BB	JSR \$BBA2	E129 60	RTS
E0C5 A9 8D	LDA #\$8D		
E0C7 A0 E0	LDY #\$E0		
E0C9 20 28 BA	JSR \$BA28		
E0CC A9 92	LDA #\$92	E12A; Perform [SYS]	
E0CE A0 E0	LDY #\$E0		
E0D0 20 67 BB	JSR \$BB67	E12A 20 8A AD	JSR \$AD8A
E0D3 A6 65	LDX \$65	E12D 20 F7 B7	JSR \$B7F7
E0D5 A5 62	LDA \$62	E130 A9 E1	LDA #\$E1
E0D7 85 65	STA \$65	E132 48	PHA
E0D9 86 62	STX \$62	E133 A9 46	LDA #\$46
E0DB A6 63	LDX \$63	E135 48	PHA
E0DD A5 64	LDA \$64	E136 AD 0F 03	LDA \$030F
E0DF 85 63	STA \$63	E139 48	PHA
E0E1 86 64	STX \$64	E13A AD 0C 03	LDA \$030C
E0E3 A9 00	LDA #\$00	E13D AE 0D 03	LDX \$030D
E0E5 85 66	STA \$66	E140 AC 0E 03	LDY \$030E
E0E7 A5 61	LDA \$61	E143 28	PLP
E0E9 85 70	STA \$70	E144 6C 14 00	JMP (\$0014)
E0EB A9 80	LDA #\$80	E147 08	PHP
E0ED 85 61	STA \$61	E148 8D 0C 03	STA \$030C
E0EF 20 D7 BB	JSR \$BBD7	E14B 8E 0D 03	STX \$030D
E0F2 A2 BB	LDX #\$BB	E14E 8C 0E 03	STY \$030E
E0F4 A0 00	LDY #\$00	E151 68	PLA
E0F6 4C D4 BB	JMP \$BBD4	E152 8D 0F 03	STA \$030F
		E155 60	RTS

E0F9; ?? breakpoints ??

E0F9 C9 F0	CMP #\$F0
E0FB D0 07	BNE \$E104
E0FD 84 38	STY \$38
E0FF 86 37	STX \$37
E101 4C 63 A6	JMP \$A663

E156; Perform [SAVE]

E156 20 D4 E1	JSR \$E1D4
E159 A6 2D	LDX \$2D
E15B A4 2E	LDY \$2E
E15D A9 2B	LDA #\$2B
E15F 20 D8 FF	JSR \$FFD8

E162 B0 95 BCS \$E0F9
E164 60 RTS

E1C6 60 RTS

E165; Perform [LOAD]

E165 A9 01 LDA #\$01
E168 A9 00 LDA #\$00
E16A B5 0A STA \$0A
E16C 20 D4 E1 JSR \$E1D4
E16F A5 0A LDA \$0A
E171 A6 2B LDX \$2B
E173 A4 2C LDY \$2C
E175 20 D5 FF JSR \$FFD5
E178 B0 57 BCS \$E1D1
E17A A5 0A LDA \$0A
E17C F0 17 BEQ \$E195
E17E A2 1C LDX #\$1C
E180 20 B7 FF JSR \$FFB7
E183 29 10 AND #\$10
E185 D0 17 BNE \$E19E
E187 A5 7A LDA \$7A
E189 C9 02 CMP #\$02
E18B F0 07 BEQ \$E194
E18D A9 64 LDA #\$64
E18F A0 A3 LDY #\$A3
E191 4C 1E AB JMP \$AB1E
E194 60 RTS
E195 20 B7 FF JSR \$FFB7
E198 29 BF AND #\$BF
E19A F0 05 BEQ \$E1A1
E19C A2 1D LDX #\$1D
E19E 4C 37 A4 JMP \$A437
E1A1 A5 7B LDA \$7B
E1A3 C9 02 CMP #\$02
E1A5 D0 0E BNE \$E1B5
E1A7 B6 2D STX \$2D
E1A9 B4 2E STY \$2E
E1AB A9 76 LDA #\$76
E1AD A0 A3 LDY #\$A3
E1AF 20 1E AB JSR \$AB1E
E1B2 4C 2A A5 JMP \$A52A
E1B5 20 BE A6 JSR \$A6BE
E1B8 20 33 A5 JSR \$A533
E1BB 4C 77 A6 JMP \$A677

E1BE; Perform [OPEN]

E1BE 20 19 E2 JSR \$E219
E1C1 20 C0 FF JSR \$FFC0
E1C4 B0 0B BCS \$E1D1

E1C7; Perform [CLOSE]

E1C7 20 19 E2 JSR \$E219
E1CA A5 49 LDA \$49
E1CC 20 C3 FF JSR \$FFC3
E1CF 90 C3 BCC \$E194
E1D1 4C F9 E0 JMP \$E0F9

E1D4; Parameters for LOAD/SAVE

E1D4 A9 00 LDA #\$00
E1D6 20 BD FF JSR \$FFBD
E1D9 A2 01 LDX #\$01
E1DB A0 00 LDY #\$00
E1DD 20 BA FF JSR \$FFBA
E1E0 20 06 E2 JSR \$E206
E1E3 20 57 E2 JSR \$E257
E1E6 20 06 E2 JSR \$E206
E1E9 20 00 E2 JSR \$E200
E1EC A0 00 LDY #\$00
E1EE B6 49 STX \$49
E1F0 20 BA FF JSR \$FFBA
E1F3 20 06 E2 JSR \$E206
E1F6 20 00 E2 JSR \$E200
E1F9 BA TXA
E1FA AB TAY
E1FB A6 49 LDX \$49
E1FD 4C BA FF JMP \$FFBA
E200 20 0E E2 JSR \$E20E
E203 4C 9E B7 JMP \$B79E

E206; Check default parameters

E206 20 79 00 JSR \$0079
E209 D0 02 BNE \$E20D
E20B 68 PLA
E20C 68 PLA
E20D 60 RTS

E20E; Check for comma

E20E 20 FD AE JSR \$AEFD
E211 20 79 00 JSR \$0079
E214 D0 F7 BNE \$E20D
E216 4C 0B AF JMP \$AF0B

E219; Parameters for OPEN/CLOSE

```

E219 A9 00      LDA #$00
E21B 20 BD FF   JSR $FFBD
E21E 20 11 E2   JSR $E211
E221 20 9E B7   JSR $B79E
E224 B6 49      STX $49
E226 BA         TXA
E227 A2 01      LDX #$01
E229 A0 00      LDY #$00
E22B 20 BA FF   JSR $FFBA
E22E 20 06 E2   JSR $E206
E231 20 00 E2   JSR $E200
E234 B6 4A      STX $4A
E236 A0 00      LDY #$00
E238 A5 49      LDA $49
E23A E0 03      CPX #$03
E23C 90 01      BCC $E23F
E23E B8         DEY
E23F 20 BA FF   JSR $FFBA
E242 20 06 E2   JSR $E206
E245 20 00 E2   JSR $E200
E248 BA         TXA
E249 AB         TAY
E24A A6 4A      LDX $4A
E24C A5 49      LDA $49
E24E 20 BA FF   JSR $FFBA
E251 20 06 E2   JSR $E206
E254 20 0E E2   JSR $E20E
E257 20 9E AD   JSR $AD9E
E25A 20 A3 B6   JSR $B6A3
E25D A6 22      LDX $22
E25F A4 23      LDY $23
E261 4C BD FF   JMP $FFBD

```

E264; Perform [COS]

```

E264 A9 E0      LDA #$E0
E266 A0 E2      LDY #$E2
E268 20 67 B8   JSR $B867

```

E26B; Perform [SIN]

```

E26B 20 0C BC   JSR $BC0C
E26E A9 E5      LDA #$E5
E270 A0 E2      LDY #$E2
E272 A6 6E      LDX $6E

```

```

E274 20 07 BB   JSR $BB07
E277 20 0C BC   JSR $BC0C
E27A 20 CC BC   JSR $BCCC
E27D A9 00      LDA #$00
E27F B5 6F      STA $6F
E281 20 53 B8   JSR $B853
E284 A9 EA      LDA #$EA
E286 A0 E2      LDY #$E2
E288 20 50 B8   JSR $B850
E28B A5 66      LDA $66
E28D 48         PHA
E28E 10 0D      BPL $E29D
E290 20 49 B8   JSR $B849
E293 A5 66      LDA $66
E295 30 09      BMI $E2A0
E297 A5 12      LDA $12
E299 49 FF      EOR $FF
E29B B5 12      STA $12
E29D 20 B4 BF   JSR $BFB4
E2A0 A9 EA      LDA #$EA
E2A2 A0 E2      LDY #$E2
E2A4 20 67 B8   JSR $B867
E2A7 68         PLA
E2AB 10 03      BPL $E2AD
E2AA 20 B4 BF   JSR $BFB4
E2AD A9 EF      LDA $EF
E2AF A0 E2      LDY #$E2
E2B1 4C 43 E0   JMP $E043

```

E2B4; Perform [TAN]

```

E2B4 20 CA BB   JSR $BBCA
E2B7 A9 00      LDA #$00
E2B9 B5 12      STA $12
E2BB 20 6B E2   JSR $E26B
E2BE A2 4E      LDX $4E
E2C0 A0 00      LDY #$00
E2C2 20 F6 E0   JSR $E0F6
E2C5 A9 57      LDA $57
E2C7 A0 00      LDY #$00
E2C9 20 A2 B8   JSR $B8A2
E2CC A9 00      LDA #$00
E2CE B5 66      STA $66
E2D0 A5 12      LDA $12
E2D2 20 DC E2   JSR $E2DC
E2D5 A9 4E      LDA $4E
E2D7 A0 00      LDY #$00
E2D9 4C 0F B8   JMP $B80F
E2DC 48         PHA
E2DD 4C 9D E2   JMP $E29D
E2E0 B1 49      STA ($49,X)

```

E2E2	0F	???
E2E3	DA	???
E2E4	A2 83	LDX #B3
E2E6	49 0F	EOR #0F
E2E8	DA	???
E2E9	A2 7F	LDX #7F
E2EB	00	BRK
E2EC	00	BRK
E2ED	00	BRK
E2EE	00	BRK
E2EF	05 B4	ORA \$B4
E2F1	E6 1A	INC \$1A
E2F3	2D 1B B6	AND \$B61B
E2F6	28	PLP
E2F7	07	???
E2F8	FB	???
E2F9	F8	SED
E2FA	87	???
E2FB	99 68 B9	STA \$B968,Y
E2FE	01 87	ORA (\$B7,X)
E300	23	???
E301	35 DF	AND \$DF,X
E303	E1 86	SBC (\$B6,X)
E305	A5 5D	LDA \$5D
E307	E7	???
E308	28	PLP
E309	83	???
E30A	49 0F	EOR #0F
E30C	DA	???

E30E; Perform [ATN]

E30E	A5 66	LDA \$66
E30F	66 48	ROR \$48
E311	10 03	BPL \$E316
E313	20 B4 BF	JSR \$BFB4
E316	A5 61	LDA \$61
E318	48	PHA
E319	C9 81	CMP #B1
E31B	90 07	BCC \$E324
E31D	A9 BC	LDA #BC
E31F	A0 B9	LDY #B9
E321	20 0F BB	JSR \$BB0F
E324	A9 3E	LDA #3E
E326	A0 E3	LDY #E3
E328	20 43 E0	JSR \$E043
E32B	68	PLA
E32C	C9 81	CMP #B1
E32E	90 07	BCC \$E337
E330	A9 E0	LDA #E0
E332	A0 E2	LDY #E2

E334	20 50 BB	JSR \$B850
E337	68	PLA
E338	10 03	BPL \$E33D
E33A	4C B4 BF	JMP \$BFB4
E33D	60	RTS
E33E	0B	???
E33F	76 B3	ROR \$B3,X
E341	83	???
E342	BD D3 79	LDA \$79D3,X
E345	1E F4 A6	ASL \$A6F4,X
E348	F5 7B	SBC \$7B,X
E34A	83	???
E34B	FC	???
E34C	B0 10	BCS \$E35E
E34E	7C	???
E34F	0C	???
E350	1F	???
E351	67	???
E352	CA	DEX
E353	7C	???
E354	DE 53 CB	DEC \$CB53,X
E357	C1 7D	CMP (\$7D,X)
E359	14	???
E35A	64	???
E35B	70 4C	BVS \$E3A9
E35D	7D B7 EA	ADC \$EAB7,X
E360	51 7A	EOR (\$7A),Y
E362	7D 63 30	ADC \$3063,X
E365	88	DEY
E366	7E 7E 92	ROR \$927E,X
E369	44	???
E36A	99 3A 7E	STA \$7E3A,Y
E36D	4C CC 91	JMP \$91CC
E370	C7	???
E371	7F	???
E372	AA	TAX
E373	AA	TAX
E374	AA	TAX
E375	13	???
E376	81 00	STA (\$00,X)
E378	00	BRK
E379	00	BRK
E37A	00	BRK

E37B; Warm restart

E37B	20 CC FF	JSR \$FFCC
E37E	A9 00	LDA #00
E380	85 13	STA \$13
E382	20 7A A6	JSR \$A67A
E385	58	CLI

E386 A2 80	LDX #\$80	E3D6 B4 06	STY \$06
E388 6C 00 03	JMP (\$0300)	E3D8 A9 AA	LDA #\$AA
E38B 8A	TXA	E3DA A0 B1	LDY #\$B1
E38C 30 03	BMI \$E391	E3DC 85 03	STA \$03
E38E 4C 3A A4	JMP \$A43A	E3DE B4 04	STY \$04
E391 4C 74 A4	JMP \$A474	E3E0 A2 1C	LDX #\$1C
		E3E2 BD A2 E3	LDA \$E3A2,X
		E3E5 95 73	STA \$73,X
		E3E7 CA	DEX
		E3EB 10 FB	BPL \$E3E2
		E3EA A9 03	LDA #\$03
		E3EC 85 53	STA \$53
		E3EE A9 00	LDA #\$00
		E3F0 85 68	STA \$68
		E3F2 85 13	STA \$13
		E3F4 85 18	STA \$18
		E3F6 A2 01	LDX #\$01
		E3FB 8E FD 01	STX \$01FD
		E3FB 8E FC 01	STX \$01FC
		E3FE A2 19	LDX #\$19
		E400 B6 16	STX \$16
		E402 38	SEC
		E403 20 9C FF	JSR \$FF9C
		E406 B6 2B	STX \$2B
		E408 B4 2C	STY \$2C
		E40A 38	SEC
		E40B 20 99 FF	JSR \$FF99
		E40E B6 37	STX \$37
		E410 B4 38	STY \$38
		E412 B6 33	STX \$33
		E414 B4 34	STY \$34
		E416 A0 00	LDY #\$00
		E418 98	TYA
		E419 91 2B	STA (\$2B),Y
		E41B E6 2B	INC \$2B
		E41D D0 02	BNE \$E421
		E41F E6 2C	INC \$2C
		E421 60	RTS
		E422 A5 2B	LDA \$2B
		E424 A4 2C	LDY \$2C
		E426 20 08 A4	JSR \$A408
		E429 A9 73	LDA #\$73
		E42B A0 E4	LDY #\$E4
		E42D 20 1E AB	JSR \$AB1E
		E430 A5 37	LDA \$37
		E432 38	SEC
		E433 E5 2B	SBC \$2B
		E435 AA	TAX
		E436 A5 38	LDA \$38
		E438 E5 2C	SBC \$2C
		E43A 20 CD BD	JSR \$BDCD
		E43D A9 60	LDA #\$60

R394; Initialize

E394 20 53 E4	JSR \$E453
E397 20 BF E3	JSR \$E3BF
E39A 20 22 E4	JSR \$E422
E39D A2 FB	LDX #\$FB
E39F 9A	TXS
E3A0 D0 E4	BNE \$E386

E3A2; CHRGET for zero page

E3A2 E6 7A	INC \$7A
E3A4 D0 02	BNE \$E3AB
E3A6 E6 7B	INC \$7B
E3AB AD 60 EA	LDA \$EA60
E3AB C9 3A	CMP #\$3A
E3AD B0 0A	BCS \$E3B9
E3AF C9 20	CMP #\$20
E3B1 F0 EF	BEQ \$E3A2
E3B3 38	SEC
E3B4 E9 30	SBC #\$30
E3B6 38	SEC
E3B7 E9 D0	SBC #\$D0
E3B9 60	RTS
E3BA 80	???
E3BB 4F	???
E3BC C7	???
E3BD 52	???
E3BE 58	CLI

E3BF; Initialize Basic

E3BF A9 4C	LDA #\$4C
E3C1 B5 54	STA \$54
E3C3 8D 10 03	STA \$0310
E3C6 A9 48	LDA #\$48
E3C8 A0 B2	LDY #\$B2
E3CA BD 11 03	STA \$0311
E3CD 8C 12 03	STY \$0312
E3D0 A9 91	LDA #\$91
E3D2 A0 B3	LDY #\$B3
E3D4 B5 05	STA \$05

E43F A0 E4	LDY #\$E4	E48D 53	???
E441 20 1E AB	JSR \$AB1E	E48E 49 43	EOR #\$43
E444 4C 44 A6	JMP \$A644	E490 20 56 32	JSR \$3256
		E493 20 2A 2A	JSR \$2A2A
		E496 2A	ROL
		E497 2A	ROL
		E498 0D 0D 20	DRA \$200D
		E49B 36 34	ROL \$34,X
		E49D 4B	???
		E49E 20 52 41	JSR \$4152
		E4A1 4D 20 53	EOR \$5320
		E4A4 59 53 54	EOR \$5453,Y
		E4A7 45 4D	EOR \$4D
		E4A9 20 20 00	JSR \$0020
		E4AC 5C	???
		E4AD 4B	PHA
		E4AE 20 C9 FF	JSR \$FFC9
		E4B1 AA	TAX
		E4B2 6B	PLA
		E4B3 90 01	BCC \$E4B6
		E4B5 BA	TXA
		E4B6 60	RTS
		E4B7 AA	TAX
		E4B8 AA	TAX
		E4B9 AA	TAX
		E4BA AA	TAX
		E4BB AA	TAX
		E4BC AA	TAX
		E4BD AA	TAX
		E4BE AA	TAX
		E4BF AA	TAX
		E4C0 AA	TAX
		E4C1 AA	TAX
		E4C2 AA	TAX
		E4C3 AA	TAX
		E4C4 AA	TAX
		E4C5 AA	TAX
		E4C6 AA	TAX
		E4C7 AA	TAX
		E4C8 AA	TAX
		E4C9 AA	TAX
		E4CA AA	TAX
		E4CB AA	TAX
		E4CC AA	TAX
		E4CD AA	TAX
		E4CE AA	TAX
		E4CF AA	TAX
		E4D0 AA	TAX
		E4D1 AA	TAX
		E4D2 AA	TAX
		E4D3 AA	TAX
		E4D4 AA	TAX

E447; Vectors for \$300

E447 8B	???
E448 E3	???
E449 83	???
E44A A4 7C	LDY \$7C
E44C A5 1A	LDA \$1A
E44E A7	???
E44F E4 A7	CPX \$A7
E451 B6 AE	STX \$AE

R453; Initialize vectors

E453 A2 0B	LDX #\$0B
E455 BD 47 E4	LDA \$E447,X
E45B 9D 00 03	STA \$0300,X
E45B CA	DEX
E45C 10 F7	BPL \$E455
E45E 60	RTS

E45F; Power-up message

E45F 00	BRK
E460 20 42 41	JSR \$4142
E463 53	???
E464 49 43	EOR #\$43
E466 20 42 59	JSR \$5942
E469 54	???
E46A 45 53	EOR \$53
E46C 20 46 52	JSR \$5246
E46F 45 45	EOR \$45
E471 0D 00 93	DRA \$9300
E474 0D 20 20	DRA \$2020
E477 20 20 2A	JSR \$2A20
E47A 2A	ROL
E47B 2A	ROL
E47C 2A	ROL
E47D 20 43 4F	JSR \$4F43
E480 4D 4D 4F	EOR \$4F4D
E483 44	???
E484 4F	???
E485 52	???
E486 45 20	EOR \$20
E488 36 34	ROL \$34,X
E48A 20 42 41	JSR \$4142

E4D5	AA	TAX
E4D6	AA	TAX
E4D7	AA	TAX
E4D8	AA	TAX
E4D9	AA	TAX
E4DA	AD 21 D0	LDA \$D021
E4DD	91 F3	STA (\$F3),Y
E4DF	60	RTS
E4E0	69 02	ADC #\$02
E4E2	A4 91	LDY \$91
E4E4	C8	INY
E4E5	D0 04	BNE \$E4EB
E4E7	C5 A1	CMP \$A1
E4E9	D0 F7	BNE \$E4E2
E4EB	60	RTS
E4EC	19 26 44	ORA \$4426,Y
E4EF	19 1A 11	ORA \$111A,Y
E4F2	E8	INX
E4F3	0D 70 0C	ORA \$0C70
E4F6	06 06	ASL \$06
E4FB	D1 02	CMP (\$02),Y
E4FA	37	???
E4FB	01 AE	ORA (\$AE,X)
E4FD	00	BRK
E4FE	69 00	ADC #\$00

E500; Get I/O address

E500	A2 00	LDX #\$00
E502	A0 DC	LDY #\$DC
E504	60	RTS

E505; Get screen size

E505	A2 28	LDX #\$28
E507	A0 19	LDY #\$19
E509	60	RTS

E50A; Put/get row/column

E50A	B0 07	BCS \$E513
E50C	B6 D6	STX \$D6
E50E	B4 D3	STY \$D3
E510	20 6C E5	JSR \$E56C
E513	A6 D6	LDX \$D6
E515	A4 D3	LDY \$D3
E517	60	RTS

E518; Initialize I/O

E518	20 A0 E5	JSR \$E5A0
E51B	A9 00	LDA #\$00
E51D	BD 91 02	STA \$0291
E520	85 CF	STA \$CF
E522	A9 48	LDA #\$48
E524	BD 8F 02	STA \$028F
E527	A9 EB	LDA #\$EB
E529	BD 90 02	STA \$0290
E52C	A9 0A	LDA #\$0A
E52E	BD 89 02	STA \$0289
E531	BD 8C 02	STA \$028C
E534	A9 0E	LDA #\$0E
E536	BD 86 02	STA \$0286
E539	A9 04	LDA #\$04
E53B	BD 8B 02	STA \$028B
E53E	A9 0C	LDA #\$0C
E540	85 CD	STA \$CD
E542	85 CC	STA \$CC

E544; Clear screen

E544	AD 88 02	LDA \$0288
E547	09 80	ORA #\$80
E549	AB	TAY
E54A	A9 00	LDA #\$00
E54C	AA	TAX
E54D	94 D9	STY \$D9,X
E54F	18	CLC
E550	69 28	ADC #\$28
E552	90 01	BCC \$E555
E554	C8	INY
E555	E8	INX
E556	E0 1A	CPX #\$1A
E558	D0 F3	BNE \$E54D
E55A	A9 FF	LDA #\$FF
E55C	95 D9	STA \$D9,X
E55E	A2 18	LDX #\$18
E560	20 FF E9	JSR \$E9FF
E563	CA	DEX
E564	10 FA	BPL \$E560

E566; Home cursor

E566	A0 00	LDY #\$00
E568	B4 D3	STY \$D3
E56A	B4 D6	STY \$D6

E56C; Set screen pointers

```

E56C A6 D6      LDX $D6
E56E A5 D3      LDA $D3
E570 B4 D9      LDY $D9,X
E572 30 08      BMI $E57C
E574 18          CLC
E575 69 28      ADC #$28
E577 85 D3      STA $D3
E579 CA          DEX
E57A 10 F4      BPL $E570
E57C B5 D9      LDA $D9,X
E57E 29 03      AND #$03
E580 0D 88 02   ORA $0288
E583 85 D2      STA $D2
E585 BD F0 EC   LDA $ECF0,X
E588 85 D1      STA $D1
E58A A9 27      LDA #$27
E58C E8          INX
E58D B4 D9      LDY $D9,X
E58F 30 06      BMI $E597
E591 18          CLC
E592 69 28      ADC #$28
E594 E8          INX
E595 10 F6      BPL $E58D
E597 85 D5      STA $D5
E599 60          RTS
E59A 20 A0 E5   JSR $E5A0
E59D 4C 66 E5   JMP $E566

```

E5A0; Set I/O defaults

```

E5A0 A9 03      LDA #$03
E5A2 85 9A      STA $9A
E5A4 A9 00      LDA #$00
E5A6 85 99      STA $99
E5A8 A2 2F      LDX #$2F
E5AA BD B8 EC   LDA $ECB8,X
E5AD 9D FF CF   STA $CFFF,X
E5B0 CA          DEX
E5B1 D0 F7      BNE $E5AA
E5B3 60          RTS

```

E5B4; Input from keyboard

```

E5B4 AC 77 02   LDY $0277
E5B7 A2 00      LDX #$00
E5B9 BD 78 02   LDA $0278,X

```

```

E5BC 9D 77 02   STA $0277,X
E5BF E8          INX
E5C0 E4 C6      CPX $C6
E5C2 D0 F5      BNE $E5B9
E5C4 C6 C6      DEC $C6
E5C6 98          TYA
E5C7 58          CLI
E5C8 18          CLC
E5C9 60          RTS
E5CA 20 16 E7   JSR $E716
E5CD A5 C6      LDA $C6
E5CF 85 CC      STA $CC
E5D1 BD 92 02   STA $0292
E5D4 F0 F7      BEQ $E5CD
E5D6 78          SEI
E5D7 A5 CF      LDA $CF
E5D9 F0 0C      BEQ $E5E7
E5DB A5 CE      LDA $CE
E5DD AE 87 02   LDX $0287
E5E0 A0 00      LDY #$00
E5E2 84 CF      STY $CF
E5E4 20 13 EA   JSR $EA13
E5E7 20 B4 E5   JSR $E5B4
E5EA C9 83      CMP #$83
E5EC D0 10      BNE $E5FE
E5EE A2 09      LDX #$09
E5F0 78          SEI
E5F1 86 C6      STX $C6
E5F3 BD E6 EC   LDA $ECE6,X
E5F6 9D 76 02   STA $0276,X
E5F9 CA          DEX
E5FA D0 F7      BNE $E5F3
E5FC F0 CF      BEQ $E5CD
E5FE C9 0D      CMP #$0D
E600 D0 C8      BNE $E5CA
E602 A4 D5      LDY $D5
E604 B4 D0      STY $D0
E606 B1 D1      LDA ($D1),Y
E608 C9 20      CMP #$20
E60A D0 03      BNE $E60F
E60C 88          DEY
E60D D0 F7      BNE $E606
E60F C8          INY
E610 84 C8      STY $C8
E612 A0 00      LDY #$00
E614 BC 92 02   STY $0292
E617 B4 D3      STY $D3
E619 B4 D4      STY $D4
E61B A5 C9      LDA $C9
E61D 30 18      BMI $E63A
E61F A6 D6      LDX $D6
E621 20 ED E6   JSR $E6ED

```

E624	E4	C9	CPX	\$C9
E626	D0	12	BNE	\$E63A
E628	A5	CA	LDA	\$CA
E62A	B5	D3	STA	\$D3
E62C	C5	C8	CMP	\$C8
E62E	90	0A	BCC	\$E63A
E630	B0	2B	BCS	\$E65D

E67E	D0	02	BNE	\$E6B2
E680	A9	FF	LDA	##FF
E682	18		CLC	
E683	60		RTS	

E632; Input from screen

E632	98		TYA	
E633	4B		PHA	
E634	8A		TXA	
E635	4B		PHA	
E636	A5	D0	LDA	\$D0
E638	F0	93	BEQ	\$E5CD
E63A	A4	D3	LDY	\$D3
E63C	B1	D1	LDA	(\$D1),Y
E63E	85	D7	STA	\$D7
E640	29	3F	AND	##3F
E642	06	D7	ASL	\$D7
E644	24	D7	BIT	\$D7
E646	10	02	BPL	\$E64A
E648	09	80	ORA	##80
E64A	90	04	BCC	\$E650
E64C	A6	D4	LDX	\$D4
E64E	D0	04	BNE	\$E654
E650	70	02	BVS	\$E654
E652	09	40	ORA	##40
E654	E6	D3	INC	\$D3
E656	20	84	JSR	\$E6B4
E659	C4	C8	CPY	\$C8
E65B	D0	17	BNE	\$E674
E65D	A9	00	LDA	##00
E65F	85	D0	STA	\$D0
E661	A9	0D	LDA	##0D
E663	A6	99	LDX	\$99
E665	E0	03	CPX	##03
E667	F0	06	BEQ	\$E66F
E669	A6	9A	LDX	\$9A
E66B	E0	03	CPX	##03
E66D	F0	03	BEQ	\$E672
E66F	20	16	JSR	\$E716
E672	A9	0D	LDA	##0D
E674	85	D7	STA	\$D7
E676	68		PLA	
E677	AA		TAX	
E678	68		PLA	
E679	AB		TAY	
E67A	A5	D7	LDA	\$D7
E67C	C9	DE	CMP	##DE

E684; Quote test

E684	C9	22	CMP	##22
E686	D0	0B	BNE	\$E690
E688	A5	D4	LDA	\$D4
E68A	49	01	EOR	##01
E68C	85	D4	STA	\$D4
E68E	A9	22	LDA	##22
E690	60		RTS	

E691; Setup screen print

E691	09	40	ORA	##40	
E693	A6	C7	LDX	\$C7	
E695	F0	02	BEQ	\$E699	
E697	09	80	ORA	##80	
E699	A6	D8	LDX	\$D8	
E69B	F0	02	BEQ	\$E69F	
E69D	C6	D8	DEC	\$D8	
E69F	AE	86	LDX	\$02B6	
E6A2	20	13	EA	JSR	\$EA13
E6A5	20	B6	E6	JSR	\$E6B6
E6A8	68		PLA		
E6A9	AB		TAY		
E6AA	A5	D8	LDA	\$D8	
E6AC	F0	02	BEQ	\$E6B0	
E6AE	46	D4	LSR	\$D4	
E6B0	68		PLA		
E6B1	AA		TAX		
E6B2	68		PLA		
E6B3	18		CLC		
E6B4	5B		CLI		
E6B5	60		RTS		

E6B6; Advance cursor

E6B6	20	B3	EB	JSR	\$E8B3
E6B9	E6	D3		INC	\$D3
E6BB	A5	D5		LDA	\$D5
E6BD	C5	D3		CMP	\$D3
E6BF	B0	3F		BCS	\$E700
E6C1	C9	4F		CMP	##4F
E6C3	F0	32		BEQ	\$E6F7
E6C5	AD	92	02	LDA	\$0292

E6C8 F0 03	BEQ \$E6CD	E716 48	PHA
E6CA 4C 67 E9	JMP \$E967	E717 85 D7	STA \$D7
E6CD A6 D6	LDX \$D6	E719 8A	TXA
E6CF E0 19	CPX ##19	E71A 48	PHA
E6D1 90 07	BCC \$E6DA	E71B 98	TYA
E6D3 20 EA E8	JSR \$E8EA	E71C 48	PHA
E6D6 C6 D6	DEC \$D6	E71D A9 00	LDA ##00
E6D8 A6 D6	LDX \$D6	E71F 85 D0	STA \$D0
E6DA 16 D9	ASL \$D9,X	E721 A4 D3	LDY \$D3
E6DC 56 D9	LSR \$D9,X	E723 A5 D7	LDA \$D7
E6DE E8	INX	E725 10 03	BPL \$E72A
E6DF B5 D9	LDA \$D9,X	E727 4C D4 E7	JMP \$E7D4
E6E1 09 80	ORA ##80	E72A C9 0D	CMP ##0D
E6E3 95 D9	STA \$D9,X	E72C D0 03	BNE \$E731
E6E5 CA	DEX	E72E 4C 91 E8	JMP \$E891
E6E6 A5 D5	LDA \$D5	E731 C9 20	CMP ##20
E6EB 18	CLC	E733 90 10	BCC \$E745
E6E9 69 28	ADC ##28	E735 C9 60	CMP ##60
E6EB 85 D5	STA \$D5	E737 90 04	BCC \$E73D
		E739 29 DF	AND ##DF
		E73B D0 02	BNE \$E73F
		E73D 29 3F	AND ##3F
		E73F 20 84 E6	JSR \$E684
		E742 4C 93 E6	JMP \$E693
		E745 A6 D8	LDX \$D8
		E747 F0 03	BEQ \$E74C
		E749 4C 97 E6	JMP \$E697
		E74C C9 14	CMP ##14
		E74E D0 2E	BNE \$E77E
		E750 98	TYA
		E751 D0 06	BNE \$E759
		E753 20 01 E7	JSR \$E701
		E756 4C 73 E7	JMP \$E773
		E759 20 A1 E8	JSR \$E8A1
		E75C 88	DEY
		E75D 84 D3	STY \$D3
		E75F 20 24 EA	JSR \$EA24
		E762 C8	INY
		E763 B1 D1	LDA (\$D1),Y
		E765 88	DEY
		E766 91 D1	STA (\$D1),Y
		E768 C8	INY
		E769 B1 F3	LDA (\$F3),Y
		E76B 88	DEY
		E76C 91 F3	STA (\$F3),Y
		E76E C8	INY
		E76F C4 D5	CPY \$D5
		E771 D0 EF	BNE \$E762
		E773 A9 20	LDA ##20
		E775 91 D1	STA (\$D1),Y
		E777 AD 86 02	LDA \$0286
		E77A 91 F3	STA (\$F3),Y

E6ED; Retreat cursor

E6ED B5 D9	LDA \$D9,X
E6EF 30 03	BMI \$E6F4
E6F1 CA	DEX
E6F2 D0 F9	BNE \$E6ED
E6F4 4C F0 E9	JMP \$E9F0
E6F7 C6 D6	DEC \$D6
E6F9 20 7C E8	JSR \$E87C
E6FC A9 00	LDA ##00
E6FE B5 D3	STA \$D3
E700 60	RTS

E701;Back into previous line

E701 A6 D6	LDX \$D6
E703 D0 06	BNE \$E70B
E705 86 D3	STX \$D3
E707 68	PLA
E708 68	PLA
E709 D0 9D	BNE \$E6A8
E70B CA	DEX
E70C 86 D6	STX \$D6
E70E 20 6C E5	JSR \$E56C
E711 A4 D5	LDY \$D5
E713 84 D3	STY \$D3
E715 60	RTS

E716; Output to screen

E77C 10 4D	BPL \$E7CB	E7EA A6 D4	LDX \$D4
E77E A6 D4	LDX \$D4	E7EC D0 3F	BNE \$E82D
E780 F0 03	BEQ \$E785	E7EE C9 14	CMP ##14
E782 4C 97 E6	JMP \$E697	E7F0 D0 37	BNE \$E829
E785 C9 12	CMP ##12	E7F2 A4 D5	LDY \$D5
E787 D0 02	BNE \$E78B	E7F4 B1 D1	LDA (\$D1), Y
E789 85 C7	STA \$C7	E7F6 C9 20	CMP ##20
E78B C9 13	CMP ##13	E7F8 D0 04	BNE \$E7FE
E78D D0 03	BNE \$E792	E7FA C4 D3	CPY \$D3
E78F 20 66 E5	JSR \$E566	E7FC D0 07	BNE \$E805
E792 C9 1D	CMP ##1D	E7FE C0 4F	CPY ##4F
E794 D0 17	BNE \$E7AD	E800 F0 24	BEQ \$E826
E796 C8	INY	E802 20 65 E9	JSR \$E965
E797 20 B3 E8	JSR \$E8B3	E805 A4 D5	LDY \$D5
E79A 84 D3	STY \$D3	E807 20 24 EA	JSR \$EA24
E79C 88	DEY	E80A 88	DEY
E79D C4 D5	CPY \$D5	E80B B1 D1	LDA (\$D1), Y
E79F 90 09	BCC \$E7AA	E80D C8	INY
E7A1 C6 D6	DEC \$D6	E80E 91 D1	STA (\$D1), Y
E7A3 20 7C E8	JSR \$E87C	E810 88	DEY
E7A6 A0 00	LDY ##00	E811 B1 F3	LDA (\$F3), Y
E7A8 84 D3	STY \$D3	E813 C8	INY
E7AA 4C A8 E6	JMP \$E6AB	E814 91 F3	STA (\$F3), Y
E7AD C9 11	CMP ##11	E816 88	DEY
E7AF D0 1D	BNE \$E7CE	E817 C4 D3	CPY \$D3
E7B1 18	CLC	E819 D0 EF	BNE \$E80A
E7B2 98	TYA	E81B A9 20	LDA ##20
E7B3 69 28	ADC ##28	E81D 91 D1	STA (\$D1), Y
E7B5 A8	TAY	E81F AD 86 02	LDA \$0286
E7B6 E6 D6	INC \$D6	E822 91 F3	STA (\$F3), Y
E7B8 C5 D5	CMP \$D5	E824 E6 D8	INC \$D8
E7BA 90 EC	BCC \$E7AB	E826 4C A8 E6	JMP \$E6AB
E7BC F0 EA	BEQ \$E7AB	E829 A6 D8	LDX \$D8
E7BE C6 D6	DEC \$D6	E82B F0 05	BEQ \$E832
E7C0 E9 28	SBC ##28	E82D 09 40	ORA ##40
E7C2 90 04	BCC \$E7C8	E82F 4C 97 E6	JMP \$E697
E7C4 85 D3	STA \$D3	E832 C9 11	CMP ##11
E7C6 D0 F8	BNE \$E7C0	E834 D0 16	BNE \$E84C
E7C8 20 7C E8	JSR \$E87C	E836 A6 D6	LDX \$D6
E7CB 4C A8 E6	JMP \$E6AB	E838 F0 37	BEQ \$E871
E7CE 20 CB E8	JSR \$E8CB	E83A C6 D6	DEC \$D6
E7D1 4C 44 EC	JMP \$EC44	E83C A5 D3	LDA \$D3
E7D4 29 7F	AND ##7F	E83E 38	SEC
E7D6 C9 7F	CMP ##7F	E83F E9 28	SBC ##28
E7D8 D0 02	BNE \$E7DC	E841 90 04	BCC \$E847
E7DA A9 5E	LDA ##5E	E843 85 D3	STA \$D3
E7DC C9 20	CMP ##20	E845 10 2A	BPL \$E871
E7DE 90 03	BCC \$E7E3	E847 20 6C E5	JSR \$E56C
E7E0 4C 91 E6	JMP \$E691	E84A D0 25	BNE \$E871
E7E3 C9 0D	CMP ##0D	E84C C9 12	CMP ##12
E7E5 D0 03	BNE \$E7EA	E84E D0 04	BNE \$E854
E7E7 4C 91 E8	JMP \$E891	E850 A9 00	LDA ##00

E852	85	C7	STA	\$C7
E854	C9	1D	CMP	##1D
E856	D0	12	BNE	\$E86A
E858	98		TYA	
E859	F0	09	BEQ	\$E864
E85B	20	A1 E8	JSR	\$E8A1
E85E	88		DEY	
E85F	84	D3	STY	\$D3
E861	4C	A8 E6	JMP	\$E6A8
E864	20	01 E7	JSR	\$E701
E867	4C	A8 E6	JMP	\$E6A8
E86A	C9	13	CMP	##13
E86C	D0	06	BNE	\$E874
E86E	20	44 E5	JSR	\$E544
E871	4C	A8 E6	JMP	\$E6A8
E874	09	80	ORA	##80
E876	20	CB E8	JSR	\$E8CB
E879	4C	4F EC	JMP	\$EC4F

E87C; Go to next line

E87C	46	C9	LSR	\$C9
E87E	A6	D6	LDX	\$D6
E880	E8		INX	
E881	E0	19	CPX	##19
E883	D0	03	BNE	\$E888
E885	20	EA E8	JSR	\$E8EA
E888	B5	D9	LDA	\$D9,X
E88A	10	F4	BPL	\$E880
E88C	86	D6	STX	\$D6
E88E	4C	6C E5	JMP	\$E56C

E891; Perform <return>

E891	A2	00	LDX	##00
E893	86	D8	STX	\$D8
E895	86	C7	STX	\$C7
E897	86	D4	STX	\$D4
E899	86	D3	STX	\$D3
E89B	20	7C E8	JSR	\$E87C
E89E	4C	AB E6	JMP	\$E6A8

E8A1; Check line decrement

E8A1	A2	02	LDX	##02
E8A3	A9	00	LDA	##00
E8A5	C5	D3	CMP	\$D3
E8A7	F0	07	BEQ	\$E8B0
E8A9	18		CLC	

E8AA	69	28	ADC	##28
E8AC	CA		DEX	
E8AD	D0	F6	BNE	\$E8A5
E8AF	60		RTS	
E8B0	C6	D6	DEC	\$D6
E8B2	60		RTS	

E8B3; Check line increment

E8B3	A2	02	LDX	##02
E8B5	A9	27	LDA	##27
E8B7	C5	D3	CMP	\$D3
E8B9	F0	07	BEQ	\$E8C2
E8BB	18		CLC	
E8BC	69	28	ADC	##28
E8BE	CA		DEX	
E8BF	D0	F6	BNE	\$E8B7
E8C1	60		RTS	
E8C2	A6	D6	LDX	\$D6
E8C4	E0	19	CPX	##19
E8C6	F0	02	BEQ	\$E8CA
E8C8	E6	D6	INC	\$D6
E8CA	60		RTS	

E8CB; Set colour code

E8CB	A2	0F	LDX	##0F
E8CD	DD	DA E8	CMP	\$E8DA,X
E8D0	F0	04	BEQ	\$E8D6
E8D2	CA		DEX	
E8D3	10	F8	BPL	\$E8CD
E8D5	60		RTS	
E8D6	8E	86 02	STX	\$0286
E8D9	60		RTS	

E8DA; Colour code table

E8DA	90	05	BCC	\$E8E1
E8DC	1C		???	
E8DD	9F		???	
E8DE	9C		???	
E8DF	1E	1F 9E	ASL	\$9E1F,X
E8E2	81	95	STA	(\$95,X)
E8E4	96	97	STX	\$97,Y
E8E6	98		TYA	
E8E7	99	9A 9B	STA	\$9B9A,Y

E8EA; Scroll screen

E8EA A5 AC	LDA \$AC	E951 88	DEX
E8EC 48	PHA	E952 D0 F9	BNE \$E94D
E8ED A5 AD	LDA \$AD	E954 84 C6	STY \$C6
E8EF 48	PHA	E956 A6 D6	LDX \$D6
E8F0 A5 AE	LDA \$AE	E958 68	PLA
E8F2 48	PHA	E959 85 AF	STA \$AF
E8F3 A5 AF	LDA \$AF	E95B 68	PLA
E8F5 48	PHA	E95C 85 AE	STA \$AE
E8F6 A2 FF	LDX #\$FF	E95E 68	PLA
E8F8 C6 D6	DEC \$D6	E95F 85 AD	STA \$AD
E8FA C6 C9	DEC \$C9	E961 68	PLA
E8FC CE A5 02	DEC \$02A5	E962 85 AC	STA \$AC
E8FF E8	INX	E964 60	RTS
E900 20 F0 E9	JSR \$E9F0		
E903 E0 18	CPX #\$18		
E905 B0 0C	BCS \$E913		
E907 BD F1 EC	LDA \$ECF1,X	E965; Open space on screen	
E90A 85 AC	STA \$AC	E965 A6 D6	LDX \$D6
E90C B5 DA	LDA \$DA,X	E967 E8	INX
E90E 20 C8 E9	JSR \$E9C8	E968 B5 D9	LDA \$D9,X
E911 30 EC	BMI \$E8FF	E96A 10 FB	BPL \$E967
E913 20 FF E9	JSR \$E9FF	E96C 8E A5 02	STX \$02A5
E916 A2 00	LDX #\$00	E96F E0 18	CPX #\$18
E918 B5 D9	LDA \$D9,X	E971 F0 0E	BEQ \$E981
E91A 29 7F	AND #\$7F	E973 90 0C	BCC \$E981
E91C B4 DA	LDY \$DA,X	E975 20 EA E8	JSR \$E8EA
E91E 10 02	BPL \$E922	E978 AE A5 02	LDX \$02A5
E920 09 80	ORA #\$80	E97B CA	DEX
E922 95 D9	STA \$D9,X	E97C C6 D6	DEC \$D6
E924 E8	INX	E97E 4C DA E6	JMP \$E6DA
E925 E0 18	CPX #\$18	E981 A5 AC	LDA \$AC
E927 D0 EF	BNE \$E918	E983 48	PHA
E929 A5 F1	LDA \$F1	E984 A5 AD	LDA \$AD
E92B 09 80	ORA #\$80	E986 48	PHA
E92D 85 F1	STA \$F1	E987 A5 AE	LDA \$AE
E92F A5 D9	LDA \$D9	E989 48	PHA
E931 10 C3	BPL \$E8F6	E98A A5 AF	LDA \$AF
E933 E6 D6	INC \$D6	E98C 48	PHA
E935 EE A5 02	INC \$02A5	E98D A2 19	LDX #\$19
E938 A9 7F	LDA #\$7F	E98F CA	DEX
E93A 8D 00 DC	STA \$DC00	E990 20 F0 E9	JSR \$E9F0
E93D AD 01 DC	LDA \$DC01	E993 EC A5 02	CPX \$02A5
E940 C9 FB	CMP #\$FB	E996 90 0E	BCC \$E9A6
E942 08	PHP	E998 F0 0C	BEQ \$E9A6
E943 A9 7F	LDA #\$7F	E99A BD EF EC	LDA \$ECEB,X
E945 8D 00 DC	STA \$DC00	E99D 85 AC	STA \$AC
E948 28	PLP	E99F B5 D8	LDA \$D8,X
E949 D0 0B	BNE \$E956	E9A1 20 C8 E9	JSR \$E9C8
E94B A0 00	LDY #\$00	E9A4 30 E9	BMI \$E98F
E94D EA	NOP	E9A6 20 FF E9	JSR \$E9FF
E94E CA	DEX	E9A9 A2 17	LDX #\$17
E94F D0 FC	BNE \$E94D	E9AB EC A5 02	CPX \$02A5

E9AE 90 0F	BCC \$E9BF	E9FE 60	RTS
E9B0 85 DA	LDA \$DA,X	E9FF A0 27	LDY #\$27
E9B2 29 7F	AND #\$7F	EA01 20 F0 E9	JSR \$E9F0
E9B4 B4 D9	LDY \$D9,X	EA04 20 24 EA	JSR \$EA24
E9B6 10 02	BPL \$E9BA	EA07 A9 20	LDA #\$20
E9B8 09 80	ORA #\$80	EA09 91 D1	STA (\$D1),Y
E9BA 95 DA	STA \$DA,X	EA0B 20 DA E4	JSR \$E4DA
E9BC CA	DEX	EA0E EA	NOP
E9BD D0 EC	BNE \$E9AB	EA0F 88	DEY
E9BF AE A5 02	LDX \$02A5	EA10 10 F5	BPL \$EA07
E9C2 20 DA E6	JSR \$E6DA	EA12 60	RTS
E9C5 4C 58 E9	JMP \$E958	EA13 A8	TAY
E9C8; Move a screen line			
E9C8 29 03	AND #\$03	EA14 A9 02	LDA #\$02
E9CA 0D 88 02	ORA \$0288	EA16 85 CD	STA \$CD
E9CD 85 AD	STA \$AD	EA18 20 24 EA	JSR \$EA24
E9CF 20 E0 E9	JSR \$E9E0	EA1B 98	TYA
E9D2 A0 27	LDY #\$27	EA1C A4 D3	LDY \$D3
E9D4 B1 AC	LDA (\$AC),Y	EA1E 91 D1	STA (\$D1),Y
E9D6 91 D1	STA (\$D1),Y	EA20 8A	TXA
E9D8 B1 AE	LDA (\$AE),Y	EA21 91 F3	STA (\$F3),Y
E9DA 91 F3	STA (\$F3),Y	EA23 60	RTS
E9DC 88	DEY	EA24 A5 D1	LDA \$D1
E9DD 10 F5	BPL \$E9D4	EA26 85 F3	STA \$F3
E9DF 60	RTS	EA28 A5 D2	LDA \$D2
E9E0; Synchronize colour transfer			
E9E0 20 24 EA	JSR \$EA24	EA2A 29 03	AND #\$03
E9E3 A5 AC	LDA \$AC	EA2C 09 D8	ORA #\$D8
E9E5 85 AE	STA \$AE	EA2E 85 F4	STA \$F4
E9E7 A5 AD	LDA \$AD	EA30 60	RTS
E9E9 29 03	AND #\$03	EA31 20 EA FF	JSR \$FFEA
E9EB 09 D8	ORA #\$D8	EA34 A5 CC	LDA \$CC
E9ED 85 AF	STA \$AF	EA36 D0 29	BNE \$EA61
E9EF 60	RTS	EA38 C6 CD	DEC \$CD
E9F0; Interrupt - clock etc.			
E9F0 8D F0 EC	LDA \$ECF0,X	EA3A D0 25	BNE \$EA61
E9F3 85 D1	STA \$D1	EA3C A9 14	LDA #\$14
E9F5 85 D9	LDA \$D9,X	EA3E 85 CD	STA \$CD
E9F7 29 03	AND #\$03	EA40 A4 D3	LDY \$D3
E9F9 0D 88 02	ORA \$0288	EA42 46 CF	LSR \$CF
E9FC 85 D2	STA \$D2	EA44 AE 87 02	LDX \$0287
		EA47 B1 D1	LDA (\$D1),Y
		EA49 B0 11	BCS \$EA5C
		EA4B E6 CF	INC \$CF
		EA4D 85 CE	STA \$CE
		EA4F 20 24 EA	JSR \$EA24
		EA52 B1 F3	LDA (\$F3),Y
		EA54 8D 87 02	STA \$0287
		EA57 AE 86 02	LDX \$0286
		EA5A A5 CE	LDA \$CE
		EA5C 49 80	EOR #\$80
		EA5E 20 1C EA	JSR \$EA1C
		EA61 A5 01	LDA \$01
		EA63 29 10	AND #\$10
		EA65 F0 0A	BEQ \$EA71

EA67 A0 00	LDY ##00	EAC7 10 02	BPL \$EACB
EA69 84 C0	STY \$C0	EAC9 84 CB	STY \$CB
EA6B A5 01	LDA \$01	EACB 68	PLA
EA6D 09 20	ORA ##20	EACC C8	INY
EA6F D0 0B	BNE \$EA79	EACD C0 41	CPY ##41
EA71 A5 C0	LDA \$C0	EACF B0 0B	BCS \$EADC
EA73 D0 06	BNE \$EA7B	EAD1 CA	DEX
EA75 A5 01	LDA \$01	EAD2 D0 DF	BNE \$EAB3
EA77 29 1F	AND ##1F	EAD4 38	SEC
EA79 85 01	STA \$01	EAD5 68	PLA
EA7B 20 87 EA	JSR \$EAB7	EAD6 2A	RDL
EA7E AD 0D DC	LDA \$DC0D	EAD7 8D 00 DC	STA \$DC00
EA81 68	PLA	EADA D0 CC	BNE \$EAA8
EA82 A8	TAY	EADC 68	PLA
EA83 68	PLA	EADD 6C 8F 02	JMP (\$028F)
EA84 AA	TAX	EAE0 A4 CB	LDY \$CB
EA85 68	PLA	EAE2 B1 F5	LDA (\$F5),Y
EA86 40	RTI	EAE4 AA	TAX
		EAE5 C4 C5	CPY \$C5
		EAE7 F0 07	BEQ \$EAF0
		EAE9 A0 10	LDY ##10
		EAEB 8C 8C 02	STY \$028C
		EAEF D0 36	BNE \$EB26
		EAF0 29 7F	AND ##7F
		EAF2 2C 8A 02	BIT \$028A
		EAF5 30 16	BMI \$EB0D
		EAF7 70 49	BVS \$EB42
		EAF9 C9 7F	CMP ##7F
		EAFB F0 29	BEQ \$EB26
		EAFD C9 14	CMP ##14
		EAF7 F0 0C	BEQ \$EB0D
		EB01 C9 20	CMP ##20
		EB03 F0 0B	BEQ \$EB0D
		EB05 C9 1D	CMP ##1D
		EB07 F0 04	BEQ \$EB0D
		EB09 C9 11	CMP ##11
		EB0B D0 35	BNE \$EB42
		EB0D AC 8C 02	LDY \$028C
		EB10 F0 05	BEQ \$EB17
		EB12 CE 8C 02	DEC \$028C
		EB15 D0 2B	BNE \$EB42
		EB17 CE 8B 02	DEC \$028B
		EB1A D0 26	BNE \$EB42
		EB1C A0 04	LDY ##04
		EB1E 8C 8B 02	STY \$028B
		EB21 A4 C6	LDY \$C6
		EB23 88	DEY
		EB24 10 1C	BPL \$EB42
		EB26 A4 CB	LDY \$CB
		EB28 84 C5	STY \$C5
		EB2A AC 8D 02	LDY \$028D
		EB2D 8C 8E 02	STY \$028E

EA87; Read keyboard

EA87 A9 00	LDA ##00
EA89 BD 8D 02	STA \$028D
EA8C A0 40	LDY ##40
EA8E 84 CB	STY \$CB
EA90 BD 00 DC	STA \$DC00
EA93 AE 01 DC	LDX \$DC01
EA96 E0 FF	CPX ##FF
EA98 F0 61	BEQ \$EAFB
EA9A A8	TAY
EA9B A9 81	LDA ##81
EA9D 85 F5	STA \$F5
EA9F A9 EB	LDA \$SEB
EAA1 85 F6	STA \$F6
EAA3 A9 FE	LDA \$FE
EAA5 8D 00 DC	STA \$DC00
EAA8 A2 0B	LDX ##0B
EAAB 48	PHA
EABD AD 01 DC	LDA \$DC01
EABE CD 01 DC	CMP \$DC01
EAB1 D0 F8	BNE \$EAB8
EAB3 4A	LSR
EAB4 B0 16	BCS \$EACC
EAB6 4B	PHA
EAB7 B1 F5	LDA (\$F5),Y
EAB9 C9 05	CMP ##05
EABB B0 0C	BCS \$EAC9
EABD C9 03	CMP ##03
EABF F0 0B	BEQ \$EAC9
EAC1 0D BD 02	ORA \$028D
EAC4 8D 8D 02	STA \$028D

EB30 E0 FF	CPX #\$FF	EB8B 41 34	EOR (\$34,X)
EB32 F0 0E	BEQ \$EB42	EB8D 5A	???
EB34 8A	TXA	EB8E 53	???
EB35 A6 C6	LDX \$C6	EB8F 45 01	EOR \$01
EB37 EC 89 02	CPX \$02B9	EB91 35 52	AND \$52,X
EB3A B0 06	BCS \$EB42	EB93 44	???
EB3C 9D 77 02	STA \$0277,X	EB94 36 43	ROL \$43,X
EB3F E8	INX	EB96 46 54	LSR \$54
EB40 86 C6	STX \$C6	EB98 58	CLI
EB42 A9 7F	LDA #\$7F	EB99 37	???
EB44 8D 00 DC	STA \$DC00	EB9A 59 47 3B	EOR \$3B47,Y
EB47 60	RTS	EB9D 42	???
EB48 AD 8D 02	LDA \$028D	EB9E 48	PHA
EB4B C9 03	CMP #\$03	EB9F 55 56	EOR \$56,X
EB4D D0 15	BNE \$EB64	EBA1 39 49 4A	AND \$4A49,Y
EB4F CD 8E 02	CMP \$028E	EBA4 30 4D	BMI \$EBF3
EB52 F0 EE	BEQ \$EB42	EBA6 4B	???
EB54 AD 91 02	LDA \$0291	EBA7 4F	???
EB57 30 1D	BMI \$EB76	EBA8 4E 2B 50	LSR \$502B
EB59 AD 18 D0	LDA \$D018	EBA9 4C 2D 2E	JMP \$2E2D
EB5C 49 02	EOR #\$02	EBAE 3A	???
EB5E 8D 18 D0	STA \$D018	EBAF 40	RTI
EB61 4C 76 EB	JMP \$EB76	EBB0 2C 5C 2A	BIT \$2A5C
EB64 0A	ASL	EBB3 3B	???
EB65 C9 08	CMP #\$08	EBB4 13	???
EB67 90 02	BCC \$EB6B	EBB5 01 3D	ORA (\$3D,X)
EB69 A9 06	LDA #\$06	EBB7 5E 2F 31	LSR \$312F,X
EB6B AA	TAX	EBBA 5F	???
EB6C BD 79 EB	LDA \$EB79,X	EBBB 04	???
EB6F 85 F5	STA \$F5	EBBC 32	???
EB71 BD 7A EB	LDA \$EB7A,X	EBBD 20 02 51	JSR \$5102
EB74 85 F6	STA \$F6	EBC0 03	???
EB76 4C E0 EA	JMP \$EAE0	EBC1 FF	???

EB79; Keyboard select vectors

EB79 81 EB	STA (\$EB,X)
EB7B C2	???
EB7C EB	???
EB7D 03	???
EB7E EC 78 EC	CPX \$EC78

EB81; Keyboard 1 - unshifted

EB81 14	???
EB82 0D 1D 88	ORA \$881D
EB85 85 86	STA \$86
EB87 87	???
EB88 11 33	ORA (\$33),Y
EB8A 57	???

EBC2; Keyboard 2 - shifted

EBC2 94 8D	STY \$8D,X
EBC4 9D 8C 89	STA \$898C,X
EBC7 8A	TXA
EBC8 8B	???
EBC9 91 23	STA (\$23),Y
EBCB D7	???
EBCD C1 24	CMP (\$24,X)
EBCF DA	???
EBCF D3	???
EBD0 C5 01	CMP \$01
EBD2 25 D2	AND \$D2
EBD4 C4 26	CPY \$26
EBD6 C3	???
EBD7 C6 D4	DEC \$D4
EBD9 D8	CLD

EBDA	27	???
EBDB	D9 C7 2B	CMP \$28C7,Y
EBDE	C2	???
EBDF	C8	INY
EBE0	D5 D6	CMP \$D6,X
EBE2	29 C9	AND #\$C9
EBE4	CA	DEX
EBE5	30 CD	BMI \$EBB4
EBE7	CB	???
EBE8	CF	???
EBE9	CE DB D0	DEC \$D0DB
EBEC	CC DD 3E	CPY \$3EDD
EBEF	5B	???
EBF0	BA	TSX
EBF1	3C	???
EBF2	A9 C0	LDA #\$C0
EBF4	5D 93 01	EOR \$0193,X
EBF7	3D DE 3F	AND \$3FDE,X
EBFA	21 5F	AND (\$5F,X)
EBFC	04	???
EBFD	22	???
EBFE	A0 02	LDY #\$02
EC00	D1 B3	CMP (\$B3),Y
EC02	FF	???

EC2F	3E 5B A4	ROL \$A45B,X
EC32	3C	???
EC33	AB	TAY
EC34	DF	???
EC35	5D 93 01	EOR \$0193,X
EC38	3D DE 3F	AND \$3FDE,X
EC3B	B1 5F	STA (\$5F,X)
EC3D	04	???
EC3E	95 A0	STA \$A0,X
EC40	02	???
EC41	AB	???
EC42	B3	???
EC43	FF	???

EC44; Graphics/text control

EC44	C9 0E	CMP #\$0E
EC46	D0 07	BNE \$EC4F
EC4B	AD 18 D0	LDA \$D018
EC4B	09 02	ORA #\$02
EC4D	D0 09	BNE \$EC5B

EC4F; Set graphics/text mode

EC4F	C9 8E	CMP #\$8E
EC51	D0 0B	BNE \$EC5E
EC53	AD 18 D0	LDA \$D018
EC56	29 FD	AND #\$FD
EC5B	BD 18 D0	STA \$D018
EC5B	4C AB E6	JMP \$E6AB
EC5E	C9 0B	CMP #\$0B
EC60	D0 07	BNE \$EC69
EC62	A9 80	LDA #\$80
EC64	0D 91 02	ORA \$0291
EC67	30 09	BMI \$EC72
EC69	C9 09	CMP #\$09
EC6B	D0 EE	BNE \$EC5B
EC6D	A9 7F	LDA #\$7F
EC6F	2D 91 02	AND \$0291
EC72	BD 91 02	STA \$0291
EC75	4C AB E6	JMP \$E6AB

EC03; Keyboard 3 - 'comm'

EC03	94 8D	STY \$8D,X
EC05	9D 8C 89	STA \$B98C,X
EC08	8A	TXA
EC09	8B	???
EC0A	91 96	STA (\$96),Y
EC0C	B3	???
EC0D	B0 97	BCS \$EBA6
EC0F	AD AE B1	LDA \$B1AE
EC12	01 9B	ORA (\$9B,X)
EC14	B2	???
EC15	AC 99 BC	LDY \$BC99
EC18	BB	???
EC19	A3	???
EC1A	BD 9A B7	LDA \$B79A,X
EC1D	A5 9B	LDA \$9B
EC1F	BF	???
EC20	B4 8B	LDY \$8B,X
EC22	BE 29 A2	LDX \$A229,Y
EC25	B5 30	LDA \$30,X
EC27	A7	???
EC28	A1 B9	LDA (\$B9,X)
EC2A	AA	TAX
EC2B	A6 AF	LDX \$AF
EC2D	B6 DC	LDX \$DC,Y

EC7B; Keyboard 4

EC7B	FF	???
EC79	FF	???
EC7A	FF	???
EC7B	FF	???
EC7C	FF	???

EC7D	FF	???	ECC0	00	BRK
EC7E	FF	???	ECC1	00	BRK
EC7F	FF	???	ECC2	00	BRK
EC80	1C	???	ECC3	00	BRK
EC81	17	???	ECC4	00	BRK
EC82	01 9F	ORA (\$9F,X)	ECC5	00	BRK
EC84	1A	???	ECC6	00	BRK
EC85	13	???	ECC7	00	BRK
EC86	05 FF	ORA \$FF	ECC8	00	BRK
EC88	9C	???	ECC9	00	BRK
EC89	12	???	ECCA	9B	???
EC8A	04	???	ECCB	37	???
EC8B	1E 03 06	ASL \$0603,X	ECCC	00	BRK
EC8E	14	???	ECCD	00	BRK
EC8F	18	CLC	ECCE	00	BRK
EC90	1F	???	ECCF	08	PHP
EC91	19 07 9E	ORA \$9E07,Y	ECD0	00	BRK
EC94	02	???	ECD1	14	???
EC95	08	PHP	ECD2	0F	???
EC96	15 16	ORA \$16,X	ECD3	00	BRK
EC98	12	???	ECD4	00	BRK
EC99	09 0A	ORA #\$0A	ECD5	00	BRK
EC9B	92	???	ECD6	00	BRK
EC9C	0D 0B 0F	ORA \$0F0B	ECD7	00	BRK
EC9F	0E FF 10	ASL \$10FF	ECD8	00	BRK
ECA2	0C	???	ECD9	0E 06 01	ASL \$0106
ECA3	FF	???	ECDC	02	???
ECA4	FF	???	ECDD	03	???
ECA5	1B	???	ECDE	04	???
ECA6	00	BRK	ECDF	00	BRK
ECA7	FF	???	ECE0	01 02	ORA (\$02,X)
ECA8	1C	???	ECE2	03	???
ECA9	FF	???	ECE3	04	???
ECAA	1D FF FF	ORA \$FFFF,X	ECE4	05 06	ORA \$06
ECAD	1F	???	ECE6	07	???
ECAE	1E FF 90	ASL \$90FF,X			
ECB1	06 FF	ASL \$FF			
ECB3	05 FF	ORA \$FF			
ECB5	FF	???			
ECB6	11 FF	ORA (\$FF),Y			
ECB8	FF	???			

ECB9; Video chip setup

ECB9	00	BRK
ECBA	00	BRK
ECBB	00	BRK
ECBC	00	BRK
ECBD	00	BRK
ECBE	00	BRK
ECBF	00	BRK

ECE7; Shift/run equivalent

ECE7	4C 4F 41	JMP \$414F
ECEA	44	???
ECEB	0D 52 55	ORA \$5552
ECEE	4E 0D 00	LSR \$000D
ECF1	28	PLP
ECF2	50 78	BVC \$ED6C
ECF4	A0 C8	LDY #\$C8
ECF6	F0 18	BEQ \$ED10
ECF8	40	RTI

ECF9; Screen in address low

ECF9 68 PLA
 ECFA 90 B8 BCC \$ECB4
 ECFC E0 08 CPX #\$08
 ECFE 30 58 BMI \$ED58
 ED00 80 ???
 ED01 A8 TAY
 ED02 D0 F8 BNE \$ECFC
 ED04 20 48 70 JSR \$7048
 ED07 98 TYA
 ED08 C0 09 CPY #\$09
 ED0A 40 RTI

ED0B; Send 'talk'

ED0B 2C 09 20 BIT \$2009
 ED0E 20 A4 F0 JSR \$F0A4

ED11; Send 'listen'

ED11 48 PHA
 ED12 24 94 BIT \$94
 ED14 10 0A BPL \$ED20
 ED16 38 SEC
 ED17 66 A3 ROR \$A3
 ED19 20 40 ED JSR \$ED40
 ED1C 46 94 LSR \$94
 ED1E 46 A3 LSR \$A3
 ED20 68 PLA
 ED21 85 95 STA \$95
 ED23 78 SEI
 ED24 20 97 EE JSR \$EE97
 ED27 C9 3F CMP #\$3F
 ED29 D0 03 BNE \$ED2E
 ED2B 20 85 EE JSR \$EEB5
 ED2E AD 00 DD LDA \$DD00
 ED31 09 08 ORA #\$08
 ED33 8D 00 DD STA \$DD00
 ED36 78 SEI
 ED37 20 8E EE JSR \$EE8E
 ED3A 20 97 EE JSR \$EE97
 ED3D 20 B3 EE JSR \$EEB3

ED40; Send to serial bus

ED40 78 SEI
 ED41 20 97 EE JSR \$EE97
 ED44 20 A9 EE JSR \$EEA9
 ED47 B0 64 BCS \$EDAD
 ED49 20 85 EE JSR \$EE85

ED4C 24 A3 BIT \$A3
 ED4E 10 0A BPL \$ED5A
 ED50 20 A9 EE JSR \$EEA9
 ED53 90 FB BCC \$ED50
 ED55 20 A9 EE JSR \$EEA9
 ED58 B0 FB BCS \$ED55
 ED5A 20 A9 EE JSR \$EEA9
 ED5D 90 FB BCC \$ED5A
 ED5F 20 BE EE JSR \$EEBE
 ED62 A9 08 LDA #\$08
 ED64 85 A5 STA \$A5
 ED66 AD 00 DD LDA \$DD00
 ED69 CD 00 DD CMP \$DD00
 ED6C D0 FB BNE \$ED66
 ED6E 0A ASL
 ED6F 90 3F BCC \$EDB0
 ED71 66 95 ROR \$95
 ED73 B0 05 BCS \$ED7A
 ED75 20 A0 EE JSR \$EEA0
 ED78 D0 03 BNE \$ED7D
 ED7A 20 97 EE JSR \$EE97
 ED7D 20 85 EE JSR \$EE85
 ED80 EA NOP
 ED81 EA NOP
 ED82 EA NOP
 ED83 EA NOP
 ED84 AD 00 DD LDA \$DD00
 ED87 29 DF AND #\$DF
 ED89 09 10 ORA #\$10
 ED8B 8D 00 DD STA \$DD00
 ED8E C6 A5 DEC \$A5
 ED90 D0 D4 BNE \$ED66
 ED92 A9 04 LDA #\$04
 ED94 8D 07 DC STA \$DC07
 ED97 A9 19 LDA #\$19
 ED99 8D 0F DC STA \$DC0F
 ED9C AD 0D DC LDA \$DC0D
 ED9F AD 0D DC LDA \$DC0D
 EDA2 29 02 AND #\$02
 EDA4 D0 0A BNE \$EDB0
 EDA6 20 A9 EE JSR \$EEA9
 EDA9 B0 F4 BCS \$ED9F
 EDAB 58 CLI
 EDAC 60 RTS
 EDAD A9 80 LDA #\$80
 EDAF 2C A9 03 BIT \$03A9

EDB2; Serial timeout

EDB2 20 1C FE JSR \$FE1C
 EDB5 58 CLI

```
EDB6 18          CLC
EDB7 90 4A       BCC $EE03
```

EDB9; Send listen SA

```
EDB9 85 95       STA $95
EDBB 20 36 ED     JSR $ED36
```

EDBE; Clear ATN

```
EDBE AD 00 DD     LDA $DD00
EDC1 29 F7        AND #$F7
EDC3 8D 00 DD     STA $DD00
EDC6 60           RTS
```

EDC7; Send talk SA

```
EDC7 85 95       STA $95
EDC9 20 36 ED     JSR $ED36
```

EDCC; Wait for clock

```
EDCC 78          SEI
EDCD 20 A0 EE     JSR $EEA0
EDD0 20 BE ED     JSR $EDBE
EDD3 20 85 EE     JSR $EE85
EDD6 20 A9 EE     JSR $EEA9
EDD9 30 FB        BMI $EDD6
EDDB 58          CLI
EDDC 60          RTS
```

EDDD; Send serial deferred

```
EDDD 24 94        BIT $94
EDDF 30 05        BMI $EDE6
EDE1 38          SEC
EDE2 66 94        ROR $94
EDE4 D0 05        BNE $EDEB
EDE6 48          PHA
EDE7 20 40 ED     JSR $ED40
EDEA 68          PLA
EDEB 85 95        STA $95
EDED 18          CLC
EDEE 60          RTS
```

EDEF; Send 'untalk'

```
EDEF 78          SEI
EDF0 20 BE EE     JSR $EE8E
EDF3 AD 00 DD     LDA $DD00
EDF6 09 08        ORA #$08
EDF8 BD 00 DD     STA $DD00
EDFB A9 5F        LDA #$5F
EDFD 2C A9 3F     BIT $3FA9
EE00 20 11 ED     JSR $ED11
```

EE03; Send 'unlisten'

```
EE03 20 BE ED     JSR $EDBE
EE06 BA          TXA
EE07 A2 0A        LDX #$0A
EE09 CA          DEX
EE0A D0 FD        BNE $EE09
EE0C AA          TAX
EE0D 20 85 EE     JSR $EE85
EE10 4C 97 EE     JMP $EE97
```

EE13; Receive from serial bus

```
EE13 78          SEI
EE14 A9 00        LDA #$00
EE16 85 A5        STA $A5
EE18 20 85 EE     JSR $EE85
EE1B 20 A9 EE     JSR $EEA9
EE1E 10 FB        BPL $EE1B
EE20 A9 01        LDA #$01
EE22 BD 07 DC     STA $DC07
EE25 A9 19        LDA #$19
EE27 BD 0F DC     STA $DC0F
EE2A 20 97 EE     JSR $EE97
EE2D AD 0D DC     LDA $DC0D
EE30 AD 0D DC     LDA $DC0D
EE33 29 02        AND #$02
EE35 D0 07        BNE $EE3E
EE37 20 A9 EE     JSR $EEA9
EE3A 30 F4        BMI $EE30
EE3C 10 18        BPL $EE56
EE3E A5 A5        LDA $A5
EE40 F0 05        BEQ $EE47
EE42 A9 02        LDA #$02
EE44 4C B2 ED     JMP $EDB2
EE47 20 A0 EE     JSR $EEA0
EE4A 20 85 EE     JSR $EE85
EE4D A9 40        LDA #$40
EE4F 20 1C FE     JSR $FE1C
EE52 E6 A5        INC $A5
EE54 D0 CA        BNE $EE20
```

```

EE56 A9 08      LDA #$08
EE58 85 A5      STA $A5
EE5A AD 00 DD    LDA $DD00
EE5D CD 00 DD    CMP $DD00
EE60 D0 F8      BNE $EE5A
EE62 0A         ASL
EE63 10 F5      BPL $EE5A
EE65 66 A4      ROR $A4
EE67 AD 00 DD    LDA $DD00
EE6A CD 00 DD    CMP $DD00
EE6D D0 F8      BNE $EE67
EE6F 0A         ASL
EE70 30 F5      BMI $EE67
EE72 C6 A5      DEC $A5
EE74 D0 E4      BNE $EE5A
EE76 20 A0 EE    JSR $EEA0
EE79 24 90      BIT $90
EE7B 50 03      BVC $EE80
EE7D 20 06 EE    JSR $EE06
EE80 A5 A4      LDA $A4
EE82 58         CLI
EE83 18         CLC
EE84 60         RTS

```

EE85; Serial clock on

```

EE85 AD 00 DD    LDA $DD00
EE88 29 EF      AND #$EF
EE8A 8D 00 DD    STA $DD00
EE8D 60         RTS

```

EE8E; Serial clock off

```

EE8E AD 00 DD    LDA $DD00
EE91 09 10      ORA #$10
EE93 8D 00 DD    STA $DD00
EE96 60         RTS

```

EE97; Serial output '1'

```

EE97 AD 00 DD    LDA $DD00
EE9A 29 DF      AND #$DF
EE9C 8D 00 DD    STA $DD00
EE9F 60         RTS

```

EEA0; Serial output '0'

```

EEA0 AD 00 DD    LDA $DD00

```

```

EEA3 09 20      ORA #$20
EEA5 8D 00 DD    STA $DD00
EEA8 60         RTS

```

EEA9; Get serial in & clock

```

EEA9 AD 00 DD    LDA $DD00
EEAC CD 00 DD    CMP $DD00
EEAF D0 F8      BNE $EEA9
EEB1 0A         ASL
EEB2 60         RTS

```

EEB3; Delay 1 ms.

```

EEB3 8A         TXA
EEB4 A2 B8      LDX #$B8
EEB6 CA         DEX
EEB7 D0 FD      BNE $EEB6
EEB9 AA         TAX
EEBA 60         RTS

```

EEBB; RS-232 send

```

EEBB A5 B4      LDA $B4
EEBD F0 47      BEQ $EF06
EEBF 30 3F      BMI $EF00
EEC1 46 B6      LSR $B6
EEC3 A2 00      LDX #$00
EEC5 90 01      BCC $EEC8
EEC7 CA         DEX
EEC8 8A         TXA
EEC9 45 BD      EOR $BD
EECB 85 BD      STA $BD
EECD C6 B4      DEC $B4
EECF F0 06      BEQ $EED7
EED1 8A         TXA
EED2 29 04      AND #$04
EED4 85 B5      STA $B5
EED6 60         RTS
EED7 A9 20      LDA #$20
EED9 2C 94 02   BIT $0294
EEDC F0 14      BEQ $EEF2
EEDE 30 1C      BMI $EEFC
EEE0 70 14      BVS $EEF6
EEE2 A5 BD      LDA $BD
EEE4 D0 01      BNE $EEE7
EEE6 CA         DEX
EEE7 C6 B4      DEC $B4
EEE9 AD 93 02   LDA $0293

```

EEEC	10	E3	BPL	\$EED1
EEEE	C6	B4	DEC	\$B4
EEF0	D0	DF	BNE	\$EED1
EEF2	E6	B4	INC	\$B4
EEF4	D0	F0	BNE	\$EEE6
EEF6	A5	BD	LDA	\$BD
EEF8	F0	ED	BEQ	\$EEE7
EEFA	D0	EA	BNE	\$EEE6
EEFC	70	E9	BVS	\$EEE7
EEFE	50	E6	BVC	\$EEE6
EF00	E6	B4	INC	\$B4
EF02	A2	FF	LDX	#\$FF
EF04	D0	CB	BNE	\$EED1

EF06; Send new RS-232 byte

EF06	AD	94	02	LDA	\$0294
EF09	4A			LSR	
EF0A	90	07		BCC	\$EF13
EF0C	2C	01	DD	BIT	DD01
EF0F	10	1D		BPL	\$EF2E
EF11	50	1E		BVC	\$EF31
EF13	A9	00		LDA	#\$00
EF15	85	BD		STA	\$BD
EF17	85	B5		STA	\$B5
EF19	AE	98	02	LDX	\$0298
EF1C	86	B4		STX	\$B4
EF1E	AC	9D	02	LDY	\$029D
EF21	CC	9E	02	CPV	\$029E
EF24	F0	13		BEQ	\$EF39
EF26	B1	F9		LDA	(\$F9),Y
EF28	85	B6		STA	\$B6
EF2A	EE	9D	02	INC	\$029D
EF2D	60			RTS	

EF2E; No - DSR error

EF2E	A9	40		LDA	#\$40
EF30	2C	A9	10	BIT	\$10A9

EF33; No - CTS error

EF33	0D	97	02	DRA	\$0297
EF36	8D	97	02	STA	\$0297
EF39	A9	01		LDA	#\$01

EF3B; Disable timer

EF3B	8D	0D	DD	STA	\$DD0D
EF3E	4D	A1	02	EOR	\$02A1
EF41	09	80		DRA	#\$80
EF43	8D	A1	02	STA	\$02A1
EF46	8D	0D	DD	STA	\$DD0D
EF49	60			RTS	

EF4A; Compute bit count

EF4A	A2	09		LDX	#\$09
EF4C	A9	20		LDA	#\$20
EF4E	2C	93	02	BIT	\$0293
EF51	F0	01		BEQ	\$EF54
EF53	CA			DEX	
EF54	50	02		BVC	\$EF58
EF56	CA			DEX	
EF57	CA			DEX	
EF58	60			RTS	

EF59; RS232 receive

EF59	A6	A9		LDX	\$A9
EF5B	D0	33		BNE	\$EF90
EF5D	C6	A8		DEC	\$A8
EF5F	F0	36		BEQ	\$EF97
EF61	30	0D		BMI	\$EF70
EF63	A5	A7		LDA	\$A7
EF65	45	A8		EOR	\$A8
EF67	85	A8		STA	\$A8
EF69	46	A7		LSR	\$A7
EF6B	66	AA		ROR	\$AA
EF6D	60			RTS	
EF6E	C6	A8		DEC	\$A8
EF70	A5	A7		LDA	\$A7
EF72	F0	67		BEQ	\$EFDB
EF74	AD	93	02	LDA	\$0293
EF77	0A			ASL	
EF78	A9	01		LDA	#\$01
EF7A	65	A8		ADC	\$A8
EF7C	D0	EF		BNE	\$EF6D

EF7E; Setup to receive

EF7E	A9	90		LDA	#\$90
EF80	8D	0D	DD	STA	\$DD0D
EF83	0D	A1	02	DRA	\$02A1
EF86	8D	A1	02	STA	\$02A1
EF89	85	A9		STA	\$A9
EF8B	A9	02		LDA	#\$02

```

EF8D 4C 3B EF    JMP $EF3B
EF90 A5 A7      LDA $A7
EF92 D0 EA      BNE $EF7E
EF94 B5 A9      STA $A9
EF96 60         RTS
EF97 AC 9B 02   LDY $029B
EF9A C8         INY
EF9B CC 9C 02   CPY $029C
EF9E F0 2A      BEQ $EFCA
EFA0 BC 9B 02   STY $029B
EFA3 88         DEY
EFA4 A5 AA      LDA $AA
EFA6 AE 9B 02   LDX $029B
EFA9 E0 09      CPX #$09
EFAB F0 04      BEQ $EFB1
EFAD 4A         LSR
EFAE E8         INX
EFAF D0 F8      BNE $EFA9
EFB1 91 F7      STA ($F7),Y
EFB3 A9 20      LDA #$20
EFB5 2C 94 02   BIT $0294
EFB8 F0 B4      BEQ $EF6E
EFBA 30 B1      BMI $EF6D
EFBC A5 A7      LDA $A7
EFBE 45 AB      EOR $AB
EFC0 F0 03      BEQ $EFC5
EFC2 70 A9      BVS $EF6D

```

EFC4; Receive parity error

```

EFC4 2C 50 A6    BIT $A650
EFC7 A9 01      LDA #$01
EFC9 2C A9 04    BIT $04A9

```

EFCC; Receive overflow

```

EFCC 2C A9 80    BIT $80A9

```

EFCF; Receive break

```

EFCF 2C A9 02    BIT $02A9

```

EFD2; Framing error

```

EFD2 0D 97 02    ORA $0297
EFD5 8D 97 02    STA $0297
EFD8 4C 7E EF    JMP $EF7E
EFD8 A5 AA      LDA $AA

```

```

EFDD D0 F1      BNE $EFD0
EFDF F0 EC      BEQ $EFCB

```

EFE1; Submit to RS232

```

EFE1 85 9A      STA $9A
EFE3 AD 94 02   LDA $0294
EFE6 4A         LSR
EFE7 90 29      BCC $F012
EFE9 A9 02      LDA #$02
EFEB 2C 01 DD   BIT $DD01
EFEE 10 1D      BPL $F00D
EFF0 D0 20      BNE $F012
EFF2 AD A1 02   LDA $02A1
EFF5 29 02      AND #$02
EFF7 D0 F9      BNE $EFF2
EFF9 2C 01 DD   BIT $DD01
EFFC 70 FB      BVS $EFF9
EFEE AD 01 DD   LDA $DD01
F001 09 02      ORA #$02
F003 8D 01 DD   STA $DD01
F006 2C 01 DD   BIT $DD01
F009 70 07      BVS $F012
F00B 30 F9      BMI $F006

```

F00D; No - DSR error

```

F00D A9 40      LDA #$40
F00F 8D 97 02   STA $0297
F012 1B         CLC
F013 60         RTS
F014 20 2B F0    JSR $F02B

```

F017; Send to RS232 buffer

```

F017 AC 9E 02   LDY $029E
F01A C8         INY
F01B CC 9D 02   CPY $029D
F01E F0 F4      BEQ $F014
F020 8C 9E 02   STY $029E
F023 88         DEY
F024 A5 9E      LDA $9E
F026 91 F9      STA ($F9),Y
F028 AD A1 02   LDA $02A1
F02B 4A         LSR
F02C B0 1E      BCS $F04C
F02E A9 10      LDA #$10
F030 8D 0E DD   STA $DD0E
F033 AD 99 02   LDA $0299

```

```

F036 8D 04 DD    STA $DD04
F039 AD 9A 02    LDA $029A
F03C 8D 05 DD    STA $DD05
F03F A9 81       LDA #$81
F041 20 3B EF    JSR $EF3B
F044 20 06 EF    JSR $EF06
F047 A9 11       LDA #$11
F049 8D 0E DD    STA $DD0E
F04C 60          RTS

```

F04D; Input from RS232

```

F04D 85 99       STA $99
F04F AD 94 02    LDA $0294
F052 4A          LSR
F053 90 2B       BCC $F07D
F055 29 08       AND #$08
F057 F0 24       BEQ $F07D
F059 A9 02       LDA #$02
F05B 2C 01 DD    BIT $DD01
F05E 10 AD       BPL $F00D
F060 F0 22       BEQ $F084
F062 AD A1 02    LDA $02A1
F065 4A          LSR
F066 B0 FA       BCS $F062
F068 AD 01 DD    LDA $DD01
F06B 29 FD       AND #$FD
F06D 8D 01 DD    STA $DD01
F070 AD 01 DD    LDA $DD01
F073 29 04       AND #$04
F075 F0 F9       BEQ $F070
F077 A9 90       LDA #$90
F079 18          CLC
F07A 4C 3B EF    JMP $EF3B
F07D AD A1 02    LDA $02A1
F080 29 12       AND #$12
F082 F0 F3       BEQ $F077
F084 18          CLC
F085 60          RTS

```

F086; Get from RS232

```

F086 AD 97 02    LDA $0297
F089 AC 9C 02    LDY $029C
F08C CC 9B 02    CPY $029B
F08F F0 0B       BEQ $F09C
F091 29 F7       AND #$F7
F093 8D 97 02    STA $0297
F096 B1 F7       LDA ($F7),Y
F098 EE 9C 02    INC $029C

```

```

F09B 60          RTS
F09C 09 08       DRA #$08
F09E 8D 97 02    STA $0297
F0A1 A9 00       LDA #$00
F0A3 60          RTS

```

F0A4; Check serial bus idle

```

F0A4 4B          PHA
F0A5 AD A1 02    LDA $02A1
F0AB F0 11       BEQ $F0BB
F0AA AD A1 02    LDA $02A1
F0AD 29 03       AND #$03
F0AF D0 F9       BNE $F0AA
F0B1 A9 10       LDA #$10
F0B3 8D 0D DD    STA $DD0D
F0B6 A9 00       LDA #$00
F0B8 8D A1 02    STA $02A1
F0BB 68          PLA
F0BC 60          RTS

```

F0BD; Messages

```

F0BD 0D 49 2F    DRA $2F49
F0C0 4F          ???
F0C1 20 45 52    JSR $5245
F0C4 52          ???
F0C5 4F          ???
F0C6 52          ???
F0C7 20 A3 0D    JSR $0DA3
F0CA 53          ???
F0CB 45 41       EOR $41
F0CD 52          ???
F0CE 43          ???
F0CF 48          PHA
F0D0 49 4E       EOR #$4E
F0D2 47          ???
F0D3 A0 46       LDY #$46
F0D5 4F          ???
F0D6 52          ???
F0D7 A0 0D       LDY #$0D
F0D9 50 52       BVC $F12D
F0DB 45 53       EOR $53
F0DD 53          ???
F0DE 20 50 4C    JSR $4C50
F0E1 41 59       EOR ($59,X)
F0E3 20 4F 4E    JSR $4E4F
F0E6 20 54 41    JSR $4154
F0E9 50 C5       BVC $F0B0
F0EB 50 52       BVC $F13F

```

FOED 45 53	EOR \$53	F142 A5 C6	LDA \$C6
FOEF 53	???	F144 F0 0F	BEQ \$F155
FOF0 20 52 45	JSR \$4552	F146 78	SEI
FOF3 43	???	F147 4C B4 E5	JMP \$E5B4
FOF4 4F	???	F14A C9 02	CMP #\$02
FOF5 52	???	F14C D0 18	BNE \$F166
FOF6 44	???		
FOF7 20 26 20	JSR \$2026		
FOFA 50 4C	BVC \$F14B	F14E; ..from RS232	
FOFE 20 4F 4E	EDR (\$59,X)	F14E 84 97	STY \$97
F101 20 54 41	JSR \$4E4F	F150 20 86 F0	JSR \$F0B6
F104 50 C5	JSR \$4154	F153 A4 97	LDY \$97
F106 0D 4C 4F	BVC \$F0CB	F155 1B	CLC
F109 41 44	DRA \$4F4C	F156 60	RTS
F10B 49 4E	EDR (\$44,X)		
F10D C7	EDR #\$4E		
F10E 0D 53 41	???	F157; Input	
F111 56 49	DRA \$4153	F157 A5 99	LDA \$99
F113 4E 47 A0	LSR \$49,X	F159 D0 0B	BNE \$F166
F116 0D 56 45	LSR \$A047	F15B A5 D3	LDA \$D3
F119 52	DRA \$4556	F15D 85 CA	STA \$CA
F11A 49 46	???	F15F A5 D6	LDA \$D6
F11C 59 49 4E	EDR #\$46	F161 85 C9	STA \$C9
F11F C7	EDR \$4E49,Y	F163 4C 32 E6	JMP \$E632
F120 0D 46 4F	???	F166 C9 03	CMP #\$03
F123 55 4E	DRA \$4F46	F168 D0 09	BNE \$F173
F125 44	EDR \$4E,X	F16A 85 D0	STA \$D0
F126 A0 0D	???	F16C A5 D5	LDA \$D5
F128 4F	LDY #\$0D	F16E 85 C8	STA \$C8
F129 4B	???	F170 4C 32 E6	JMP \$E632
		F173 B0 3B	BCS \$F1AD
		F175 C9 02	CMP #\$02
		F177 F0 3F	BEQ \$F1B8
		F179 86 97	STX \$97
		F17B 20 99 F1	JSR \$F199
		F17E B0 16	BCS \$F196
		F180 48	PHA
		F181 20 99 F1	JSR \$F199
		F184 B0 0D	BCS \$F193
		F186 D0 05	BNE \$F18D
		F188 A9 40	LDA #\$40
		F18A 20 1C FE	JSR \$FE1C
		F18D C6 A6	DEC \$A6
		F18F A6 97	LDX \$97
		F191 68	PLA
		F192 60	RTS
		F193 AA	TAX
		F194 68	PLA
		F195 8A	TXA
		F196 A6 97	LDX \$97

F12B; Print if direct

F12B 24 9D	BIT \$9D
F12D 10 0D	BPL \$F13C
F12F B9 BD F0	LDA \$F0BD,Y
F132 08	PHP
F133 29 7F	AND #\$7F
F135 20 D2 FF	JSR \$FFD2
F138 CB	INY
F139 28	PLP
F13A 10 F3	BPL \$F12F
F13C 18	CLC
F13D 60	RTS

F13E; Get...

F13E A5 99	LDA \$99
F140 D0 0B	BNE \$F14A

F198 60	RTS	F1E2 48	PHA
		F1E3 90 23	BCC \$F208
		F1E5 20 0D F8	JSR \$F80D
F199; Get..tape/serial/RS232		F1E8 D0 0E	BNE \$F1F8
		F1EA 20 64 F8	JSR \$F864
F199 20 0D F8	JSR \$F80D	F1ED B0 0E	BCS \$F1FD
F19C D0 0B	BNE \$F1A9	F1EF A9 02	LDA #\$02
F19E 20 41 F8	JSR \$F841	F1F1 A0 00	LDY #\$00
F1A1 B0 11	BCS \$F1B4	F1F3 91 B2	STA (\$B2),Y
F1A3 A9 00	LDA #\$00	F1F5 C8	INY
F1A5 B5 A6	STA \$A6	F1F6 B4 A6	STY \$A6
F1A7 F0 F0	BEQ \$F199	F1F8 A5 9E	LDA \$9E
F1A9 B1 B2	LDA (\$B2),Y	F1FA 91 B2	STA (\$B2),Y
F1AB 18	CLC	F1FC 18	CLC
F1AC 60	RTS	F1FD 68	PLA
F1AD A5 90	LDA \$90	F1FE A8	TAY
F1AF F0 04	BEQ \$F1B5	F1FF 68	PLA
F1B1 A9 0D	LDA #\$0D	F200 AA	TAX
F1B3 18	CLC	F201 A5 9E	LDA \$9E
F1B4 60	RTS	F203 90 02	BCC \$F207
F1B5 4C 13 EE	JMP \$EE13	F205 A9 00	LDA #\$00
F1B8 20 4E F1	JSR \$F14E	F207 60	RTS
F1BB B0 F7	BCS \$F1B4	F208 20 17 F0	JSR \$F017
F1BD C9 00	CMP #\$00	F20B 4C FC F1	JMP \$F1FC
F1BF D0 F2	BNE \$F1B3		
F1C1 AD 97 02	LDA \$0297	F20E; Set input device	
F1C4 29 60	AND #\$60	F20E 20 0F F3	JSR \$F30F
F1C6 D0 E9	BNE \$F1B1	F211 F0 03	BEQ \$F216
F1C8 F0 EE	BEQ \$F1B8	F213 4C 01 F7	JMP \$F701
		F216 20 1F F3	JSR \$F31F
F1CA; Output..		F219 A5 BA	LDA \$BA
F1CA 48	PHA	F21B F0 16	BEQ \$F233
F1CB A5 9A	LDA \$9A	F21D C9 03	CMP #\$03
F1CD C9 03	CMP #\$03	F21F F0 12	BEQ \$F233
F1CF D0 04	BNE \$F1D5	F221 B0 14	BCS \$F237
F1D1 68	PLA	F223 C9 02	CMP #\$02
F1D2 4C 16 E7	JMP \$E716	F225 D0 03	BNE \$F22A
F1D5 90 04	BCC \$F1DB	F227 4C 4D F0	JMP \$F04D
F1D7 68	PLA	F22A A6 B9	LDX \$B9
F1DB 4C DD ED	JMP \$EDDD	F22C E0 60	CPX #\$60
F1DB 4A	LSR	F22E F0 03	BEQ \$F233
F1DC 68	PLA	F230 4C 0A F7	JMP \$F70A
		F233 B5 99	STA \$99
F1DD; ..to tape		F235 18	CLC
F1DD 85 9E	STA \$9E	F236 60	RTS
F1DF 8A	TXA	F237 AA	TAX
F1E0 48	PHA	F238 20 09 ED	JSR \$ED09
F1E1 98	TYA	F23B A5 B9	LDA \$B9
		F23D 10 06	BPL \$F245
		F23F 20 CC ED	JSR \$EDCC

F242 4C 48 F2 JMP \$F248
 F245 20 C7 ED JSR \$EDC7
 F248 8A TXA
 F249 24 90 BIT \$90
 F24B 10 E6 BPL \$F233
 F24D 4C 07 F7 JMP \$F707

F250; Set output device

F250 20 0F F3 JSR \$F30F
 F253 F0 03 BEQ \$F258
 F255 4C 01 F7 JMP \$F701
 F258 20 1F F3 JSR \$F31F
 F25B A5 BA LDA \$BA
 F25D D0 03 BNE \$F262
 F25F 4C 0D F7 JMP \$F70D
 F262 C9 03 CMP #\$03
 F264 F0 0F BEQ \$F275
 F266 B0 11 BCS \$F279
 F268 C9 02 CMP #\$02
 F26A D0 03 BNE \$F26F
 F26C 4C E1 EF JMP \$EFE1
 F26F A6 B9 LDY \$B9
 F271 E0 60 CPX #\$60
 F273 F0 EA BEQ \$F25F
 F275 85 9A STA \$9A
 F277 18 CLC
 F278 60 RTS
 F279 AA TAX
 F27A 20 0C ED JSR \$ED0C
 F27D A5 B9 LDA \$B9
 F27F 10 05 BPL \$F286
 F281 20 BE ED JSR \$EDBE
 F284 D0 03 BNE \$F289
 F286 20 B9 ED JSR \$EDB9
 F289 8A TXA
 F28A 24 90 BIT \$90
 F28C 10 E7 BPL \$F275
 F28E 4C 07 F7 JMP \$F707

F291; Close file

F291 20 14 F3 JSR \$F314
 F294 F0 02 BEQ \$F298
 F296 18 CLC
 F297 60 RTS
 F298 20 1F F3 JSR \$F31F
 F29B 8A TXA
 F29C 48 PHA
 F29D A5 BA LDA \$BA

F29F F0 50 BEQ \$F2F1
 F2A1 C9 03 CMP #\$03
 F2A3 F0 4C BEQ \$F2F1
 F2A5 B0 47 BCS \$F2EE
 F2A7 C9 02 CMP #\$02
 F2A9 D0 1D BNE \$F2CB
 F2AB 68 PLA
 F2AC 20 F2 F2 JSR \$F2F2
 F2AF 20 83 F4 JSR \$F483
 F2B2 20 27 FE JSR \$FE27
 F2B5 A5 F8 LDA \$F8
 F2B7 F0 01 BEQ \$F2BA
 F2B9 C8 INY
 F2BA A5 FA LDA \$FA
 F2BC F0 01 BEQ \$F2BF
 F2BE C8 INY
 F2BF A9 00 LDA #\$00
 F2C1 85 F8 STA \$F8
 F2C3 85 FA STA \$FA
 F2C5 4C 7D F4 JMP \$F47D
 F2C8 A5 B9 LDA \$B9
 F2CA 29 0F AND #\$0F
 F2CC F0 23 BEQ \$F2F1
 F2CE 20 D0 F7 JSR \$F7D0
 F2D1 A9 00 LDA #\$00
 F2D3 38 SEC
 F2D4 20 DD F1 JSR \$F1DD
 F2D7 20 64 FB JSR \$FB64
 F2DA 90 04 BCC \$F2E0
 F2DC 68 PLA
 F2DD A9 00 LDA #\$00
 F2DF 60 RTS
 F2E0 A5 B9 LDA \$B9
 F2E2 C9 62 CMP #\$62
 F2E4 D0 0B BNE \$F2F1
 F2E6 A9 05 LDA #\$05
 F2E8 20 6A F7 JSR \$F76A
 F2EB 4C F1 F2 JMP \$F2F1
 F2EE 20 42 F6 JSR \$F642
 F2F1 68 PLA
 F2F2 AA TAX
 F2F3 C6 98 DEC \$98
 F2F5 E4 98 CPX \$98
 F2F7 F0 14 BEQ \$F30D
 F2F9 A4 98 LDY \$98
 F2FB B9 59 02 LDA \$0259,Y
 F2FE 9D 59 02 STA \$0259,X
 F301 B9 63 02 LDA \$0263,Y
 F304 9D 63 02 STA \$0263,X
 F307 B9 6D 02 LDA \$026D,Y
 F30A 9D 6D 02 STA \$026D,X
 F30D 18 CLC

F30E 60	RTS	F34E 4C 0A F7	JMP \$F70A
		F351 20 0F F3	JSR \$F30F
F30F; Find file		F354 D0 03	BNE \$F359
F30F A9 00	LDA #\$00	F356 4C FE F6	JMP \$F6FE
F311 85 90	STA \$90	F359 A6 98	LDX \$98
F313 8A	TXA	F35B E0 0A	CPX #\$0A
F314 A6 98	LDX \$98	F35D 90 03	BCC \$F362
F316 CA	DEX	F35F 4C FB F6	JMP \$F6FB
F317 30 15	BMI \$F32E	F362 E6 98	INC \$98
F319 D0 59 02	CMP \$0259,X	F364 A5 B8	LDA \$B8
F31C D0 FB	BNE \$F316	F366 9D 59 02	STA \$0259,X
F31E 60	RTS	F369 A5 B9	LDA \$B9
		F36B 09 60	ORA #\$60
		F36D 85 B9	STA \$B9
		F36F 9D 6D 02	STA \$026D,X
F31F; Set file values		F372 A5 BA	LDA \$BA
		F374 9D 63 02	STA \$0263,X
F31F BD 59 02	LDA \$0259,X	F377 F0 5A	BEQ \$F3D3
F322 85 B8	STA \$B8	F379 C9 03	CMP #\$03
F324 BD 63 02	LDA \$0263,X	F37B F0 56	BEQ \$F3D3
F327 85 BA	STA \$BA	F37D 90 05	BCC \$F384
F329 BD 6D 02	LDA \$026D,X	F37F 20 D5 F3	JSR \$F3D5
F32C 85 B9	STA \$B9	F382 90 4F	BCC \$F3D3
F32E 60	RTS	F384 C9 02	CMP #\$02
		F386 D0 03	BNE \$F38B
		F388 4C 09 F4	JMP \$F409
F32F; Abort all files		F38B 20 D0 F7	JSR \$F7D0
		F38E B0 03	BCS \$F393
F32F A9 00	LDA #\$00	F390 4C 13 F7	JMP \$F713
F331 85 98	STA \$98	F393 A5 B9	LDA \$B9
		F395 29 0F	AND #\$0F
		F397 D0 1F	BNE \$F3BB
F333; Restore default I/O		F399 20 17 F8	JSR \$F817
		F39C B0 36	BCS \$F3D4
F333 A2 03	LDX #\$03	F39E 20 AF F5	JSR \$F5AF
F335 E4 9A	CPX \$9A	F3A1 A5 B7	LDA \$B7
F337 B0 03	BCS \$F33C	F3A3 F0 0A	BEQ \$F3AF
F339 20 FE ED	JSR \$EDFE	F3A5 20 EA F7	JSR \$F7EA
F33C E4 99	CPX \$99	F3AB 90 18	BCC \$F3C2
F33E B0 03	BCS \$F343	F3AA F0 28	BEQ \$F3D4
F340 20 EF ED	JSR \$EDEF	F3AC 4C 04 F7	JMP \$F704
F343 86 9A	STX \$9A	F3AF 20 2C F7	JSR \$F72C
F345 A9 00	LDA #\$00	F3B2 F0 20	BEQ \$F3D4
F347 85 99	STA \$99	F3B4 90 0C	BCC \$F3C2
F349 60	RTS	F3B6 B0 F4	BCS \$F3AC
		F3B8 20 38 F8	JSR \$F838
		F3BB B0 17	BCS \$F3D4
F34A; Do open file		F3BD A9 04	LDA #\$04
		F3BF 20 6A F7	JSR \$F76A
F34A A6 B8	LDX \$B8	F3C2 A9 BF	LDA \$BF
F34C D0 03	BNE \$F351	F3C4 A4 B9	LDY \$B9
		F3C6 C0 60	CPY #\$60

F3C8 F0 07	BEQ \$F3D1	F423 AD 93 02	LDA \$0293
F3CA A0 00	LDY #\$00	F426 29 0F	AND #\$0F
F3CC A9 02	LDA #\$02	F428 F0 1C	BEQ \$F446
F3CE 91 B2	STA (\$B2),Y	F42A 0A	ASL
F3D0 98	TYA	F42B AA	TAX
F3D1 B5 A6	STA \$A6	F42C AD A6 02	LDA \$02A6
F3D3 18	CLC	F42F D0 09	BNE \$F43A
F3D4 60	RTS	F431 BC C1 FE	LDY \$FEC1,X
		F434 BD C0 FE	LDA \$FEC0,X
		F437 4C 40 F4	JMP \$F440
		F43A BC EB E4	LDY \$E4EB,X
		F43D BD EA E4	LDA \$E4EA,X
		F440 BC 96 02	STY \$0296
		F443 BD 95 02	STA \$0295
		F446 AD 95 02	LDA \$0295
		F449 0A	ASL
		F44A 20 2E FF	JSR \$FF2E
		F44D AD 94 02	LDA \$0294
		F450 4A	LSR
		F451 90 09	BCC \$F45C
		F453 AD 01 DD	LDA \$DD01
		F456 0A	ASL
		F457 B0 03	BCS \$F45C
		F459 20 0D F0	JSR \$F00D
		F45C AD 9B 02	LDA \$029B
		F45F BD 9C 02	STA \$029C
		F462 AD 9E 02	LDA \$029E
		F465 BD 9D 02	STA \$029D
		F468 20 27 FE	JSR \$FE27
		F46B A5 F8	LDA \$F8
		F46D D0 05	BNE \$F474
		F46F 88	DEY
		F470 B4 F8	STY \$F8
		F472 B6 F7	STX \$F7
		F474 A5 FA	LDA \$FA
		F476 D0 05	BNE \$F47D
		F478 88	DEY
		F479 B4 FA	STY \$FA
		F47B B6 F9	STX \$F9
		F47D 38	SEC
		F47E A9 F0	LDA #\$F0
		F480 4C 2D FE	JMP \$FE2D
		F483 A9 7F	LDA #\$7F
		F485 BD 0D DD	STA \$DD0D
		F488 A9 06	LDA #\$06
		F48A BD 03 DD	STA \$DD03
		F48D BD 01 DD	STA \$DD01
		F490 A9 04	LDA #\$04
		F492 0D 00 DD	ORA \$DD00
		F495 BD 00 DD	STA \$DD00
		F49B A0 00	LDY #\$00
		F49A BC A1 02	STY \$02A1

F3D5; Send SA

F3D5 A5 B9	LDA \$B9
F3D7 30 FA	BMI \$F3D3
F3D9 A4 B7	LDY \$B7
F3DB F0 F6	BEQ \$F3D3
F3DD A9 00	LDA #\$00
F3DF B5 90	STA \$90
F3E1 A5 BA	LDA \$BA
F3E3 20 0C ED	JSR \$ED0C
F3E6 A5 B9	LDA \$B9
F3E8 09 F0	ORA #\$F0
F3EA 20 B9 ED	JSR \$EDB9
F3ED A5 90	LDA \$90
F3EF 10 05	BPL \$F3F6
F3F1 68	PLA
F3F2 68	PLA
F3F3 4C 07 F7	JMP \$F707
F3F6 A5 B7	LDA \$B7
F3F8 F0 0C	BEQ \$F406
F3FA A0 00	LDY #\$00
F3FC B1 BB	LDA (\$BB),Y
F3FE 20 DD ED	JSR \$EDDD
F401 C8	INY
F402 C4 B7	CPY \$B7
F404 D0 F6	BNE \$F3FC
F406 4C 54 F6	JMP \$F654

F409; Open RS232

F409 20 B3 F4	JSR \$F483
F40C BC 97 02	STY \$0297
F40F C4 B7	CPY \$B7
F411 F0 0A	BEQ \$F41D
F413 B1 BB	LDA (\$BB),Y
F415 99 93 02	STA \$0293,Y
F418 C8	INY
F419 C0 04	CPY #\$04
F41B D0 F2	BNE \$F40F
F41D 20 4A EF	JSR \$EF4A
F420 BE 98 02	STX \$0298

F49D 60	RTS	F505 A5 90	LDA \$90
		F507 4A	LSR
		F508 4A	LSR
F49E; Load program		F509 B0 EB	BCS \$F4F3
		F50B BA	TXA
F49E B6 C3	STX \$C3	F50C A4 93	LDY \$93
F4A0 84 C4	STY \$C4	F50E F0 0C	BEQ \$F51C
F4A2 6C 30 03	JMP (\$0330)	F510 A0 00	LDY #\$00
F4A5 B5 93	STA \$93	F512 D1 AE	CMP (\$AE),Y
F4A7 A9 00	LDA #\$00	F514 F0 08	BEQ \$F51E
F4A9 B5 90	STA \$90	F516 A9 10	LDA #\$10
F4AB A5 BA	LDA \$BA	F518 20 1C FE	JSR \$FE1C
F4AD D0 03	BNE \$F4B2	F51B 2C 91 AE	BIT \$AE91
F4AF 4C 13 F7	JMP \$F713	F51E E6 AE	INC \$AE
F4B2 C9 03	CMP #\$03	F520 D0 02	BNE \$F524
F4B4 F0 F9	BEQ \$F4AF	F522 E6 AF	INC \$AF
F4B6 90 7B	BCC \$F533	F524 24 90	BIT \$90
F4BB A4 B7	LDY \$B7	F526 50 CB	BVC \$F4F3
F4BA D0 03	BNE \$F4BF	F528 20 EF ED	JSR \$EDEF
F4BC 4C 10 F7	JMP \$F710	F52B 20 42 F6	JSR \$F642
F4BF A6 B9	LDX \$B9	F52E 90 79	BCC \$F5A9
F4C1 20 AF F5	JSR \$F5AF	F530 4C 04 F7	JMP \$F704
F4C4 A9 60	LDA #\$60	F533 4A	LSR
F4C6 B5 B9	STA \$B9	F534 B0 03	BCS \$F539
F4C8 20 D5 F3	JSR \$F3D5	F536 4C 13 F7	JMP \$F713
F4CB A5 BA	LDA \$BA	F539 20 D0 F7	JSR \$F7D0
F4CD 20 09 ED	JSR \$ED09	F53C B0 03	BCS \$F541
F4D0 A5 B9	LDA \$B9	F53E 4C 13 F7	JMP \$F713
F4D2 20 C7 ED	JSR \$EDC7	F541 20 17 F8	JSR \$F817
F4D5 20 13 EE	JSR \$EE13	F544 B0 68	BCS \$F5AE
F4D8 B5 AE	STA \$AE	F546 20 AF F5	JSR \$F5AF
F4DA A5 90	LDA \$90	F549 A5 B7	LDA \$B7
F4DC 4A	LSR	F54B F0 09	BEQ \$F556
F4DD 4A	LSR	F54D 20 EA F7	JSR \$F7EA
F4DE B0 50	BCS \$F530	F550 90 0B	BCC \$F55D
F4E0 20 13 EE	JSR \$EE13	F552 F0 5A	BEQ \$F5AE
F4E3 B5 AF	STA \$AF	F554 B0 DA	BCS \$F530
F4E5 BA	TXA	F556 20 2C F7	JSR \$F72C
F4E6 D0 0B	BNE \$F4F0	F559 F0 53	BEQ \$F5AE
F4E8 A5 C3	LDA \$C3	F55B B0 D3	BCS \$F530
F4EA B5 AE	STA \$AE	F55D A5 90	LDA \$90
F4EC A5 C4	LDA \$C4	F55F 29 10	AND #\$10
F4EE B5 AF	STA \$AF	F561 38	SEC
F4F0 20 D2 F5	JSR \$F5D2	F562 D0 4A	BNE \$F5AE
F4F3 A9 FD	LDA #\$FD	F564 E0 01	CPX #\$01
F4F5 25 90	AND \$90	F566 F0 11	BEQ \$F579
F4F7 B5 90	STA \$90	F568 E0 03	CPX #\$03
F4F9 20 E1 FF	JSR \$FFE1	F56A D0 DD	BNE \$F549
F4FC D0 03	BNE \$F501	F56C A0 01	LDY #\$01
F4FE 4C 33 F6	JMP \$F633	F56E B1 B2	LDA (\$B2),Y
F501 20 13 EE	JSR \$EE13	F570 B5 C3	STA \$C3
F504 AA	TAX	F572 CB	INY

F573 B1 B2	LDA (\$B2),Y	F5C9 20 D2 FF	JSR \$FFD2
F575 B5 C4	STA \$C4	F5CC C8	INY
F577 B0 04	BCS \$F57D	F5CD C4 B7	CPY \$B7
F579 A5 B9	LDA \$B9	F5CF D0 F6	BNE \$F5C7
F57B D0 EF	BNE \$F56C	F5D1 60	RTS
F57D A0 03	LDY #\$03		
F57F B1 B2	LDA (\$B2),Y		
F581 A0 01	LDY #\$01	F5D2; 'loading/verifying'	
F583 F1 B2	SBC (\$B2),Y		
F585 AA	TAX	F5D2 A0 49	LDY #\$49
F586 A0 04	LDY #\$04	F5D4 A5 93	LDA \$93
F588 B1 B2	LDA (\$B2),Y	F5D6 F0 02	BEQ \$F5DA
F58A A0 02	LDY #\$02	F5D8 A0 59	LDY #\$59
F58C F1 B2	SBC (\$B2),Y	F5DA 4C 2B F1	JMP \$F12B
F58E A8	TAY		
F58F 18	CLC		
F590 8A	TXA	F5DD; Save program	
F591 65 C3	ADC \$C3		
F593 B5 AE	STA \$AE	F5DD 86 AE	STX \$AE
F595 98	TYA	F5DF 84 AF	STY \$AF
F596 65 C4	ADC \$C4	F5E1 AA	TAX
F598 B5 AF	STA \$AF	F5E2 B5 00	LDA \$00,X
F59A A5 C3	LDA \$C3	F5E4 85 C1	STA \$C1
F59C 85 C1	STA \$C1	F5E6 B5 01	LDA \$01,X
F59E A5 C4	LDA \$C4	F5E8 85 C2	STA \$C2
F5A0 85 C2	STA \$C2	F5EA 6C 32 03	JMP (\$0332)
F5A2 20 D2 F5	JSR \$F5D2	F5ED A5 BA	LDA \$BA
F5A5 20 4A F8	JSR \$FB4A	F5EF D0 03	BNE \$F5F4
F5A8 24 18	BIT \$18	F5F1 4C 13 F7	JMP \$F713
F5AA A6 AE	LDX \$AE	F5F4 C9 03	CMP #\$03
F5AC A4 AF	LDY \$AF	F5F6 F0 F9	BEQ \$F5F1
F5AE 60	RTS	F5F8 90 5F	BCC \$F659
		F5FA A9 61	LDA \$61
		F5FC 85 B9	STA \$B9
		F5FE A4 B7	LDY \$B7
		F600 D0 03	BNE \$F605
		F602 4C 10 F7	JMP \$F710
		F605 20 D5 F3	JSR \$F3D5
		F608 20 BF F6	JSR \$F68F
		F60B A5 BA	LDA \$BA
		F60D 20 0C ED	JSR \$ED0C
		F610 A5 B9	LDA \$B9
		F612 20 B9 ED	JSR \$EDB9
		F615 A0 00	LDY #\$00
		F617 20 8E FB	JSR \$FB8E
		F61A A5 AC	LDA \$AC
		F61C 20 DD ED	JSR \$EDDD
		F61F A5 AD	LDA \$AD
		F621 20 DD ED	JSR \$EDDD
		F624 20 D1 FC	JSR \$FCD1
		F627 B0 16	BCS \$F63F
		F629 B1 AC	LDA (\$AC),Y

F5AF; 'searching'

F5AF A5 9D	LDA \$9D
F5B1 10 1E	BPL \$F5D1
F5B3 A0 0C	LDY #\$0C
F5B5 20 2F F1	JSR \$F12F
F5B8 A5 B7	LDA \$B7
F5BA F0 15	BEQ \$F5D1
F5BC A0 17	LDY #\$17
F5BE 20 2F F1	JSR \$F12F

F5C1; Print filename

F5C1 A4 B7	LDY \$B7
F5C3 F0 0C	BEQ \$F5D1
F5C5 A0 00	LDY #\$00
F5C7 B1 BB	LDA (\$BB),Y

```

F62B 20 DD ED JSR $EDDD
F62E 20 E1 FF JSR $FFE1
F631 D0 07 BNE $F63A
F633 20 42 F6 JSR $F642
F636 A9 00 LDA #$00
F63B 38 SEC
F639 60 RTS
F63A 20 DB FC JSR $FCDB
F63D D0 E5 BNE $F624
F63F 20 FE ED JSR $EDFE
F642 24 B9 BIT $B9
F644 30 11 BMI $F657
F646 A5 BA LDA $BA
F64B 20 0C ED JSR $ED0C
F64B A5 B9 LDA $B9
F64D 29 EF AND #$EF
F64F 09 E0 ORA #$E0
F651 20 B9 ED JSR $EDB9
F654 20 FE ED JSR $EDFE
F657 18 CLC
F65B 60 RTS
F659 4A LSR
F65A B0 03 BCS $F65F
F65C 4C 13 F7 JMP $F713
F65F 20 D0 F7 JSR $F7D0
F662 90 8D BCC $F5F1
F664 20 38 F8 JSR $F838
F667 B0 25 BCS $F68E
F669 20 8F F6 JSR $F68F
F66C A2 03 LDX #$03
F66E A5 B9 LDA $B9
F670 29 01 AND #$01
F672 D0 02 BNE $F676
F674 A2 01 LDX #$01
F676 BA TXA
F677 20 6A F7 JSR $F76A
F67A B0 12 BCS $F68E
F67C 20 67 F8 JSR $F867
F67F B0 0D BCS $F68E
F681 A5 B9 LDA $B9
F683 29 02 AND #$02
F685 F0 06 BEQ $F68D
F687 A9 05 LDA #$05
F689 20 6A F7 JSR $F76A
F68C 24 1B BIT $1B
F68E 60 RTS

```

F6BF; Print 'saving'

```

F6BF A5 9D LDA $9D
F691 10 FB BPL $F6BE

```

```

F693 A0 51 LDY #$51
F695 20 2F F1 JSR $F12F
F698 4C C1 F5 JMP $F5C1

```

F69B; Bump clock

```

F69B A2 00 LDX #$00
F69D E6 A2 INC $A2
F69F D0 06 BNE $F6A7
F6A1 E6 A1 INC $A1
F6A3 D0 02 BNE $F6A7
F6A5 E6 A0 INC $A0
F6A7 38 SEC
F6AB A5 A2 LDA $A2
F6AA E9 01 SBC #$01
F6AC A5 A1 LDA $A1
F6AE E9 1A SBC #$1A
F6B0 A5 A0 LDA $A0
F6B2 E9 4F SBC #$4F
F6B4 90 06 BCC $F6BC
F6B6 B6 A0 STX $A0
F6B8 B6 A1 STX $A1
F6BA B6 A2 STX $A2

```

F6BC; Log PIA key reading

```

F6BC AD 01 DC LDA $DC01
F6BF CD 01 DC CMP $DC01
F6C2 D0 F8 BNE $F6BC
F6C4 AA TAX
F6C5 30 13 BMI $F6DA
F6C7 A2 BD LDX #$BD
F6C9 BE 00 DC STX $DC00
F6CC AE 01 DC LDX $DC01
F6CF EC 01 DC CPX $DC01
F6D2 D0 F8 BNE $F6CC
F6D4 8D 00 DC STA $DC00
F6D7 E8 INX
F6D8 D0 02 BNE $F6DC
F6DA B5 91 STA $91
F6DC 60 RTS

```

F6DD; Get time

```

F6DD 7B SEI
F6DE A5 A2 LDA $A2
F6E0 A6 A1 LDX $A1
F6E2 A4 A0 LDY $A0

```

F6E4; Set time

F6E4 78	SEI
F6E5 85 A2	STA \$A2
F6E7 86 A1	STX \$A1
F6E9 84 A0	STY \$A0
F6EB 58	CLI
F6EC 60	RTS

F6ED; Check stop key

F6ED A5 91	LDA \$91
F6EF C9 7F	CMP #\$7F
F6F1 D0 07	BNE \$F6FA
F6F3 08	PHP
F6F4 20 CC FF	JSR \$FFCC
F6F7 85 C6	STA \$C6
F6F9 28	PLP
F6FA 60	RTS

F6FB; Output error messages

F6FB A9 01	LDA #\$01
F6FD 2C A9 02	BIT \$02A9
F700 2C A9 03	BIT \$03A9
F703 2C A9 04	BIT \$04A9
F706 2C A9 05	BIT \$05A9
F709 2C A9 06	BIT \$06A9
F70C 2C A9 07	BIT \$07A9
F70F 2C A9 08	BIT \$08A9
F712 2C A9 09	BIT \$09A9
F715 48	PHA
F716 20 CC FF	JSR \$FFCC
F719 A0 00	LDY #\$00
F71B 24 9D	BIT \$9D
F71D 50 0A	BVC \$F729
F71F 20 2F F1	JSR \$F12F
F722 68	PLA
F723 48	PHA
F724 09 30	ORA #\$30
F726 20 D2 FF	JSR \$FFD2
F729 68	PLA
F72A 38	SEC
F72B 60	RTS

F72C; Find any tape header

F72C A5 93	LDA \$93
F72E 48	PHA
F72F 20 41 FB	JSR \$FB41
F732 68	PLA
F733 B5 93	STA \$93
F735 B0 32	BCS \$F769
F737 A0 00	LDY #\$00
F739 B1 B2	LDA (\$B2),Y
F73B C9 05	CMP #\$05
F73D F0 2A	BEQ \$F769
F73F C9 01	CMP #\$01
F741 F0 08	BEQ \$F748
F743 C9 03	CMP #\$03
F745 F0 04	BEQ \$F748
F747 C9 04	CMP #\$04
F749 D0 E1	BNE \$F72C
F74B AA	TAX
F74C 24 9D	BIT \$9D
F74E 10 17	BPL \$F767
F750 A0 63	LDY #\$63
F752 20 2F F1	JSR \$F12F
F755 A0 05	LDY #\$05
F757 B1 B2	LDA (\$B2),Y
F759 20 D2 FF	JSR \$FFD2
F75C C8	INY
F75D C0 15	CPY #\$15
F75F D0 F6	BNE \$F757
F761 A5 A1	LDA \$A1
F763 20 E0 E4	JSR \$E4E0
F766 EA	NOP
F767 18	CLC
F768 88	DEY
F769 60	RTS

F76A; Write tape header

F76A 85 9E	STA \$9E
F76C 20 D0 F7	JSR \$F7D0
F76F 90 5E	BCC \$F7CF
F771 A5 C2	LDA \$C2
F773 48	PHA
F774 A5 C1	LDA \$C1
F776 48	PHA
F777 A5 AF	LDA \$AF
F779 48	PHA
F77A A5 AE	LDA \$AE
F77C 48	PHA
F77D A0 BF	LDY #\$BF
F77F A9 20	LDA #\$20
F781 91 B2	STA (\$B2),Y
F783 88	DEY

```

F784 D0 FB      BNE $F781
F786 A5 9E      LDA $9E
F788 91 B2      STA ($B2),Y
F78A C8         INY
F78B A5 C1      LDA $C1
F78D 91 B2      STA ($B2),Y
F78F C8         INY
F790 A5 C2      LDA $C2
F792 91 B2      STA ($B2),Y
F794 C8         INY
F795 A5 AE      LDA $AE
F797 91 B2      STA ($B2),Y
F799 C8         INY
F79A A5 AF      LDA $AF
F79C 91 B2      STA ($B2),Y
F79E C8         INY
F79F 84 9F      STY $9F
F7A1 A0 00      LDY #$00
F7A3 84 9E      STY $9E
F7A5 A4 9E      LDY $9E
F7A7 C4 B7      CPY $B7
F7A9 F0 0C      BEQ $F7B7
F7AB B1 BB      LDA ($BB),Y
F7AD A4 9F      LDY $9F
F7AF 91 B2      STA ($B2),Y
F7B1 E6 9E      INC $9E
F7B3 E6 9F      INC $9F
F7B5 D0 EE      BNE $F7A5
F7B7 20 D7 F7   JSR $F7D7
F7BA A9 69      LDA #$69
F7BC 85 AB      STA $AB
F7BE 20 6B FB   JSR $F86B
F7C1 A8         TAY
F7C2 68         PLA
F7C3 85 AE      STA $AE
F7C5 68         PLA
F7C6 85 AF      STA $AF
F7C8 68         PLA
F7C9 85 C1      STA $C1
F7CB 68         PLA
F7CC 85 C2      STA $C2
F7CE 98         TYA
F7CF 60         RTS

```

F7D0; Get buffer address

```

F7D0 A6 B2      LDX $B2
F7D2 A4 B3      LDY $B3
F7D4 C0 02      CPY #$02
F7D6 60         RTS

```

F7D7; Set buffer start/end pointers

```

F7D7 20 D0 F7   JSR $F7D0
F7DA 8A         TXA
F7DB 85 C1      STA $C1
F7DD 18         CLC
F7DE 69 C0      ADC #$C0
F7E0 85 AE      STA $AE
F7E2 98         TYA
F7E3 85 C2      STA $C2
F7E5 69 00      ADC #$00
F7E7 85 AF      STA $AF
F7E9 60         RTS

```

F7EA; Find specific header

```

F7EA 20 2C F7   JSR $F72C
F7ED 80 1D      BCS $F80C
F7EF A0 05      LDY #$05
F7F1 84 9F      STY $9F
F7F3 A0 00      LDY #$00
F7F5 84 9E      STY $9E
F7F7 C4 B7      CPY $B7
F7F9 F0 10      BEQ $F80B
F7FB B1 BB      LDA ($BB),Y
F7FD A4 9F      LDY $9F
F7FF D1 B2      CMP ($B2),Y
F801 D0 E7      BNE $F7EA
F803 E6 9E      INC $9E
F805 E6 9F      INC $9F
F807 A4 9E      LDY $9E
F809 D0 EC      BNE $F7F7
F80B 18         CLC
F80C 60         RTS

```

F80D; Bump tape pointer

```

F80D 20 D0 F7   JSR $F7D0
F810 E6 A6      INC $A6
F812 A4 A6      LDY $A6
F814 C0 C0      CPY #$C0
F816 60         RTS

```

F817; 'press play'

```

F817 20 2E FB   JSR $F82E

```

F81A	F0	1A	BEQ	\$F836	
F81C	A0	1B	LDY	##1B	
F81E	20	2F	F1	JSR	\$F12F
F821	20	D0	F8	JSR	\$F8D0
F824	20	2E	F8	JSR	\$F82E
F827	D0	F8	BNE	\$F821	
F829	A0	6A	LDY	##6A	
F82B	4C	2F	F1	JMP	\$F12F

F867	A9	14	LDA	##14	
F869	85	AB	STA	\$AB	
F86B	20	38	F8	JSR	\$F838
F86E	B0	6C	BCS	\$F8DC	
F870	78		SEI		
F871	A9	82	LDA	##82	
F873	A2	08	LDX	##08	

F82E; Check tape status

F82E	A9	10	LDA	##10
F830	24	01	BIT	\$01
F832	D0	02	BNE	\$F836
F834	24	01	BIT	\$01
F836	18		CLC	
F837	60		RTS	

F838; 'press record'

F838	20	2E	F8	JSR	\$F82E
F83B	F0	F9	BEQ	\$F836	
F83D	A0	2E	LDY	##2E	
F83F	D0	DD	BNE	\$F81E	

F841; Initiate tape read

F841	A9	00	LDA	##00	
F843	85	90	STA	\$90	
F845	85	93	STA	\$93	
F847	20	D7	F7	JSR	\$F7D7
F84A	20	17	F8	JSR	\$F817
F84D	B0	1F	BCS	\$F86E	
F84F	78		SEI		
F850	A9	00	LDA	##00	
F852	85	AA	STA	\$AA	
F854	85	B4	STA	\$B4	
F856	85	B0	STA	\$B0	
F858	85	9E	STA	\$9E	
F85A	85	9F	STA	\$9F	
F85C	85	9C	STA	\$9C	
F85E	A9	90	LDA	##90	
F860	A2	0E	LDX	##0E	
F862	D0	11	BNE	\$F875	

F864; Initiate tape write

F864	20	D7	F7	JSR	\$F7D7
------	----	----	----	-----	--------

F875; Common tape code

F875	A0	7F	LDY	##7F	
F877	8C	0D	DC	STY	\$DC0D
F87A	8D	0D	DC	STA	\$DC0D
F87D	AD	0E	DC	LDA	\$DC0E
F880	09	19		ORA	##19
F882	8D	0F	DC	STA	\$DC0F
F885	29	91		AND	##91
F887	8D	A2	02	STA	\$02A2
F88A	20	A4	F0	JSR	\$F0A4
F88D	AD	11	D0	LDA	\$D011
F890	29	EF		AND	##EF
F892	8D	11	D0	STA	\$D011
F895	AD	14	03	LDA	\$0314
F898	8D	9F	02	STA	\$029F
F89B	AD	15	03	LDA	\$0315
F89E	8D	A0	02	STA	\$02A0
F8A1	20	BD	FC	JSR	\$FCBD
F8A4	A9	02		LDA	##02
F8A6	85	BE		STA	\$BE
F8A8	20	97	FB	JSR	\$FB97
F8AB	A5	01		LDA	\$01
F8AD	29	1F		AND	##1F
F8AF	85	01		STA	\$01
F8B1	85	C0		STA	\$C0
F8B3	A2	FF		LDX	##FF
F8B5	A0	FF		LDY	##FF
F8B7	88			DEY	
F8B8	D0	FD		BNE	\$F8B7
F8BA	CA			DEX	
F8BB	D0	F8		BNE	\$F8B5
F8BD	58			CLI	
F8BE	AD	A0	02	LDA	\$02A0
F8C1	CD	15	03	CMP	\$0315
F8C4	18			CLC	
F8C5	F0	15		BEQ	\$F8DC
F8C7	20	D0	F8	JSR	\$F8D0
F8CA	20	BC	F6	JSR	\$F6BC
F8CD	4C	BE	F8	JMP	\$F8BE

F8D0; Check tape stop

F8D0	20	E1	FF	JSR	\$FFE1
F8D3	18			CLC	
F8D4	D0	0B		BNE	\$F8E1
F8D6	20	93	FC	JSR	\$FC93
F8D9	38			SEC	
F8DA	68			PLA	
F8DB	68			PLA	
F8DC	A9	00		LDA	##00
F8DE	8D	A0	02	STA	\$02A0
F8E1	60			RTS	

F92B	60			RTS	
------	----	--	--	-----	--

F92C; Read tape bits

F92C	AE	07	DC	LDX	\$DC07
F92F	A0	FF		LDY	##FF
F931	98			TYA	
F932	ED	06	DC	SBC	\$DC06
F935	EC	07	DC	CPX	\$DC07
F938	D0	F2		BNE	\$F92C
F93A	86	B1		STX	\$B1
F93C	AA			TAX	
F93D	8C	06	DC	STY	\$DC06
F940	8C	07	DC	STY	\$DC07
F943	A9	19		LDA	##19
F945	8D	0F	DC	STA	\$DC0F
F948	AD	0D	DC	LDA	\$DC0D
F94B	8D	A3	02	STA	\$02A3
F94E	98			TYA	
F94F	E5	B1		SBC	\$B1
F951	86	B1		STX	\$B1
F953	4A			LSR	
F954	66	B1		ROR	\$B1
F956	4A			LSR	
F957	66	B1		ROR	\$B1
F959	A5	B0		LDA	\$B0
F95B	18			CLC	
F95C	69	3C		ADC	##3C
F95E	C5	B1		CMP	\$B1
F960	B0	4A		BCS	\$F9AC
F962	A6	9C		LDX	\$9C
F964	F0	03		BEQ	\$F969
F966	4C	60	FA	JMP	\$FA60
F969	A6	A3		LDX	\$A3
F96B	30	1B		BMI	\$F9BB
F96D	A2	00		LDX	##00
F96F	69	30		ADC	##30
F971	65	B0		ADC	\$B0
F973	C5	B1		CMP	\$B1
F975	B0	1C		BCS	\$F993
F977	EB			INX	
F978	69	26		ADC	##26
F97A	65	B0		ADC	\$B0
F97C	C5	B1		CMP	\$B1
F97E	B0	17		BCS	\$F997
F980	69	2C		ADC	##2C
F982	65	B0		ADC	\$B0
F984	C5	B1		CMP	\$B1
F986	90	03		BCC	\$F98B
F988	4C	10	FA	JMP	\$FA10
F98B	A5	B4		LDA	\$B4

F8E2; Set read timing

F8E2	86	B1		STX	\$B1
F8E4	A5	B0		LDA	\$B0
F8E6	0A			ASL	
F8E7	0A			ASL	
F8E8	18			CLC	
F8E9	65	B0		ADC	\$B0
F8EB	18			CLC	
F8EC	65	B1		ADC	\$B1
F8EE	85	B1		STA	\$B1
F8F0	A9	00		LDA	##00
F8F2	24	B0		BIT	\$B0
F8F4	30	01		BMI	\$F8F7
F8F6	2A			ROL	
F8F7	06	B1		ASL	\$B1
F8F9	2A			ROL	
F8FA	06	B1		ASL	\$B1
F8FC	2A			ROL	
F8FD	AA			TAX	
F8FE	AD	06	DC	LDA	\$DC06
F901	C9	16		CMP	##16
F903	90	F9		BCC	\$F8FE
F905	65	B1		ADC	\$B1
F907	8D	04	DC	STA	\$DC04
F90A	8A			TXA	
F90B	6D	07	DC	ADC	\$DC07
F90E	8D	05	DC	STA	\$DC05
F911	AD	A2	02	LDA	\$02A2
F914	8D	0E	DC	STA	\$DC0E
F917	8D	A4	02	STA	\$02A4
F91A	AD	0D	DC	LDA	\$DC0D
F91D	29	10		AND	##10
F91F	F0	09		BEQ	\$F92A
F921	A9	F9		LDA	##F9
F923	48			PHA	
F924	A9	2A		LDA	##2A
F926	48			PHA	
F927	4C	43	FF	JMP	\$FF43
F92A	58			CLI	

F98D F0 1D	BEQ \$F9AC	F9F8 45 9B	EOR \$9B
F98F 85 A8	STA \$A8	F9FA 85 9B	STA \$9B
F991 D0 19	BNE \$F9AC	F9FC A5 B4	LDA \$B4
F993 E6 A9	INC \$A9	F9FE F0 D2	BEQ \$F9D2
F995 B0 02	BCE \$F999	FA00 C6 A3	DEC \$A3
F997 C6 A9	DEC \$A9	FA02 30 C5	BMI \$F9C9
F999 38	SEC	FA04 46 D7	LSR \$D7
F99A E9 13	SBC #\$13	FA06 66 BF	ROR \$BF
F99C E5 B1	SBC \$B1	FA08 A2 DA	LDX #\$DA
F99E 65 92	ADC \$92	FA0A 20 E2 F8	JSR \$F8E2
F9A0 85 92	STA \$92	FA0D 4C BC FE	JMP \$FEBC
F9A2 A5 A4	LDA \$A4	FA10 A5 96	LDA \$96
F9A4 49 01	EOR #\$01	FA12 F0 04	BEQ \$FA18
F9A6 85 A4	STA \$A4	FA14 A5 B4	LDA \$B4
F9A8 F0 2B	BEQ \$F9D5	FA16 F0 07	BEQ \$FA1F
F9AA B6 D7	STX \$D7	FA18 A5 A3	LDA \$A3
F9AC A5 B4	LDA \$B4	FA1A 30 03	BMI \$FA1F
F9AE F0 22	BEQ \$F9D2	FA1C 4C 97 F9	JMP \$F997
F9B0 AD A3 02	LDA \$02A3	FA1F 46 B1	LSR \$B1
F9B3 29 01	AND #\$01	FA21 A9 93	LDA #\$93
F9B5 D0 05	BNE \$F9BC	FA23 38	SEC
F9B7 AD A4 02	LDA \$02A4	FA24 E5 B1	SBC \$B1
F9BA D0 16	BNE \$F9D2	FA26 65 B0	ADC \$B0
F9BC A9 00	LDA #\$00	FA28 0A	ASL
F9BE 85 A4	STA \$A4	FA29 AA	TAX
F9C0 8D A4 02	STA \$02A4	FA2A 20 E2 F8	JSR \$F8E2
F9C3 A5 A3	LDA \$A3	FA2D E6 9C	INC \$9C
F9C5 10 30	BPL \$F9F7	FA2F A5 B4	LDA \$B4
F9C7 30 BF	BMI \$F988	FA31 D0 11	BNE \$FA44
F9C9 A2 A6	LDX #\$A6	FA33 A5 96	LDA \$96
F9CB 20 E2 F8	JSR \$F8E2	FA35 F0 26	BEQ \$FA5D
F9CE A5 9B	LDA \$9B	FA37 85 A8	STA \$A8
F9D0 D0 B9	BNE \$F98B	FA39 A9 00	LDA #\$00
F9D2 4C BC FE	JMP \$FEBC	FA3B 85 96	STA \$96
F9D5 A5 92	LDA \$92	FA3D A9 B1	LDA #\$81
F9D7 F0 07	BEQ \$F9E0	FA3F 8D 0D DC	STA \$DC0D
F9D9 30 03	BMI \$F9DE	FA42 85 B4	STA \$B4
F9DB C6 B0	DEC \$B0	FA44 A5 96	LDA \$96
F9DD 2C E6 B0	BIT \$B0E6	FA46 85 B5	STA \$B5
F9E0 A9 00	LDA #\$00	FA48 F0 09	BEQ \$FA53
F9E2 85 92	STA \$92	FA4A A9 00	LDA #\$00
F9E4 E4 D7	CPX \$D7	FA4C 85 B4	STA \$B4
F9E6 D0 0F	BNE \$F9F7	FA4E A9 01	LDA #\$01
F9E8 BA	TXA	FA50 8D 0D DC	STA \$DC0D
F9E9 D0 A0	BNE \$F98B	FA53 A5 BF	LDA \$BF
F9EB A5 A9	LDA \$A9	FA55 85 BD	STA \$BD
F9ED 30 BD	BMI \$F9AC	FA57 A5 AB	LDA \$AB
F9EF C9 10	CMP #\$10	FA59 05 A9	DRA \$A9
F9F1 90 B9	BCC \$F9AC	FA5B 85 B6	STA \$B6
F9F3 85 96	STA \$96	FA5D 4C BC FE	JMP \$FEBC
F9F5 B0 B5	BCE \$F9AC		
F9F7 BA	TXA		

FA60; Store tape chars.

FA60 20 97 FB	JSR \$FB97	FAC2 F0 0A	BEQ \$FACE
FA63 85 9C	STA \$9C	FAC4 A9 04	LDA #\$04
FA65 A2 DA	LDX #\$DA	FAC6 20 1C FE	JSR \$FE1C
FA67 20 E2 FB	JSR \$FBE2	FAC9 A9 00	LDA #\$00
FA6A A5 BE	LDA \$BE	FACB 4C 4A FB	JMP \$FB4A
FA6C F0 02	BEQ \$FA70	FACE 20 D1 FC	JSR \$FCD1
FA6E 85 A7	STA \$A7	FAD1 90 03	BCC \$FAD6
FA70 A9 0F	LDA #\$0F	FAD3 4C 48 FB	JMP \$FB48
FA72 24 AA	BIT \$AA	FAD6 A6 A7	LDX \$A7
FA74 10 17	BPL \$FABD	FAD8 CA	DEX
FA76 A5 B5	LDA \$B5	FAD9 F0 2D	BEQ \$FB08
FA78 D0 0C	BNE \$FAB6	FADB A5 93	LDA \$93
FA7A A6 BE	LDX \$BE	FADD F0 0C	BEQ \$FAEB
FA7C CA	DEX	FADF A0 00	LDY #\$00
FA7D D0 0B	BNE \$FABA	FAE1 A5 BD	LDA \$BD
FA7F A9 08	LDA #\$08	FAE3 D1 AC	CMP (\$AC),Y
FAB1 20 1C FE	JSR \$FE1C	FAE5 F0 04	BEQ \$FAEB
FAB4 D0 04	BNE \$FABA	FAE7 A9 01	LDA #\$01
FAB6 A9 00	LDA #\$00	FAE9 85 B6	STA \$B6
FAB8 85 AA	STA \$AA	FAEB A5 B6	LDA \$B6
FABA 4C BC FE	JMP \$FEBC	FAED F0 4B	BEQ \$FB3A
FABD 70 31	BVS \$FAC0	FAEF A2 3D	LDX #\$3D
FABF D0 18	BNE \$FAA9	FAF1 E4 9E	CPX \$9E
FA91 A5 B5	LDA \$B5	FAF3 90 3E	BCC \$FB33
FA93 D0 F5	BNE \$FABA	FAF5 A6 9E	LDX \$9E
FA95 A5 B6	LDA \$B6	FAF7 A5 AD	LDA \$AD
FA97 D0 F1	BNE \$FABA	FAF9 9D 01 01	STA \$0101,X
FA99 A5 A7	LDA \$A7	FAFC A5 AC	LDA \$AC
FA9B 4A	LSR	FAFE 9D 00 01	STA \$0100,X
FA9C A5 BD	LDA \$BD	FB01 E8	INX
FA9E 30 03	BMI \$FAA3	FB02 E8	INX
FAA0 90 18	BCC \$FABA	FB03 86 9E	STX \$9E
FAA2 18	CLC	FB05 4C 3A FB	JMP \$FB3A
FAA3 B0 15	BCS \$FABA	FB08 A6 9F	LDX \$9F
FAA5 29 0F	AND #\$0F	FB0A E4 9E	CPX \$9E
FAA7 85 AA	STA \$AA	FB0C F0 35	BEQ \$FB43
FAA9 C6 AA	DEC \$AA	FB0E A5 AC	LDA \$AC
FAAB D0 DD	BNE \$FABA	FB10 DD 00 01	CMP \$0100,X
FAAD A9 40	LDA #\$40	FB13 D0 2E	BNE \$FB43
FAAF 85 AA	STA \$AA	FB15 A5 AD	LDA \$AD
FAB1 20 BE FB	JSR \$FB8E	FB17 DD 01 01	CMP \$0101,X
FAB4 A9 00	LDA #\$00	FB1A D0 27	BNE \$FB43
FAB6 85 AB	STA \$AB	FB1C E6 9F	INC \$9F
FAB8 F0 D0	BEQ \$FABA	FB1E E6 9F	INC \$9F
FABA A9 B0	LDA #\$B0	FB20 A5 93	LDA \$93
FABC 85 AA	STA \$AA	FB22 F0 0B	BEQ \$FB2F
FABE D0 CA	BNE \$FABA	FB24 A5 BD	LDA \$BD
FAC0 A5 B5	LDA \$B5	FB26 A0 00	LDY #\$00
		FB28 D1 AC	CMP (\$AC),Y
		FB2A F0 17	BEQ \$FB43
		FB2C CB	INX
		FB2D B4 B6	STY \$B6

```

FB2F A5 B6      LDA $B6
FB31 F0 07      BEQ $FB3A
FB33 A9 10      LDA #$10
FB35 20 1C FE    JSR $FE1C
FB38 D0 09      BNE $FB43
FB3A A5 93      LDA $93
FB3C D0 05      BNE $FB43
FB3E A8         TAY
FB3F A5 BD      LDA $BD
FB41 91 AC      STA ($AC),Y
FB43 20 DB FC    JSR $FCDB
FB46 D0 43      BNE $FB8B
FB48 A9 80      LDA #$80
FB4A 85 AA      STA $AA
FB4C 78         SEI
FB4D A2 01      LDX #$01
FB4F 8E 0D DC    STX $DC0D
FB52 AE 0D DC    LDX $DC0D
FB55 A6 BE      LDX $BE
FB57 CA         DEX
FB58 30 02      BMI $FB5C
FB5A 86 BE      STX $BE
FB5C C6 A7      DEC $A7
FB5E F0 08      BEQ $FB68
FB60 A5 9E      LDA $9E
FB62 D0 27      BNE $FB8B
FB64 85 BE      STA $BE
FB66 F0 23      BEQ $FB8B
FB68 20 93 FC    JSR $FC93
FB6B 20 8E FB    JSR $FB8E
FB6E A0 00      LDY #$00
FB70 B4 AB      STY $AB
FB72 B1 AC      LDA ($AC),Y
FB74 45 AB      EOR $AB
FB76 85 AB      STA $AB
FB78 20 DB FC    JSR $FCDB
FB7B 20 D1 FC    JSR $FCD1
FB7E 90 F2      BCC $FB72
FB80 A5 AB      LDA $AB
FB82 45 BD      EOR $BD
FB84 F0 05      BEQ $FB8B
FB86 A9 20      LDA #$20
FB88 20 1C FE    JSR $FE1C
FB8B 4C BC FE    JMP $FEBF

```

FB8E; Reset pointer

```

FB8E A5 C2      LDA $C2
FB90 85 AD      STA $AD
FB92 A5 C1      LDA $C1
FB94 85 AC      STA $AC

```

```

FB96 60         RTS

```

FB97; New character setup

```

FB97 A9 08      LDA #$08
FB99 85 A3      STA $A3
FB9B A9 00      LDA #$00
FB9D 85 A4      STA $A4
FB9F 85 A8      STA $A8
FBA1 85 9B      STA $9B
FBA3 85 A9      STA $A9
FBA5 60         RTS

```

FBA6; Send transition to tape

```

FBA6 A5 BD      LDA $BD
FBA8 4A         LSR
FBA9 A9 60      LDA #$60
FBAB 90 02      BCC $FBAF
FBAD A9 B0      LDA $B0
FBAF A2 00      LDX #$00
FBB1 8D 06 DC    STA $DC06
FBB4 8E 07 DC    STX $DC07
FBB7 AD 0D DC    LDA $DC0D
FBBA A9 19      LDA #$19
FBBB 8D 0F DC    STA $DC0F
FBBF A5 01      LDA $01
FBC1 49 08      EOR #$08
FBC3 85 01      STA $01
FBC5 29 08      AND #$08
FBC7 60         RTS

```

FBC8; Write data to tape

```

FBC8 38         SEC
FBC9 66 B6      ROR $B6
FBCB 30 3C      BMI $FC09

```

FBCD; IRQ entry point

```

FBCD A5 AB      LDA $AB
FBCF D0 12      BNE $FBE3
FBD1 A9 10      LDA #$10
FBD3 A2 01      LDX #$01
FBD5 20 B1 FB    JSR $FBB1
FBD8 D0 2F      BNE $FC09
FBDA E6 AB      INC $AB
FBDC A5 B6      LDA $B6

```

FBDE	10	29		BPL	\$FC09
FBE0	4C	57	FC	JMP	\$FC57
FBE3	A5	A9		LDA	\$A9
FBES	D0	09		BNE	\$FBF0
FBE7	20	AD	FB	JSR	\$FBAD
FBEA	D0	1D		BNE	\$FC09
FBEC	E6	A9		INC	\$A9
FBEE	D0	19		BNE	\$FC09
FBF0	20	A6	FB	JSR	\$FBA6
FBF3	D0	14		BNE	\$FC09
FBF5	A5	A4		LDA	\$A4
FBF7	49	01		EOR	#\$01
FBF9	B5	A4		STA	\$A4
FBFB	F0	0F		BEQ	\$FC0C
FBFD	A5	BD		LDA	\$BD
FBFF	49	01		EOR	#\$01
FC01	B5	BD		STA	\$BD
FC03	29	01		AND	#\$01
FC05	45	9B		EOR	\$9B
FC07	B5	9B		STA	\$9B
FC09	4C	BC	FE	JMP	\$FEBC
FC0C	46	BD		LSR	\$BD
FC0E	C6	A3		DEC	\$A3
FC10	A5	A3		LDA	\$A3
FC12	F0	3A		BEQ	\$FC4E
FC14	10	F3		BPL	\$FC09
FC16	20	97	FB	JSR	\$FB97
FC19	58			CLI	
FC1A	A5	A5		LDA	\$A5
FC1C	F0	12		BEQ	\$FC30
FC1E	A2	00		LDX	#\$00
FC20	86	D7		STX	\$D7
FC22	C6	A5		DEC	\$A5
FC24	A6	BE		LDX	\$BE
FC26	E0	02		CPX	#\$02
FC28	D0	02		BNE	\$FC2C
FC2A	09	80		ORA	#\$80
FC2C	85	BD		STA	\$BD
FC2E	D0	D9		BNE	\$FC09
FC30	20	D1	FC	JSR	\$FCD1
FC33	90	0A		BCC	\$FC3F
FC35	D0	91		BNE	\$FBCB
FC37	E6	AD		INC	\$AD
FC39	A5	D7		LDA	\$D7
FC3B	85	BD		STA	\$BD
FC3D	B0	CA		BCS	\$FC09
FC3F	A0	00		LDY	#\$00
FC41	B1	AC		LDA	(\$AC),Y
FC43	85	BD		STA	\$BD
FC45	45	D7		EOR	\$D7
FC47	85	D7		STA	\$D7
FC49	20	DB	FC	JSR	\$FCD9

```
FC4C D0 BB      BNE $FC09
FC4E A5 9B      LDA $9B
FC50 49 01      EOR #$01
FC52 85 BD      STA $BD
FC54 4C BC FE    JMP $FEB0
```

FC57: Write tape leader

FC57	C6	BE		DEC	\$BE
FC59	D0	03		BNE	\$FC5E
FC5B	20	CA	FC	JSR	\$FCCA
FC5E	A9	50		LDA	##50
FC60	85	A7		STA	\$A7
FC62	A2	08		LDX	##08
FC64	78			SEI	
FC65	20	BD	FC	JSR	\$FCBD
FC68	D0	EA		BNE	\$FC5A
FC6A	A9	78		LDA	##78
FC6C	20	AF	FB	JSR	\$FBAF
FC6F	D0	E3		BNE	\$FC54
FC71	C6	A7		DEC	\$A7
FC73	D0	DF		BNE	\$FC54
FC75	20	97	FB	JSR	\$FB97
FC78	C6	AB		DEC	\$AB
FC7A	10	D8		BPL	\$FC54
FC7C	A2	0A		LDX	##0A
FC7E	20	BD	FC	JSR	\$FCBD
FC81	58			CLI	
FC82	E6	AB		INC	\$AB
FC84	A5	BE		LDA	\$BE
FC86	F0	30		BEQ	\$FCB8
FC88	20	8E	FB	JSR	\$FB8E
FC8B	A2	09		LDX	##09
FC8D	86	A5		STX	\$A5
FC8F	86	B6		STX	\$B6
FC91	D0	83		BNE	\$FC16

FC93: Restore normal IRQ

FC93	08			PHP
FC94	78			SEI
FC95	AD	11	DO	LDA \$D011
FC98	09	10		ORA #\$10
FC9A	BD	11	DO	STA \$D011
FC9D	20	CA	FC	JSR \$FCCA
FCA0	A9	7F		LDA #\$7F
FCA2	8D	0D	DC	STA \$DC0D
FCA5	20	DD	FD	JSR \$FDDD
FCA8	AD	A0	02	LDA \$02A0
FCAE	F0	09		BEQ \$FCB6

FCAD 8D 15 03 STA \$0315
 FCBO AD 9F 02 LDA \$029F
 FCB3 8D 14 03 STA \$0314
 FCB6 28 PLP
 FCB7 60 RTS

FCBB; Set IRQ vector

FCBB 20 93 FC JSR \$FC93
 FCBB F0 97 BEQ \$FC54
 FCBD BD 93 FD LDA \$FD93,X
 FCC0 8D 14 03 STA \$0314
 FCC3 BD 94 FD LDA \$FD94,X
 FCC6 8D 15 03 STA \$0315
 FCC9 60 RTS

FCCA; Kill tape motor

FCCA A5 01 LDA \$01
 FCCC 09 20 ORA #\$20
 FCCE 85 01 STA \$01
 FCD0 60 RTS

FCD1; Check r/w pointer

FCD1 38 SEC
 FCD2 A5 AC LDA \$AC
 FCD4 E5 AE SBC \$AE
 FCD6 A5 AD LDA \$AD
 FCD8 E5 AF SBC \$AF
 FCDA 60 RTS

FCDB; Bump r/w pointer

FCDB E6 AC INC \$AC
 FCDD D0 02 BNE \$FCE1
 FCDF E6 AD INC \$AD
 FCE1 60 RTS

FCE2; Power reset entry

FCE2 A2 FF LDX #\$FF
 FCE4 78 SEI
 FCE5 9A TXS
 FCE6 D8 CLD
 FCE7 20 02 FD JSR \$FD02
 FCEA D0 03 BNE \$FCEF

FCEC 6C 00 80 JMP (\$B000)
 FCEF 8E 16 D0 STX \$D016
 FCF2 20 A3 FD JSR \$FDA3
 FCF5 20 50 FD JSR \$FD50
 FCF8 20 15 FD JSR \$FD15
 FCFB 20 5B FF JSR \$FF5B
 FCFE 58 CLI
 FCFF 6C 00 A0 JMP (\$A000)

FD02; Check 8-rom

FD02 A2 05 LDX #\$05
 FD04 BD 0F FD LDA \$FD0F,X
 FD07 DD 03 80 CMP \$B003,X
 FD0A D0 03 BNE \$FD0F
 FD0C CA DEX
 FD0D D0 F5 BNE \$FD04
 FD0F 60 RTS

FD10; 8-rom mask

FD10 C3 ???
 FD11 C2 ???
 FD12 CD 3B 30 CMP \$303B

FD15; Kernal reset

FD15 A2 30 LDX #\$30
 FD17 A0 FD LDY #\$FD
 FD19 18 CLC

FD1A; Kernal move

FD1A B6 C3 STX \$C3
 FD1C B4 C4 STY \$C4
 FD1E A0 1F LDY #\$1F
 FD20 B9 14 03 LDA \$0314,Y
 FD23 B0 02 BCS \$FD27
 FD25 B1 C3 LDA (\$C3),Y
 FD27 91 C3 STA (\$C3),Y
 FD29 99 14 03 STA \$0314,Y
 FD2C 88 DEY
 FD2D 10 F1 BPL \$FD20
 FD2F 60 RTS

FD30; Vectors

FD30	31	EA	AND (\$EA),Y
FD32	66	FE	ROR \$FE
FD34	47		???
FD35	FE	4A F3	INC \$F34A,X
FD38	91	F2	STA (\$F2),Y
FD3A	0E	F2 50	ASL \$50F2
FD3D	F2		???
FD3E	33		???
FD3F	F3		???
FD40	57		???
FD41	F1	CA	SBC (\$CA),Y
FD43	F1	ED	SBC (\$ED),Y
FD45	F6	3E	INC \$3E,X
FD47	F1	2F	SBC (\$2F),Y
FD49	F3		???
FD4A	66	FE	ROR \$FE
FD4C	A5	F4	LDA \$F4
FD4E	ED	F5 A9	SBC \$A9F5

FD88	98		TYA
FD89	AA		TAX
FDBA	A4	C2	LDY \$C2
FD8C	18		CLC
FDBD	20	2D FE	JSR \$FE2D
FD90	A9	08	LDA #\$08
FD92	8D	B2 02	STA \$0282
FD95	A9	04	LDA #\$04
FD97	8D	88 02	STA \$0288
FD9A	60		RTS

FD9B; IRQ vectors

FD9B	6A		ROR
FD9C	FC		???
FD9D	CD	FB 31	CMP \$31FB
FDA0	EA		NOP
FDA1	2C	F9 A9	BIT \$A9F9

FD50;Initialize system consts.

FD50	A9	00	LDA #\$00
FD52	A8		TAY
FD53	99	02 00	STA \$0002,Y
FD56	99	00 02	STA \$0200,Y
FD59	99	00 03	STA \$0300,Y
FD5C	C8		INY
FD5D	D0	F4	BNE \$FD53
FD5F	A2	3C	LDX #\$3C
FD61	A0	03	LDY #\$03
FD63	86	B2	STX \$B2
FD65	84	B3	STY \$B3
FD67	A8		TAY
FD68	A9	03	LDA #\$03
FD6A	B5	C2	STA \$C2
FD6C	E6	C2	INC \$C2
FD6E	B1	C1	LDA (\$C1),Y
FD70	AA		TAX
FD71	A9	55	LDA #\$55
FD73	91	C1	STA (\$C1),Y
FD75	D1	C1	CMP (\$C1),Y
FD77	D0	0F	BNE \$FD88
FD79	2A		ROL
FD7A	91	C1	STA (\$C1),Y
FD7C	D1	C1	CMP (\$C1),Y
FD7E	D0	08	BNE \$FD88
FD80	8A		TXA
FD81	91	C1	STA (\$C1),Y
FD83	C8		INY
FD84	D0	E8	BNE \$FD6E
FD86	F0	E4	BEQ \$FD6C

FDA3; initialize I/O

FDA3	A9	7F	LDA #\$7F
FDA5	8D	0D DC	STA \$DC0D
FDA8	8D	0D DD	STA \$DD0D
FDA8	8D	00 DC	STA \$DC00
FDAE	A9	08	LDA #\$08
FDB0	8D	0E DC	STA \$DC0E
FDB3	8D	0E DD	STA \$DD0E
FDB6	8D	0F DC	STA \$DC0F
FDB9	8D	0F DD	STA \$DD0F
FDBC	A2	00	LDX #\$00
FDBE	8E	03 DC	STX \$DC03
FDC1	8E	03 DD	STX \$DD03
FDC4	8E	18 D4	STX \$D418
FDC7	CA		DEX
FDC8	8E	02 DC	STX \$DC02
FDCB	A9	07	LDA #\$07
FDCD	8D	00 DD	STA \$DD00
FDD0	A9	3F	LDA #\$3F
FDD2	8D	02 DD	STA \$DD02
FDD5	A9	E7	LDA #\$E7
FDD7	85	01	STA \$01
FDD9	A9	2F	LDA #\$2F
FDD8	85	00	STA \$00

FDDD; Enable timer

FDDD	AD	A6 02	LDA \$02A6
FDE0	F0	0A	BEQ \$FDEC

```

FDE2 A9 25      LDA #$25
FDE4 BD 04 DC    STA $DC04
FDE7 A9 40      LDA #$40
FDE9 4C F3 FD    JMP $FDF3
FDEC A9 95      LDA #$95
FDEE BD 04 DC    STA $DC04
FDF1 A9 42      LDA #$42
FDF3 BD 05 DC    STA $DC05
FDF6 4C 6E FF    JMP $FF6E

```

FDF9; Save filename data

```

FDF9 85 B7      STA $B7
FDFB 86 BB      STX $BB
FDFD 84 BC      STY $BC
FDFE 60         RTS

```

FE00; Save file details

```

FE00 85 B8      STA $B8
FE02 86 BA      STX $BA
FE04 84 B9      STY $B9
FE06 60         RTS

```

FE07; Get status

```

FE07 A5 BA      LDA $BA
FE09 C9 02      CMP #$02
FE0B D0 0D      BNE $FE1A
FE0D AD 97 02    LDA $0297
FE10 48         PHA
FE11 A9 00      LDA #$00
FE13 BD 97 02    STA $0297
FE16 68         PLA
FE17 60         RTS

```

FE18; Flag status

```

FE18 85 9D      STA $9D
FE1A A5 90      LDA $90

```

FE1C; Set status

```

FE1C 05 90      ORA $90
FE1E 85 90      STA $90
FE20 60         RTS

```

FE21; Set timeout

```

FE21 BD 85 02    STA $0285
FE24 60         RTS

```

FE25; Read/set top of memory

```

FE25 90 06      BCC $FE2D

```

FE27; Read top of memory

```

FE27 AE 83 02    LDX $0283
FE2A AC 84 02    LDY $0284

```

FE2D; Set top of memory

```

FE2D 8E 83 02    STX $0283
FE30 8C 84 02    STY $0284
FE33 60         RTS

```

FE34; Read/set bottom of memory

```

FE34 90 06      BCC $FE3C
FE36 AE 81 02    LDX $0281
FE39 AC 82 02    LDY $0282
FE3C 8E 81 02    STX $0281
FE3F 8C 82 02    STY $0282
FE42 60         RTS

```

FE43; NMI entry

```

FE43 78         SEI
FE44 6C 18 03    JMP ($0318)
FE47 48         PHA
FE48 8A         TXA
FE49 48         PHA
FE4A 98         TYA
FE4B 48         PHA
FE4C A9 7F      LDA #$7F
FE4E 8D 0D DD    STA $DD0D
FE51 AC 0D DD    LDY $DD0D
FE54 30 1C      BMI $FE72
FE56 20 02 FD    JSR $FD02
FE59 D0 03      BNE $FE5E

```

```

FE5B 6C 02 80    JMP ($8002)
FE5E 20 BC F6    JSR $F6BC
FE61 20 E1 FF    JSR $FFE1
FE64 D0 0C       BNE $FE72

```

```

FEBC 68          PLA
FEBD A8          TAY
FEBE 68          PLA
FEBF AA          TAX
FEC0 68          PLA
FEC1 40          RTI

```

FE66; Warm start

```

FE66 20 15 FD    JSR $FD15
FE69 20 A3 FD    JSR $FDA3
FE6C 20 18 E5    JSR $E518
FE6F 6C 02 A0    JMP ($A002)
FE72 98          TYA
FE73 2D A1 02    AND $02A1
FE76 AA          TAX
FE77 29 01       AND #$01
FE79 F0 28       BEQ $FEA3
FE7B AD 00 DD    LDA $DD00
FE7E 29 FB       AND #$FB
FE80 05 B5       ORA $B5
FE82 BD 00 DD    STA $DD00
FE85 AD A1 02    LDA $02A1
FE88 BD 0D DD    STA $DD0D
FE8B BA          TXA
FE8C 29 12       AND #$12
FE8E F0 0D       BEQ $FE9D
FE90 29 02       AND #$02
FE92 F0 06       BEQ $FE9A
FE94 20 D6 FE    JSR $FED6
FE97 4C 9D FE    JMP $FE9D
FE9A 20 07 FF    JSR $FF07
FE9D 20 BB EE    JSR $EEBB
FEA0 4C B6 FE    JMP $FEB6
FEA3 BA          TXA
FEA4 29 02       AND #$02
FEA6 F0 06       BEQ $FEAE
FEA8 20 D6 FE    JSR $FED6
FEAB 4C B6 FE    JMP $FEB6
FEAE BA          TXA
FEAF 29 10       AND #$10
FEB1 F0 03       BEQ $FEB6
FEB3 20 07 FF    JSR $FF07

```

FEC2; RS-232 timing table

```

FEC2 C1 27       CMP ($27,X)
FEC4 3E 1A C5    ROL $C51A,X
FEC7 11 74       ORA ($74),Y
FEC9 0E ED 0C    ASL $0CED
FECC 45 06       EOR $06
FECE F0 02       BEQ $FED2
FED0 46 01       LSR $01
FED2 B8          CLV
FED3 00          BRK
FED4 71 00       ADC ($00),Y

```

FED6; NMI RS-232 in

```

FED6 AD 01 DD    LDA $DD01
FED9 29 01       AND #$01
FEDB B5 A7       STA $A7
FEDD AD 06 DD    LDA $DD06
FEE0 E9 1C       SBC #$1C
FEE2 6D 99 02    ADC $0299
FEE5 BD 06 DD    STA $DD06
FEEB AD 07 DD    LDA $DD07
FEEB 6D 9A 02    ADC $029A
FEEE BD 07 DD    STA $DD07
FEF1 A9 11       LDA #$11
FEF3 BD 0F DD    STA $DD0F
FEF6 AD A1 02    LDA $02A1
FEF9 BD 0D DD    STA $DD0D
FEFC A9 FF       LDA #$FF
FEFE BD 06 DD    STA $DD06
FF01 BD 07 DD    STA $DD07
FF04 4C 59 EF    JMP $EF59

```

FEB6; Reset IRQ & exit

```

FEB6 AD A1 02    LDA $02A1
FEB9 BD 0D DD    STA $DD0D

```

FF07; NMI RS-232 out

```

FF07 AD 95 02    LDA $0295
FF0A BD 06 DD    STA $DD06
FF0D AD 96 02    LDA $0296
FF10 BD 07 DD    STA $DD07
FF13 A9 11       LDA #$11
FF15 BD 0F DD    STA $DD0F

```

FEBC; Interrupt exit

```

FF1B A9 12      LDA #$12
FF1A 4D A1 02   EOR $02A1
FF1D 8D A1 02   STA $02A1
FF20 A9 FF      LDA #$FF
FF22 8D 06 DD   STA $DD06
FF25 8D 07 DD   STA $DD07
FF28 AE 98 02   LDX $0298
FF2B 86 A8      STX $A8
FF2D 60         RTS
FF2E AA         TAX
FF2F AD 96 02   LDA $0296
FF32 2A         ROL
FF33 A8         TAY
FF34 BA         TXA
FF35 69 C8      ADC #$C8
FF37 8D 99 02   STA $0299
FF3A 98         TYA
FF3B 69 00      ADC #$00
FF3D 8D 9A 02   STA $029A
FF40 60         RTS
FF41 EA         NOP
FF42 EA         NOP

```

FF43; Fake IRQ

```

FF43 08         PHP
FF44 68         PLA
FF45 29 EF      AND #$EF
FF47 4B         PHA

```

FF48; IRQ entry

```

FF48 4B         PHA
FF49 8A         TXA
FF4A 4B         PHA
FF4B 98         TYA
FF4C 4B         PHA
FF4D BA         TSX
FF4E BD 04 01   LDA $0104,X
FF51 29 10      AND #$10
FF53 F0 03      BEQ $FF58
FF55 6C 16 03   JMP ($0316)
FF58 6C 14 03   JMP ($0314)
FF5B 20 18 E5   JSR $E518
FF5E AD 12 D0   LDA $D012
FF61 D0 FB      BNE $FF5E
FF63 AD 19 D0   LDA $D019
FF66 29 01      AND #$01
FF68 8D A6 02   STA $02A6
FF6B 4C DD FD   JMP $FDDD

```

```

FF6E A9 81      LDA #$81
FF70 8D 0D DC   STA $DC0D
FF73 AD 0E DC   LDA $DC0E
FF76 29 80      AND #$80
FF78 09 11      ORA #$11
FF7A 8D 0E DC   STA $DC0E
FF7D 4C 8E EE   JMP $EEBE
FF80 00         BRK

```

FF81; Jumbo jump table

```

FF81 4C 5B FF   JMP $FF5B
FF84 4C A3 FD   JMP $FDA3
FF87 4C 50 FD   JMP $FD50
FF8A 4C 15 FD   JMP $FD15
FF8D 4C 1A FD   JMP $FD1A
FF90 4C 18 FE   JMP $FE18
FF93 4C B9 ED   JMP $EDB9
FF96 4C C7 ED   JMP $EDC7
FF99 4C 25 FE   JMP $FE25
FF9C 4C 34 FE   JMP $FE34
FF9F 4C 87 EA   JMP $EA87
FFA2 4C 21 FE   JMP $FE21
FFA5 4C 13 EE   JMP $EE13
FFA8 4C DD ED   JMP $EDDD
FFAB 4C EF ED   JMP $EDEF
FFAE 4C FE ED   JMP $EDFE
FFB1 4C 0C ED   JMP $ED0C
FFB4 4C 09 ED   JMP $ED09
FFB7 4C 07 FE   JMP $FE07
FFBA 4C 00 FE   JMP $FE00
FFBD 4C F9 FD   JMP $FDF9
FFC0 6C 1A 03   JMP ($031A)
FFC3 6C 1C 03   JMP ($031C)
FFC6 6C 1E 03   JMP ($031E)
FFC9 6C 20 03   JMP ($0320)
FFCC 6C 22 03   JMP ($0322)
FFCF 6C 24 03   JMP ($0324)
FFD2 6C 26 03   JMP ($0326)
FFD5 4C 9E F4   JMP $F49E
FFD8 4C DD F5   JMP $F5DD
FFDB 4C E4 F6   JMP $F6E4
FFDE 4C DD F6   JMP $F6DD
FFE1 6C 28 03   JMP ($0328)
FFE4 6C 2A 03   JMP ($032A)
FFE7 6C 2C 03   JMP ($032C)
FFEA 4C 9B F6   JMP $F69B
FFED 4C 05 E5   JMP $E505
FFF0 4C 0A E5   JMP $E50A
FFF3 4C 00 E5   JMP $E500

```

FFF6; Hardware vectors

FFF6	52		???
FFF7	52		???
FFFB	42		???
FFF9	59	43 FE	EOR \$FE43,Y
FFFC	E2		???
FFFD	FC		???
FFFE	48		PHA
FFFF	FF		???

M/C instruction set

The following notation applies to this summary:

A	Accumulator
X, Y	Index registers
M	Memory
P	Processor status register
S	Stack Pointer
✓	Change
—	No change
+	Add
∧	Logical AND
—	Subtract
∨	Logical Exclusive-or
→, ←	Transfer to
⋈	Logical (inclusive) OR
PC	Program counter
PCH	Program counter high
PCL	Program counter low
#dd	8-bit immediate data value (2 hexadecimal digits)
aa	8-bit zero page address (2 hexadecimal digits)
aaaa	16-bit absolute address (4 hexadecimal digits)
↑	Transfer from stack (Pull)
↓	Transfer onto stack (Push)

ADC

Add to Accumulator with Carry

Operation: $A + M + C \rightarrow A, C$

N Z C I D V
✓ ✓ ✓ - - ✓

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Immediate	ADC #dd	69	2	2
Zero Page	ADC aa	65	2	3
Zero Page, X	ADC aa,X	75	2	4
Absolute	ADC aaaa	6D	3	4
Absolute, X	ADC aaaa,X	7D	3	4*
Absolute, Y	ADC aaaa,Y	79	3	4*
(Indirect, X)	ADC (aa,X)	61	2	6
(Indirect), Y	ADC (aa),Y	71	2	5*

*Add 1 if page boundary is crossed.

AND

AND Memory with Accumulator

Logical AND to the accumulator

Operation: $A \wedge M \rightarrow A$

N Z C I D V
✓ ✓ - - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Immediate	AND #dd	29	2	2
Zero Page	AND aa	25	2	3
Zero Page, X	AND aa,X	35	2	4
Absolute	AND aaaa	2D	3	4
Absolute, X	AND aaaa,X	3D	3	4*
Absolute, Y	AND aaaa,Y	39	3	4*
(Indirect, X)	AND (aa,X)	21	2	6
(Indirect), Y	AND (aa),Y	31	2	5*

*Add 1 if page boundary is crossed.

ASL

Accumulator Shift Left

Operation: $C \leftarrow \begin{array}{|c|c|c|c|c|c|c|c|} \hline 7 & 6 & 5 & 4 & 3 & 2 & 1 & 0 \\ \hline \end{array} \leftarrow 0$

N Z C I D V
✓ ✓ ✓ - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Accumulator	ASL A	0A	1	2
Zero Page	ASL aa	06	2	5
Zero Page, X	ASL aa,X	16	2	6
Absolute	ASL aaaa	0E	3	6
Absolute, X	ASL aaaa,X	1E	3	7

BCC

Branch on Carry Clear

Operation: Branch on $C = 0$

N Z C I D V
- - - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Relative	BCC aa	90	2	2*

*Add 1 if branch occurs to same page.

Add 2 if branch occurs to different page.

Note: AIM 65 will accept an absolute address as the operand (instruction format BCC aaaa), and convert it to a relative address.

BCS

Branch on Carry Set

Operation: Branch on $C = 1$

N Z C I D V
- - - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Relative	BCS aa	B0	2	2*

*Add 1 if branch occurs to same page.

Add 2 if branch occurs to next page.

Note: AIM 65 will accept an absolute address as the operand (instruction format BCS aaaa), and convert it to a relative address.

BEQ

Branch on Result Equal to Zero

Operation: Branch on $Z = 1$

N Z C I D V

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Relative	BEQ aa	F0	2	2*

*Add 1 if branch occurs to same page.

Add 2 if branch occurs to next page.

Note: AIM 65 will accept an absolute address as the operand (instruction format BEQ aaaa), and convert it to a relative address.

BIT

Test Bits in Memory with Accumulator

Operation: $A \ M, M_7 \rightarrow N, M_6 \rightarrow V$

Bit 6 and 7 are transferred to the Status Register. If the result of $A \ M$ is zero then $Z = 1$, otherwise $Z = 0$

N Z C I D V

$M_7 \checkmark - - - M_6$

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Zero Page	BIT aa	24	2	3
Absolute	BIT aaaa	2C	3	4

BMI

Branch on Result Minus

Operation: Branch on $N = 1$

N Z C I D V

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Relative	BMI aa	30	2	2*

*Add 1 if branch occurs to same page.

Add 2 if branch occurs to different page.

Note: AIM 65 will accept an absolute address as the operand (instruction format BMI aaaa), and convert it to a relative address.

BNE

Branch on Result Not Equal to Zero

Operation: Branch on $Z = 0$

N Z C I D V

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Relative	BNE aa	D0	2	2*

*Add 1 if branch occurs to same page.

Add 2 if branch occurs to different page.

Note: AIM 65 will accept an absolute address as the operand (instruction format BNE aaaa), and convert it to a relative address.

BPL

Branch on Result Plus

Operation: Branch on $N = 0$

N Z C I D V

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Relative	BPL aa	10	2	2*

*Add 1 if branch occurs to same page.

Add 2 if branch occurs to different page.

Note: AIM 65 will accept an absolute address as the operand (instruction format BPL aaaa), and convert it to a relative address.

BRK

Force Break

Operation: Forced Interrupt $PC + 2 \downarrow P \downarrow$

B N Z C I D V

1 --- 1 ---

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Implied	BRK	00	1	7

BVC

Branch on Overflow Clear

Operation: Branch on $V = 0$

N Z C I D V

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Relative	BVC aa	50	2	2*

*Add 1 if branch occurs to same page.

Add 2 if branch occurs to different page.

Note: AIM 65 will accept an absolute address as the operand (instruction format BVC aaaa), and convert it to a relative address.

BVS

Branch on Overflow Set

Operation: Branch on $V = 1$

N Z C I D V

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Relative	BVS aa	70	2	2*

*Add 1 if branch occurs to same page.

Add 2 if branch occurs to different page.

Note: AIM 65 will accept an absolute address as the operand (instruction format BVS aaaa), and convert it to a relative address.

CLC

Clear Carry Flag

Operation: $0 \rightarrow C$

N Z C I D V

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Implied	CLC	18	1	2

CLD

Clear Decimal Mode

Operation: 0 → D

N Z C I D V
- - - - 0 -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Implied	CLD	D8	1	2

CLI

Clear Interrupt Disable Bit

Operation: 0 → I

N Z C I D V
- - - 0 - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Implied	CLI	58	1	2

CLV

Clear Overflow Flag

Operation: 0 → V

N Z C I D V
- - - - - 0

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Implied	CLV	B8	1	2

CMP

Compare Memory and Accumulator

Operation: A — M

N Z C I D V
✓ ✓ ✓ — —

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Immediate	CMP #dd	C9	2	2
Zero Page	CMP aa	C5	2	3
Zero Page, X	CMP aa,X	D5	2	4
Absolute	CMP aaaa	CD	3	4
Absolute, X	CMP aaaa,X	DD	3	4*
Absolute, Y	CMP aaaa,Y	D9	3	4*
(Indirect, X)	CMP (aa,X)	C1	2	6
(Indirect), Y	CMP (aa),Y	D1	2	5*

*Add 1 if page boundary is crossed.

CPX

Compare Memory and Index X

Operation: X — M

N Z C I D V
✓ ✓ ✓ — —

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Immediate	CPX #dd	E0	2	2
Zero Page	CPX aa	E4	2	3
Absolute	CPX aaaa	EC	3	4

CPY

Compare Memory and Index Y

Operation: Y — M

N Z C I D V
✓ ✓ ✓ — —

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Immediate	CPY #dd	C0	2	2
Zero Page	CPY aa	C4	2	3
Absolute	CPY aaaa	CC	3	4

DEC

Decrement Memory by One

Operation: $M - 1 \rightarrow M$

N Z C I D V
✓ ✓ - - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Zero Page	DEC aa	C6	2	5
Zero Page, X	DEC aa,X	D6	2	6
Absolute	DEC aaaa	CE	3	6
Absolute, X	DEC aaaa,X	DE	3	7

DEX

Decrement Index X by One

Operation: $X - 1 \rightarrow X$

N Z C I D V
✓ ✓ - - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Implied	DEX	CA	1	2

DEY

Decrement Index Y by One

Operation: $Y - 1 \rightarrow Y$

N Z C I D V
✓ ✓ - - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Implied	DEY	88	1	2

EOR

Exclusive-OR Memory with Accumulator

Operation: $A \vee M \rightarrow A$

N Z C I D V
✓ / - - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Immediate	EOR #dd	49	2	2
Zero Page	EOR aa	45	2	3
Zero Page, X	EOR aa,X	55	2	4
Absolute	EOR aaaa	4D	3	4
Absolute, X	EOR aaaa,X	5D	3	4*
Absolute, Y	EOR aaaa,Y	59	3	4*
(Indirect, X)	EOR (aa,X)	41	2	6
(Indirect), Y	EOR (aa),Y	51	2	5*

*Add 1 if page boundary is crossed.

INC

Increment Memory by One

Operation: $M + 1 \rightarrow M$

N Z C I D V
✓ / - - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Zero Page	INC aa	E6	2	5
Zero Page, X	INC aa,X	F6	2	6
Absolute	INC aaaa	EE	3	6
Absolute, X	INC aaaa,X	FE	3	7

INX

Increment Index X by One

Operation: $X + 1 \rightarrow X$

N Z C I D V
✓ / - - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Implied	INX	E8	1	2

INY

Increment Index Y by One

Operation: $Y + 1 \rightarrow Y$

N Z C I D V
✓ ✓ - - - -

Addressing Mode	Assembly Language Form	OP Code	No. Bytes	No. Cycles
Implied	INY	C8	1	2

JMP

Jump

Operation: $(PC + 1) \rightarrow PCL$
 $(PC + 2) \rightarrow PCH$

N Z C I D V
- - - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Absolute	JMP aaaa	4C	3	3
Indirect	JMP (aaaa)	6C	3	5

JSR

Jump to Subroutine

Operation: $PC + 2 \downarrow, (PC + 1) \rightarrow PCL$
 $(PC + 2) \rightarrow PCH$

N Z C I D V
- - - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Absolute	JSR aaaa	20	3	6

LDA

Load Accumulator with Memory

Operation: M → A

N Z C I D V

✓ / - - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Immediate	LDA #dd	A9	2	2
Zero Page	LDA aa	A5	2	3
Zero Page, X	LDA aa,X	B5	2	4
Absolute	LDA aaaa	AD	3	4
Absolute, X	LDA aaaa,X	BD	3	4*
Absolute, Y	LDA aaaa,Y	B9	3	4*
(Indirect, X)	LDA (aa,X)	A1	2	6
(Indirect), Y	LDA (aa),Y	B1	2	5*

*Add 1 if page boundary is crossed.

LDX

Load Index X with Memory

Operation: M → X

N Z C I D V

✓ / - - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Immediate	LDX #dd	A2	2	2
Zero Page	LDX aa	A6	2	3
Zero Page, Y	LDX aa,Y	B6	2	4
Absolute	LDX aaaa	AE	3	4
Absolute, Y	LDX aaaa,Y	BE	3	4*

*Add 1 when page boundary is crossed.

LDY

Load Index Y with Memory

Operation: M → Y

N Z C I D V

✓ / - - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Immediate	LDY #dd	A0	2	2
Zero Page	LDY aa	A4	2	3
Zero Page, X	LDY aa,X	B4	2	4
Absolute	LDY aaaa	AC	3	4
Absolute, X	LDY aaaa,X	BC	3	4*

*Add 1 when page boundary is crossed.

LSR

Local Shift Right

Operation: 0 →

7	6	5	4	3	2	1	0
---	---	---	---	---	---	---	---

 → C

N Z C I D V

0 ✓ / - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Accumulator	LSR A	4A	1	2
Zero Page	LSR aa	46	2	5
Zero Page, X	LSR aa,X	56	2	6
Absolute	LSR aaaa	4E	3	6
Absolute, X	LSR aaaa,X	5E	3	7

NOP

No Operation

Operation: No Operation (2 cycles)

N Z C I D V

- - - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Implied	NOP	EA	1	2

ORA

OR Memory with Accumulator

Operation: A V M → A

N Z C I D V
✓ / - - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Immediate	ORA #dd	09	2	2
Zero Page	ORA aa	05	2	3
Zero Page, X	ORA aa,X	15	2	4
Absolute	ORA aaaa	0D	3	4
Absolute, X	ORA aaaa,X	1D	3	4*
Absolute, Y	ORA aaaa,Y	19	3	4*
(Indirect, X)	ORA (aa,X)	01	2	6
(Indirect), Y	ORA (aa),Y	11	2	5*

*Add 1 on page crossing.

PHA

Push Accumulator on Stack

Operation: A ↓

N Z C I D V
- - - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Implied	PHA	48	1	3

PHP

Push Processor Status on Stack

Operation: P ↓

N Z C I D V
- - - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Implied	PHP	08	1	3

PLA

Pull Accumulator from Stack

Operation: A ↑

N Z C I D V
✓ / - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Implied	PLA	68	1	4

PLP

Pull Processor Status from Stack

Operation: P ↑

N Z C I D V
From Stack

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Implied	PLP	28	1	4

ROL

Rotate Left

Operation:

M or A							
7	6	5	4	3	2	1	0

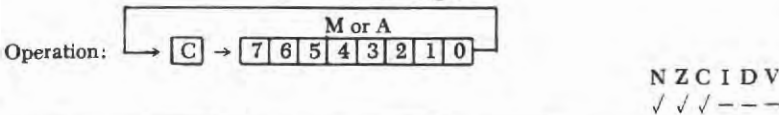
 ← C ←

N Z C I D V
✓ / ✓ - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Accumulator	ROL A	2A	1	2
Zero Page	ROL aa	26	2	5
Zero Page, X	ROL aa,X	36	2	6
Absolute	ROL aaaa	2E	3	6
Absolute, X	ROL aaaa,X	3E	3	7

ROR

Rotate Right



Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Accumulator	ROR A	6A	1	2
Zero Page	ROR aa	66	2	5
Zero Page, X	ROR aa,X	76	2	6
Absolute	ROR aaaa	6E	3	6
Absolute, X	ROR aaaa,X	7E	3	7

RTI

Return from Interrupt



Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Implied	RTI	40	1	6

RTS

Return from Subroutine



Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Implied	RTS	60	1	6

SBC

Subtract from Accumulator with Carry

Operation: $A - M - \overline{C} \rightarrow A$

Note: $\overline{C}$ = Borrow

N Z C I D V

✓ ✓ ✓ - - ✓

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Immediate	SBC #dd	E9	2	2
Zero Page	SBC aa	E5	2	3
Zero Page, X	SBC aa,X	F5	2	4
Absolute	SBC aaaa	ED	3	4
Absolute, X	SBC aaaa,X	FD	3	4*
Absolute, Y	SBC aaaa,Y	F9	3	4*
(Indirect, X)	SBC (aa,X)	E1	2	6
(Indirect), Y	SBC (aa),Y	F1	2	5*

*Add 1 when page boundary is crossed.

SEC

Set Carry Flag

Operation: $1 \rightarrow C$

N Z C I D V

- - 1 - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Implied	SEC	38	1	2

SED

Set Decimal Mode

Operation: $1 \rightarrow D$

N Z C I D V

- - - - 1 -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Implied	SED	F8	1	2

SEI

Set Interrupt Disable Status

Operation: 1 → I

N Z C I D V
- - - 1 - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Implied	SEI	78	1	2

STA

Store Accumulator in Memory

Operation: A → M

N Z C I D V
- - - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Zero Page	STA aa	85	2	3
Zero Page, X	STA aa,X	95	2	4
Absolute	STA aaaa	8D	3	4
Absolute, X	STA aaaa,X	9D	3	5
Absolute, Y	STA aaaa,Y	99	3	5
(Indirect, X)	STA (aa,X)	81	2	6
(Indirect, Y)	STA (aa),Y	91	2	6

STX

Store Index X in Memory

Operation: X → M

N Z C I D V
- - - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Zero Page	STX aa	86	2	3
Zero Page, Y	STX aa,Y	96	2	4
Absolute	STX aaaa	8E	3	4

STY

Store Index Y in Memory

Operation: $Y \rightarrow M$

N Z C I D V

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Zero Page	STY aa	84	2	3
Zero Page, X	STY aa,X	94	2	4
Absolute	STY aaaa	8C	3	4

TAX

Transfer Accumulator to Index X

Operation: $A \rightarrow X$

N Z C I D V

✓ ✓ - - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Implied	TAX	AA	1	2

TAY

Transfer Accumulator to Index Y

Operation: $A \rightarrow Y$

N Z C I D V

✓ ✓ - - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Implied	TAY	A8	1	2

TSX

Transfer Stack Pointer to Index X

Operation: $S \rightarrow X$

N Z C I D V
✓ ✓ - - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Implied	TSX	BA	1	2

TXA

Transfer Index X to Accumulator

Operation: $X \rightarrow A$

N Z C I D V
✓ ✓ - - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Implied	TXA	8A	1	2

TXS

Transfer Index X to Stack Pointer

Operation: $X \rightarrow S$

N Z C I D V
- - - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Implied	TXS	9A	1	2

TYA

Transfer Index Y to Accumulator

Operation: $Y \rightarrow A$

N Z C I D V
✓ ✓ - - - -

Addressing Mode	Assembly Language Form	OP CODE	No. Bytes	No. Cycles
Implied	TYA	98	1	2

Extramón: A Machine Code Assembler

```
100 PRINT "TINY PEEKER/POKER"
110 X$="*": INPUT X$: IF X$="*" THEN END
120 GOSUB 500
130 IF E GOTO 280
140 A=V
150 IF J > LEN(X$) GOTO 300
160 FOR I=0 TO 7
170 P=J: GOSUB 550
180 C(I)=V
190 IF E GOTO 280
200 NEXT I
210 T=0
220 FOR I=0 TO 7
230 POKE A+I, C(I)
240 T=T+C(I)
250 NEXT I
260 PRINT "CHECKSUM="; T
270 GOTO 110
280 PRINT MID$(X$, 1, J); "??": GOTO 110
300 T=0
310 FOR I=0 TO 7
320 V=PEEK(A+I)
330 T=T+V
340 V=V/16
350 PRINT " ";
360 FOR J=1 TO 2
370 V%=V
380 V=(V-V%)*16
390 IF V%>9 THEN V%=V%+7
400 PRINT CHR$(V%+48);
410 NEXT J
420 NEXT I
430 PRINT "/"; T
440 GOTO 110
500 P=1
510 L=4
520 GOTO 600
550 P=J
560 L=2
600 E=0
610 V=0
620 FOR J=P TO LEN(X$)
630 X=ASC(MID$(X$, J))
640 IF X=32 THEN NEXT J
650 IF J > LEN(X$) THEN 790
660 P=J
670 FOR J=PTOLEN(X$)
680 X=ASC(MID$(X$, J))
```

```

690 IF X<>32 THEN NEXT J
700 IF J-P<>L THEN 790
710 FORK=PTDJ-1
720 X=ASC(MID$(X$,K))
730 IF X<58 THEN X=X-48
740 IF X<64 THEN X=X-55
750 IF X<0 OR X>15 THEN 790
760 V=V*16+X
770 NEXT K
780 RETURN
790 E=-1
800 RETURN

```

```

:10B90 00 1A 08 64 00 99 22 93
:10B08 12 10 1D 10 53 55 50
:10B10 45 52 20 56 34 20 4D 4F
:10B18 4E 00 31 08 6E 00 99 22
:10B20 11 20 20 20 20 20 20
:10B28 20 20 20 20 20 20 26
:10B30 40 48 08 78 00 99 22 11
:10B38 20 2E 2E 4A 49 20 42
:10B40 55 54 54 54 52 46 49 45
:10B48 4C 44 00 66 08 82 00 9E
:10B50 28 C2 28 34 33 29 AA 32
:10B58 35 36 AC C2 28 34 34 29
:10B60 AA 31 32 37 29 00 00 00
:10B68 AA AA AA AA AA AA AA
:10B70 AA AA AA AA AA AA AA
:10B78 AA AA AA AA AA AA AA

```

```

:10A00 02 20 4B FA 00 AD 3A 02
:10A08 20 4B FA 00 20 87 FB 00
:10A10 20 8D FB 00 F0 5C 20 3E
:10A18 F8 00 20 79 FA 00 90 33
:10A20 20 69 FA 00 20 3E FB 00
:10A28 20 79 FA 00 90 2B 20 69
:10A30 FA 00 A9 90 20 82 FF 20
:10A38 E1 FF F0 3C A6 26 D0 39
:10A40 A5 C3 C5 C1 A5 C4 E5 C2
:10A48 90 2E A0 3A 20 C2 FB 00
:10A50 20 41 FA 00 20 BB FB 00
:10A58 F0 E0 4C ED FA 00 20 79
:10A60 FA 00 70 03 20 80 FB 00
:10A68 20 B7 FB 00 D0 07 20 79
:10A70 FA 00 90 EB A9 08 85 1D
:10A78 20 3E FB 00 20 41 FB 00

```

```

:10C00 60 A2 02 2C A2 03 00 B4
:10C08 C1 00 08 B4 C2 D0 02 E6
:10C10 26 D6 C2 D6 C1 60 20 7E
:10C18 FB 00 C9 20 F0 F9 60 49
:10C20 00 00 8D 00 00 31 20 CC
:10C28 FA 00 20 BF FA 00 20 7C
:10C30 FA 00 90 09 60 20 3E FB
:10C38 00 20 79 FA 00 80 DE 4E
:10C40 3F 02 9A A9 90 20 D2 FF
:10C48 A9 3F 20 D2 FF 4C 47 FB
:10C50 00 20 54 FD 00 CA D0 7B
:10C58 60 E6 C3 D0 02 E6 C4 95
:10C60 A2 02 B5 C0 4B 85 27 95
:10C68 00 68 95 27 CA D0 F3 60
:10C70 A5 C3 A4 C4 38 F9 02 B0
:10C78 0E B8 90 6B 85 2B A4 29

```

```

:10B80 A5 20 B5 22 A5 2E B5 23
:10B88 A5 37 B5 24 A5 3B B5 25
:10B90 A0 00 A5 22 D0 02 C6 23
:10B98 C6 22 B1 22 D0 02 C6 22
:10BA0 D0 02 C6 23 C6 22 B1 22
:10BA8 D0 21 25 26 A5 22 D0 02
:10BB0 C6 23 C6 22 B1 22 1B 65
:10BB8 AA A5 26 A5 25 4B A5
:10BC0 37 D0 02 C6 3B C6 37 68
:10BC8 91 37 BA 4B A5 37 D0 02
:10BD0 C6 38 C6 37 68 91 37 1B
:10BD8 90 B6 C9 4F D0 ED A5 37
:10BE0 B5 35 A5 3A B5 34 AC 57
:10BE8 00 4F 4F 4F 4D E6 6F
:10BF0 00 8D 16 02 AD E7 FF 00
:10BF8 BD 17 03 A9 80 20 90 FF

```

```

:10AB0 D0 FB 4C 47 FB 00 20 CF
:10AB8 FF C9 0D F0 0C C9 20 D0
:10AB0 D1 20 79 FA 00 90 03 20
:10AB8 B0 FB 00 A9 90 20 D2 FF
:10AB0 AE 3F 02 9A 7B AD 3B 02
:10AB8 4B AD 3A 02 4B AD 3B 02
:10AB0 4B AD 3C 02 AE 3D 02 AC
:10AB8 3E 02 40 A9 90 20 D2 FF
:10AB0 AE 3F 02 9A AC 02 40 A0
:10AB8 01 B4 B4 B4 B9 B8 B4 B5
:10AB0 B4 90 84 93 A9 40 85 BE
:10AB8 A9 02 B5 BC 20 CF FF C9
:10AB0 20 F0 F9 C9 0D F0 3B C9
:10AB8 22 D0 14 20 CF FF C9 22
:10AB0 F0 10 C9 0D F0 29 91 B8
:10AB8 E6 B7 EB C0 10 D0 EL AC

```

```

:10CB0 4C 33 FB 00 A5 C3 A4 C4
:10CB8 3B E5 C1 B5 1E 9B E5 C2
:10CB0 A8 05 1E 60 20 D4 FA 00
:10CB8 20 69 FA 00 20 E5 FA 00
:10CB0 00 0C FB 00 20 E5 FA 00
:10CB8 20 2F FB 00 20 69 FA 00
:10CB0 90 15 A6 26 D0 64 20 2B
:10CB8 FB 00 5F 01 C1 B1 C3
:10CB0 20 05 FB 00 20 33 FB 00
:10CB8 D0 EB 20 2B FB 00 1B A5
:10CB0 1E A5 C3 B5 C3 9B 65 C4
:10CB8 B5 C4 20 0C FB 00 A6 26
:10CB0 D0 3D A1 C1 B1 C3 20 2B
:10CB8 FB 00 B0 34 20 B8 FA 00
:10CB0 20 BB FA 00 4C 7D FB 00
:10CB8 20 D4 FA 00 20 69 FA 00

```

```

:10B00 00 03 D8 68 B0 3E 02 68
:10B08 BD 3D 02 68 B0 3C 02 68
:10B10 BD 3D 02 68 AA 68 AB 38
:10B18 BA 9E 02 BD 3A 02 98 E9
:10B20 00 8D 39 02 BA BE 3F
:10B28 02 20 57 FD 00 A2 42 A9
:10B30 2A 20 57 FA 00 A9 52 D0
:10B38 34 E6 C1 00 06 E6 C2 00
:10B40 02 E6 26 60 20 CF FF C9
:10B48 00 D0 FB 68 68 A9 90 20
:10B50 D2 FF A9 00 00 B5 26 A2
:10B58 00 A9 2E 20 57 FA 00 A9
:10B60 05 20 D2 F0 3E FB 00
:10B68 C9 2E FF F9 C9 20 F0 F5
:10B70 A2 0E D0 B7 FF 00 D0 0C
:10B78 BA 06 AA BD C7 FF 00 4B

```

```

:10B80 ED FA 00 20 CF FF C9 0D
:10B88 F0 16 C9 2C D0 DC 20 B8
:10B90 FA 00 29 F0 F9 C9 03
:10B98 F0 E5 B5 BA 20 CF FF C9
:10B00 D0 60 AC 30 03 AC 32 03
:10B08 20 96 F9 00 D0 D4 90 FF
:10B10 20 D2 FF A9 00 20 EF
:10B18 F9 00 A5 29 10 D0 C4
:10B20 4C 47 FB 00 20 96 F9 00
:10B28 C9 2C D0 BA 20 79 FA 00
:10B30 20 69 FA 00 20 CF FF C9
:10B38 2C D0 20 79 FA 00 A5
:10B40 C1 B5 AE A5 C2 B5 4F D0
:10B48 69 FA 00 20 CF FF C9 0D
:10B50 D0 9B A9 90 20 D2 FF 20
:10B58 F2 F9 00 4C 47 FB 00 A5

```

```

:10DB0 20 E5 FA 00 20 69 FA 00
:10DB8 2E 3E FB 00 20 B8 FA 00
:10DB0 20 14 B5 1D A6 26 D0 11
:10DB8 20 2F FB 00 90 AC A5 1D
:10DB0 B1 C1 20 33 FB 00 D0 EE
:10DB8 4C ED FA 00 4C 47 FB 00
:10DB0 20 D4 FA 00 20 69 FA 00
:10DB8 20 E5 FA 00 20 69 FA 00
:10DB0 3E 3E FB 00 A2 00 20
:10DB8 3E FB 00 C9 27 D0 14 20
:10DB0 3E FB 00 9D 10 02 B8 20
:10DB8 CF FF C9 0D F0 22 E0 20
:10DB0 F1 F0 1C 0E 00 00 01
:10DB8 20 BF FA 00 90 C6 9D 00
:10DB0 02 EB 20 CF FF C9 0D F0
:10DB8 20 B8 FA 00 90 B6 E0 20

```

```

:10DB0 B6 C6 FF 00 4B 60 CA 10
:10DB8 ED AC ED FA 00 A5 C1 B0
:10DB0 3A 02 A5 C2 BD 39 02 60
:10DB8 A9 08 1D A0 90 00 20
:10DB0 54 FD 00 B1 C1 20 4B FA
:10DB8 00 20 33 FB 00 C6 1D D0
:10DB0 F1 60 20 B8 FA 00 90 0B
:10DB8 00 00 B1 C1 C1 C1 F0
:10DB0 03 AC ED FA 00 20 33 FB
:10DB8 00 C6 1D 60 A9 38 B5 C1
:10DB0 A9 02 B5 C2 A9 05 60 98
:10DB8 4B 20 57 FD 00 68 A2 3E
:10DB0 AC 57 FA 00 A9 20 D0
:10DB8 FF A2 00 00 BD EA FF 00
:10DB0 20 D2 FF EB E0 16 D0 F5
:10DB8 A0 3B 20 C2 FB 00 AD 39

```

```

:10DB0 C2 20 4B FA 00 A5 C1 4B
:10DB8 4A 4A 4A 20 60 FA 00
:10DB0 AA 6B 29 F0 20 60 FA 00
:10DB8 4B 8A 20 D2 FF 68 AC D0
:10DB0 FF 09 30 C9 3A 00 02 6F
:10DB8 06 60 A2 02 B5 C0 4B B5
:10DB0 C2 95 C0 6B 95 C4 D0
:10DB8 F3 60 20 B8 FA 00 90 02
:10DB0 B5 C2 20 B8 FA 00 90 02
:10DB8 B5 C1 60 A9 00 85 2A
:10DB0 20 3E FB 00 C9 20 D0 09
:10DB8 20 3E FB 00 C9 20 D0 0E
:10DB0 1B 60 20 BF FA 00 A9
:10DB8 0A 0A B5 24 20 3E FB 00
:10DB0 20 AF FA 00 05 2A 3B 60
:10DB8 C9 3A 90 02 69 08 29 0F

```

```

:10DB0 20 D0 EC B6 1C A9 90 20
:10DB8 D2 FF 20 57 FD 00 A2 00
:10DB0 00 00 00 00 B1 C1 D0 10
:10DB8 02 D0 0C B8 EB 41 00 D0
:10DB0 F3 20 20 41 FA 00 20 54 FB
:10DB8 00 20 33 FB 00 06 26 D0
:10DB0 00 2F FB 00 00 D0 4C
:10DB8 47 FB 00 20 D4 FA 00 B5
:10DB0 20 A5 C2 B5 21 A2 00 00
:10DB8 B8 2B A9 93 20 D2 FF A9
:10DB0 90 20 D2 FF A9 16 B5 10
:10DB8 20 68 FC 00 20 CA FC 00
:10DB0 B5 C1 B4 C2 CA 1D 00 F2
:10DB8 A9 91 20 D2 FF 4C 47 FB
:10DB0 00 A0 2C 20 C2 FB 00 20
:10DB8 54 FD 00 20 41 FA 00 20

```

```

:10E00 54 FD 00 A2 00 00 A1 C1 :10FB0 F6 CA D0 ED A2 02 20 CF :11100 59 00 00 58 24 24 00 00
:10E08 20 D9 FC 00 48 20 1F FD :10FB8 FF C9 0D F0 1E C9 20 F0 :11108 1C BA 1C 23 50 88 18 A1
:10E10 00 68 20 35 FD 00 A2 06 :10FB9 F5 20 D0 FE 00 80 0F 20 :11110 9D BA 1D 23 9D 88 1D A1
:10E18 03 05 00 12 A4 1F F0 0E :10FB9 9C FA 00 A4 C1 84 C2 85 :11118 00 00 29 19 AE 69 68 19
:10E20 A5 2A C9 EB 81 C1 80 1C :10FB0 C1 A9 20 9D 10 02 EB 9D :11120 23 24 53 18 23 24 53 19
:10E28 20 C2 FC 00 8B 00 F2 06 :10FB1 10 02 EB D0 DB 86 28 A2 :11128 A1 00 00 1A 58 58 65 69
:10E30 2A 90 0E 8D 2A FF 00 20 :10FB0 00 00 86 26 F0 04 E6 26 :11130 24 24 AE AE AB AD 29 00
:10E38 A5 FD 00 80 30 FF 00 F0 :10FB8 F0 75 A2 00 00 86 1D A5 :11138 00 7C 00 00 15 9C 6D 9C
:10E40 03 20 A5 FD 00 CA D0 05 :10FC0 26 20 D9 FC 00 A6 2A 86 :11140 A5 69 29 53 84 13 34 11
:10E48 60 20 CD FC 00 AA EB D0 :10FB8 29 A6 BC 37 FF 00 8D 77 :11148 A5 69 23 A0 DB 62 5A 48
:10E50 01 CB 98 20 C2 FC 00 8A :10FD0 FF 00 20 89 FE 00 D0 E3 :11150 26 62 94 88 54 44 CB 54
:10E58 86 1C 20 48 FA 00 A6 1C :10FB8 A2 06 E0 03 D0 19 A4 1F :11158 68 44 EB 94 00 00 84 08
:10E60 60 A5 1F 3B A4 C2 AA 10 :10FD0 F0 15 A5 2A C9 EB A9 30 :11160 84 74 84 28 AE 74 FA CC
:10E68 01 88 65 C1 90 01 CB 60 :10FB8 80 21 20 BF FE 00 D0 CC :11168 A4 72 F2 A4 BA 00 00 AA
:10E70 A4 90 08 A4 80 17 C9 :10FF0 20 C1 FE 00 D0 C7 88 D0 :11170 A2 A2 74 74 74 72 44 68
:10E78 22 F0 13 29 07 09 80 4A :10FB8 EB D6 2A 90 08 BC 30 FF :11178 82 32 82 00 00 22 00 00

:10EB0 AA 8D 04 FE 00 80 04 4A :11000 00 8D 2A FF 00 20 89 FE :11180 1A 1A 26 26 72 72 88 CB
:10EB8 4A 4A 4A 29 0F D0 04 A0 :11008 00 D0 85 CA D0 D1 F0 0A :11188 C4 CA 26 48 44 44 A2 CB
:10E90 80 A9 00 00 AA 8D 1D FF :11010 20 88 FE 00 D0 AB 20 88 :11190 3A 38 52 40 47 58 4C 53
:10E98 00 85 2A 29 03 85 1F 98 :11018 FE 00 D0 A6 A5 28 C5 10 :11198 5A 46 48 44 50 2C C1 42
:10EA0 29 8F AA 98 A0 03 E0 8A :11020 D0 A0 20 A9 FA 00 A4 1F :111A0 F9 00 35 F9 00 CB F9 00
:10EA8 F0 08 4A 90 0B 4A 4A 09 :11028 F0 28 A5 29 C9 9D D0 1A :111A8 F7 F8 00 56 F9 00 BF F9
:10EB0 20 88 D0 FA CB 8B D0 F2 :11030 20 1C FB 00 90 08 9B D0 :111B0 0A FA F9 00 0C FA 00 3E
:10EB8 60 81 C1 20 C2 FC 00 A2 :11038 04 A5 1E 10 04 CD ED FA :111B8 F8 00 92 F8 00 C0 FB 00
:10EC0 01 20 FE FA 00 C4 1F CB :11040 00 CB D0 FA A5 1E 10 F6 :111C0 38 FC 00 58 F0 00 8A FD
:10EC8 90 F1 A2 03 C0 04 90 F2 :11048 A4 1F D0 03 89 C2 00 00 :111C8 00 AC FD 00 46 F8 00 FF
:10ED0 A0 8B 97 37 FF 00 85 28 :11050 91 C1 88 D0 F8 A5 26 91 :111D0 F7 00 ED F7 00 00 20 20
:10ED8 89 77 FF 00 85 29 A9 00 :11058 C2 20 CA FC 00 85 C1 84 :111D8 20 50 43 20 20 53 52 20
:10EE0 00 A0 05 06 29 26 28 2A :11060 C2 A9 90 20 D2 FF A0 41 :111E0 A1 43 20 58 52 20 59 52
:10EE8 88 D0 FB 69 3F 20 D2 FF :11068 20 C2 F8 00 20 54 FD 00 :111E8 20 53 50 58 80 01 22 20
:10EF0 CA D0 C2 A9 20 2C A9 00 :11070 20 A1 FA 00 20 54 FD 00 :
:10EF8 4C D2 FF 20 D4 FA 00 20 :11078 A9 05 20 D2 FF 4C 80 FD

:10F00 69 FA 00 20 E5 FA 00 20 :11080 00 AB 20 BF FE 00 D0 11 :11088 98 F0 0E 86 1C A6 1D 00
:10F08 69 FA 00 A2 00 00 86 2B :11090 10 02 0E EB 86 1D A6 1C :11098 28 60 C9 30 90 03 C9 47
:10F10 A9 90 20 D2 FF 20 57 FD :110A0 60 38 60 00 02 45 03 D0 :110A8 08 40 09 30 22 45 33 D0
:10F18 00 20 72 FC 00 20 CA FC :110B0 08 40 09 40 02 45 33 D0 :110B8 08 40 09 40 02 45 33 D0
:10F20 00 85 C1 84 C2 20 E1 FF :110C0 08 40 09 00 00 22 44 33 :110C8 08 40 09 00 00 22 44 33
:10F28 F0 05 20 2F FB 00 80 E9 :110D0 33 D0 BC 44 9A 10 22 44 :110D8 33 D0 BC 44 9A 10 22 44
:10F30 4C 47 FB 00 20 D4 FA 00 :110E0 33 D0 08 40 09 62 13 78 :110E8 A9 00 00 21 81 82 00 00
:10F38 A9 03 85 1D 20 3E F8 00 :110F0 00 00 59 4D 91 92 86 4A :110F8 85 9D 2C 29 2C 23 28 24
:10F40 20 A1 FB 00 D0 FB A5 20 :
:10F48 85 C1 A5 21 85 C2 4C 46 :
:10F50 FC 00 C5 28 F0 03 20 D2 :
:10F58 FF 60 20 D4 FA 00 00 69 :
:10F60 FA 00 BE 11 02 A2 03 20 :
:10F68 CC FA 00 48 CA D0 F9 A2 :
:10F70 03 68 38 E9 3F A0 05 4A :
:10F78 AE 11 02 6F 10 02 88 D0 :

```

Instructions for entering and using Supermon64

Entering the program

Enter in immediate mode:

POKE 8192,0:POKE 44,32:NEW <return>

This moves the start of Basic to decimal 12800, and gives us room to put in Supermon. Now type in Tiny Peeker/Poker.

Run the program, and in answer to the question prompt type in the memory address and memory contents as given in the 20 blocks of data at the end of this section. You can look at memory just by entering the memory address.

When you've finished, type in immediate mode:

POKE 44,08:CLR <return>

which puts Basic back to normal again. You can now save Supermon by using a normal Basic SAVE. Before running it, you'll need to check that it's all there, so in immediate mode, enter the following line (you'll need to use Basic abbreviations e.g. 'P' for PRINT, 'F' shifted E for PEEK, and so on, to fit it all in):

```
M=1:FORJ=0TO18:FORI=2048+128*NTO2047+128*N:A=A+
PEEK(I):NEXTI:PRINTA;J:A=0:N=N+1:M=M+1:NEXTJ
```

This should display the following numbers on your screen, together with the block number :

```
10021, 13841, 14762, 15283, 14641, 16091, 16771,
13076, 15720, 14716, 14189, 15165, 14543, 15051,
14669, 16467, 16259, 9635, 11241
```

although they'll be in column form on the screen. Due to the vagaries of Basic the first number might differ (I got 12205 once!), but running the check again should sort it out. If one of your numbers disagrees, we'll need to go back to the beginning with Tiny Pecker again. So, enter the first set of POKes again (Supermon will still be there), enter or re-load Tiny Pecker, and check each incorrect block. The last block will have to be checked by hand.

When you've done that, enter POKE 44,08:CLR again, re-SAVE Supermon, and run the checking program. When you've finally got it right, the 64 is yours for the disassembling!

Using Supermon 64

This will be given in the form COMMAND, followed by the syntax.

- 1) Simple Assembler
 .A 2000 LDA#12
 start assembly at 2000 hex.
- 2) Disassembler
 .D 2000
 disassemble hex from 2000 onwards.
- 3) Printing Disassembler
 .P 2000,2040
 engage printer beforehand with OPEN4,4:CMD4.
- 4) Fill memory
 .F 1000 1100 FF
 fill memory from 1000 to 1100 hex with the byte FF.
- 5) Go run
 .G 1000
 go to hex 1000 and execute program there.
- 6) Hunt memory
 .H C000 D000 'READ
 look from C000 to D000 for the ASCII string READ.
- 7) Load
 .L "FRED",0B
 load the string FRED from device 0B.
- 8) Memory display
 .M 0B00 0B20
 display memory from hex 0B00 to 0B20.
- 9) Register display
 .R
 displays register values when Extramon was entered.
- 10) Save
 .S "0:FRED",0B,0B00,0B20
 save memory from hex 0B00 to 0B20 onto device 0B drive 1, and call that portion of memory FRED.
- 11) Transfer memory
 .T 1000 1100 5000
 transfer memory in the range hex 1000 to 1100 and start storing it at hex 5000 onwards.
- 12) Exit to Basic
 .Q
 return to Basic ready mode. Perform a CLR before doing anything.

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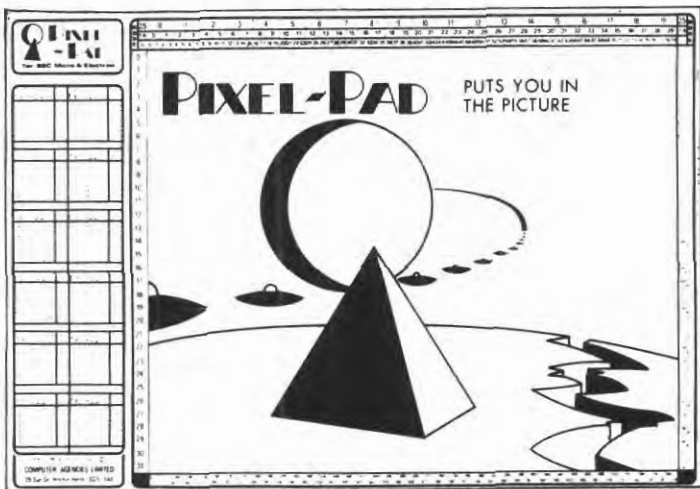
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