Atari 8-Bit Reference Cards

Inspired by and largely derived from the ANALOG Computing Pocket Reference Card. Other sources include *Mapping the Atari* and the manuals for various DOS's and programming languages.

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Cmd	Abbr/Ex.	Comment
COMMANDS		
BYE	B.	Goes to memo pad or self-test mode
CLR	CLR	Clears all variables
CONT	CON.	Continues execution after <break> or STOP
DIM	DI. A$(30)	Reserves 30 bytes for A$
	DI. B(100)	Defines an array with 101 positions
	DI. C(17,3)	Defines an 18 x 4 array
END	END	Closes files, turns off sound, halts program
LET	LE. A=B	Assigns variable A to the value of variable B
	C$=D$	(the word LET can be omitted)
LIST	L.	Lists a program
	L. 400,500	Lists program lines 400 through 500
NEW	NEW	Erases program and variables from memory
POKE	POKE Y,X	Writes value X to memory address Y
REM	. program comment	Comment
RUN	RU.	Begins execution of program in memory
	RU. "D1:MYPROG	Loads MYPROG from disk and runs it
STOP	STO.	Halts program without closing files
PROGRAM STATEMENTS		
FOR, TO, STEP...	F. X=3 TO 9 STEP 2	STEP may be omitted for step value of 1
		3, 9, and 2 may be arithmetic expressions
NEXT	N. X	
GOSUB... RETURN	100 GOS. 300:___	RETURN goes to the statement following
	300 ?	the colon.
	400 RET.	
GOTO	G. X	X may be a variable or line number
IF/THEN	IF Y=5 THEN 500	Conditional branch
	IF X THEN Y=6	X=0 is false, X>0 is true.
	IF A$="Y" THEN A=1:?	False goes to next line number; true
		executes the rest of the line
ON/GOSUB	ON X GOS. 20,30,40	If X<1 or X>3, it goes to the next line
ON/GOTO	ON X G. 20,30,40	
POP	POP	Use when RETURN or NEXT is bypassed
TRAP	T. 1000	Identifies the line to GOTO if error occurs
	T. 32768	If TRAP >32767, previous TRAP is cleared
I/O COMMANDS		
CLOAD	CLOA.	Loads a program from cassette
CLOSE	C. #2	Closes a file (no error if file is not open)
CSAVE	CS.	Saves a program to cassette
DOS	DO.	Goes to DOS (if DOS not loaded, same as BYE)
ENTER	E. "D1:MYPROG	Loads a program saved with LIST
GET	GE. #5,Y	Input a single byte
INPUT	I. Y$	Prints "?", then receives data from keyboard
	I. #1,A	Receives data from file #1
	I. #16,Y$	Recieves data from keyboard with no "?"
LIST	L. "D1:MYPROG	Lists a program to a file
LOAD	LO. "D1:MYPROG	Loads a program save with SAVE
LPRINT	LP. A$	Prints a line to printer
NOTE	NO. #2,A,B	Detects sector and byte within file
OPEN	O. #2,N,0,"D1:FILE	Open FILE; N=4 - input N=6 - directory
		N=7 - dir w/ <> (DOS 2.5)
		N=8 - output N=9 - append
		N=12 - input and output
POINT	P. #3,A,B	Position on sector A, byte B within a file
PRINT	? A,B;"HERE"	Comma tabs, semicolon appends
PUT	PU. #5,Y	Output a single byte
READ	REA. A,B	Assigns data values from DATA statements

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DATA      D. 5,10,16,3        Hold data values for READ
RESTORE   RES. 350            Data for next READ is on line 350
SAVE      S. "D1:MYPROG       Saves a program to be loaded with LOAD or RUN
STATUS    ST. #3,A            Sets A to the device status value
XIO       XIO cmd,#5,aux1,aux2,"S:"  (See XIO Command Codes)
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Cmd	Abbr/Ex.	Comment
ARITHMETIC FUNCTIONS		
ABS	Y=ABS(X)	Absolute value - |X|
CLOG	Y=CLOG(X)	Base 10 logarithm
EXP	Y=EXP(X)	Inverse of LOG - e^X
INT	Y=INT(X)	Integer, rounds down: INT(-4.5) = -5
LOG	Y=LOG(X)	Natural logarithm, e=2.71...
RND	Y=RND(X)	Random number between 0 and 1 (value of X is irrelevent)
SGN	Y=SGN(X)	Evaluates sign of X; Y=-1,0,1
SQR	Y=SQR(X)	Square root
TRIG FUNCTIONS (others are derived)		
ATN	Y=ATN(X)	Inverse tangent (Arctan)
COS	Y=COS(X)	Cosine
SIN	Y=SIN(X)	Sine
DEG	DEG	Use degrees for angle measurements
RAD	RAD	Use radians for angle measurements (default)
SPECIAL FUNCTIONS		
ADR	Y=ADR(X$)	Memory address of string
FRE	? FRE(0)	Remaining free space in RAM (in pages)
PEEK	Y=PEEK(X)	Contents of memory at address X
USR	Y=USR(X)	Result of machine language program at memory address X
STRING FUNCTIONS		
ASC	Y=ASC(X$)	ATASCII code of first byte of X$
CHR$	Y$=CHR$(X)	Character with ATASCII value X
LEN	Y=LEN(X$)	Length of string
STR$	Y$=STR$(X)	Convert number to string - STR$(12) = "12"
VAL	Y=VAL(X$)	Convert string to number - VAL("12") = 12
substring	Y$=X$(5,8)	Y$ contains the 5th through 8th character of X$
GRAPHICS/SOUND (X increases right, Y increases down)		
GET #6	GE. #6,A	Input data from screen
GRAPHICS	GR. M	Reset graphics mode to mode M
COLOR	C. 3	Set color number for PLOT or DRAWTO
DRAWTO	DR. X,Y	Draw line to screen coordinate
LOCATE	LOC. X,Y,A	Set A to the COLOR number of coordinate X,Y
PLOT	PL. X,Y	Plot a graphics point
POSITION	POS. X,Y	Set cursor position
PUT #6	PU. #6,A	Output data to screen
SETCOLOR	SE. R,H,L	Change Hue and Luminance of color Register
SOUND	SO. V,P,D,L	Turn on sound: Voice (0-3), Pitch (0-255), Distortion (0-14 even), Loudness (0-15)
XIO 18	X. 18,#6,0,0,"S:"	Fill bounded area of screen with color in memory location 765
CONTROLLER FUNCTIONS		
PADDLE	Y=PADDLE(X)	Paddle value, Y=0 to 228 400/800: X=0 to 7 XL/XE: X=0 to 3
PTRIG	Y=PTRIG(X)	Paddle trigger, Y=0 if pressed, 1 if not 400/800: X=0 to 7 XL/XE: X=0 to 3
STICK	Y=STICK(X)	Joystick position 400/800: X=0 to 3 XL/XE: X=0 or 1
STRIG	Y=STRIG(X)	Joystick trigger, Y=0 if pressed, 1 if not 400/800: X=0 to 3 XL/XE: X=0 or 1

COLOR REGISTER VALUES

Color	Setcolor Hue	ADD-VALUE
gray	0	0
light orange	1	16
orange	2	32
red-orange	3	48
pink	4	64
purple	5	80
purple-blue	6	96
blue	7	112
blue	8	128
light blue	9	144
turquoise	10	160
green-blue	11	176
green	12	192
yellow-green	13	208
orange-green	14	224
light orange	15	240

for SETCOLOR A,B,C the contents of
color reg. A = (ADD-VALUE of B) + C
= (B * 16) + C

SYMBOLIC DEVICE NAMES

Symbol	Device	IOCB
C:	Cassette tape unit	#7
D1:-D9:	Disk units 1-9 (number available depends on DOS)	
E:	Screen editor	#0
K:	Keyboard	
P: (P1:)	Printer	
P2:-P8:	Alternate printer; e.g. most parallel are P2:	
R1:-R4:	RS-232 interfaces; requires handler to be loaded	
S:	Screen	#6
Z:	R-Time-8 Clock; requires handler to be loaded	

Atari BASIC & OSS BASIC XL/XE Errors

1	OSS: BREAK key pressed
2	Memory full: Insufficient memory for a statement, variable, or DIM
3	A value is outside its expected range
4	Too many variables: more than 128 variables have been defined
5	A string exceeded its dimensioned length
6	Out of DATA: a READ occurred for which there was no DATA
7	A value is not a positive integer or exceeds 32767
8	INPUT or READ type mismatch
9	DIM error
10	Too many nested GOSUBS -- Argument stack overflow
10	OSS: Expression too complex
11	Floating point overflow/underflow error
12	Line not found: referenced line number does not exist
13	NEXT with no corresponding FOR
14	Statement is too long or to complex
15	NEXT or RETURN refers to deleted FOR or GOSUB
16	RETURN with no corresponding GOSUB
17	Bad line -- Invalid instruction or address encountered
18	String begins with an invalid value, or VAL string is not numeric
19	Insufficient memory to LOAD program
20	Invalid device number
21	Attempted to LOAD a non-LOAD file
22	OSS: USING string too big
23	OSS: USING value too big
24	OSS: USING type mismatch
25	OSS: RGET DIM mismatch
26	OSS: RGET type mismatch
28	OSS: Invalid structure
29	OSS: P/M # out of range
30	OSS: P/M Graphics not active
32	OSS: End of ENTER
34	OSS: Can't NUM/RENUM: parameter is 0
35	OSS: Can't NUM/RENUM: exceeded maximum line # (32767)
40	OSS: String type mismatch
65	BXE: EXTENDed memory not available
100	BXE: Command requires disk extensions

Microsoft BASIC II Errors

1	NEXT without FOR
2	Syntax error
3	RETURN without GOSUB
4	Out of DATA
5	Function call error
6	Overflow
7	Out of memory
8	Undefined line
9	Subscript out of range
10	Redimension error
11	Division by zero
12	Illegal direct
13	Type mismatch
14	File I/O error
15	Quantity too big
16	Formula too complex
17	Can't continue
18	Undefined user function
19	No RESUME
20	RESUME without error
21	FOR without NEXT

22 LOCK error
23 Time error

ACTION! Errors
0 Out of system memory
1 Missing double quote in string
2 Nested DEFINEs
3 Global variable symbol table full
4 Local variable symbol table full
5 SET directive syntax error
6 Declaration error
7 Invalid argument list
8 Variable not declared
9 Not a constant
10 Illegal assignment
11 Unknown error
12 Missing THEN
13 Missing FI
14 Out of code space
15 Missing DO
16 Missing TO
17 Bad expression format
18 Unmatched parentheses
19 Missing OD
20 Can't allocate memory
21 Illegal array reference
22 Input file too large
23 Illegal conditional expression
24 Illegal FOR syntax
25 Illegal EXIT: no DO - OD loop to EXIT out of
26 Nesting too deep (16 levels max)
27 Illegal TYPE syntax
28 Illegal RETURN
61 Out of symbol table space

Atari Assembler Cartridge Errors
1 Insufficient memory for assembly
2 The number xx cannot be found for the "DEL xx,yy" command
3 Error in specifying an address in mini-assembler
4 File cannot be loaded
5 Undefined reference label
6 Syntax error in a statement
7 Label defined more than once
8 Buffer overflow
9 No label given before "=".
10 Byte expression is greater than 255
11 Null string used where invalid
12 Address or address type specified is incorrect
13 Phase error: inconsistent result found from pass 1 to pass 2
14 Undefined forward reference
15 Line too large
16 Source statement not recognized by assembler
17 Line number too large
18 LOMEM command attempted after other commands/instructions
19 No starting address given

MAC/65 Errors
1 Memory Full
2 Invalid delete
3 Branch too far
4 Expression for immediate or indirect addressing is greater than 255

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5       Undefined label encountered
6       Expression too complex for assembler
7       Duplicate label name
8       Editor syntax buffer overflow -- line too long
9       Extra .ELSE or .ENDIF
10      Byte expression exceeded 255
11      Conditionals nested too far (14 levels max)
12      Nested macro definition or missing .ENDM
13      Phase error: pass 2 and pass 1 addresses don't match
14      Program counter was forward referenced
15      Editor syntax overflow -- line too complex for editor
16      Duplicate macro name
17      Line number greater than 65535
18      Missing .ENDM -- EOF encountered before .ENDM
19      No origin address given
20      NUM/REN generated line number greater than 65535
21      Included file contained an .INCLUDE directive
22      List output buffer exceeded 255 characters
23      File was not created with SAVE command
24      Load file cannot fit in memory
25      File is not in a valid binary format
27      Invalid .SET
30      Undefined macro
31      Macros nested too far (14 levels max)
32      Macro referenced nonexistent parameter

        DOS or other Operating System Errors
3       MyDOS: Last byte of file read, next read will return EOF
128     BREAK occurred during I/O
129     IOCB already open
130     Specified device does not exist
131     Attempted to read a write-only device
132     Invalid I/O command
133     File or device is not open
134     Invalid IOCB number
135     Attempted to write to a read-only device
136     End of file
137     Truncated Record: tried to read a record longer than allowed
138     Device Timeout: Device did not respond to I/O commands
139     Device NAK: I/O error or faulty device
140     Serial bus input framing error
141     Cursor exceeded range of graphics mode
142     Serial bus data frame overrun
143     Serial bus data frame checksum error
144     Device done error, bad sector, or write-protected disk
145     Read after write compare error
146     Function not implemented in handler
147     Insufficient memory for selected graphics mode
148     Sparta: Unrecognized disk format
149     Sparta: Disk not SpartaDOS version 2.x
150     Sparta: Directory not found
151     Sparta: File exists, may not replace or delete
152     Sparta: Not a binary file
154     SDX: Loader symbol not defined/driver not loaded
156     SDX: Bad parameter
158     SDX: Out of memory
160     Invalid unit/drive number
161     Too many files are open
162     Disk full
163     Atari DOS: Unrecoverable system data I/O error
163     MyDOS: Write protected or system error, disk not readable
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163     Sparta: Illegal wild card in filename
164     File number mismatch
164     Sparta: File is erase-protected
165     Invalid filename
166     Invalid POINT request
167     File locked/protected
167     Sparta: Cannot delete directory
168     Invalid or privileged device command
169     Directory full
169     Sparta: Disk is write-locked
170     File not found
171     POINT invalid or IOCB not open
172     SmartDOS: Illegal append
172     MyDOS: File/directory name exists in parent directory
173     Bad disk or drive, cannot format
174     MyDOS: Directory not in parent directory
175     MyDOS: Directory not empty, cannot delete
180     MyDOS: Not a binary file
181     MyDOS: Invalid Address range for loading binary file
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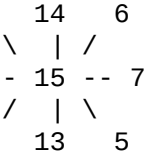
Joystick Movement (STICK values)



bits:

3	2	1	0
R	L	D	U
i	e	o	p
g	f	w	
h	t	n	
t			

6502 ASSEMBLY LANGUAGE MNEMONICS

Code	Operation
ADC	ADd memory to accumulator with Carry
AND	AND memory with accumulator
ASL	(Arithmetic) Shift Left one bit
BCC	Branch on Carry Clear
BCS	Branch on Carry Set
BEQ	Branch on result EQual to zero
BIT	test BITs in accumulator with memory
BMI	Branch on result MInus (negative)
BNE	Branch on result Not Equal to zero
BPL	Branch on result PLus (positive)
BRK	force Break
BVC	Branch on oVerflow flag Clear
BVS	Branch on oVerflow flag Set
CLC	CLear Carry flag
CLD	CLear (binary-coded) Decimal mode
CLI	CLear Interrupt disable flag
CLV	CLear oVerflow flag
CMP	CoMPare memory and accumulator
CPX	ComPare memory and index X
CPY	ComPare memory and index Y
DEC	DECrement memory by one
DEX	DEcrement index X by one
DEY	DEcrement index Y by one
EOR	Exclusive OR memory with accumulator
INC	INCrement memory by one
INX	INcrement index X by one
INY	INcrement index Y by one
JMP	JuMP to new location
JSR	Jump to new location, Save Return address (Jump to SubRoutine)
LDA	LoaD Accumulator from memory
LDX	LoaD index X from memory
LDY	LoaD index Y from memory
LSR	(Logical) Shift Right one bit
NOP	No OPeration
ORA	OR memory with Accumulator
PHA	PusH Accumulator on stack
PHP	PusH Processor status on stack
PLA	PulL Accumulator from stack
PLP	PulL Processor status from stack
ROL	ROtate Left one bit
ROR	ROtate Right one bit
RTI	ReTurn from Interrupt
RTS	ReTurn from Subroutine
SBC	SuBtract memory and borrow from accumulator (SuBtract with Carry)
SEC	SEt Carry flag
SED	SEt (binary-coded) Decimal mode
SEI	SEt Interrupt disable flag
STA	STore Accumulator in memory
STX	STore index X in memory
STY	STore index Y in memory
TAX	Transfer Accumulator to index X
TAY	Transfer Accumulator to index Y
TSX	Transfer Stack pointer to index X
TXA	Transfer index X to Accumulator
TXS	Transfer index X to Stack pointer

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TYA       Transfer index Y to Accumulator
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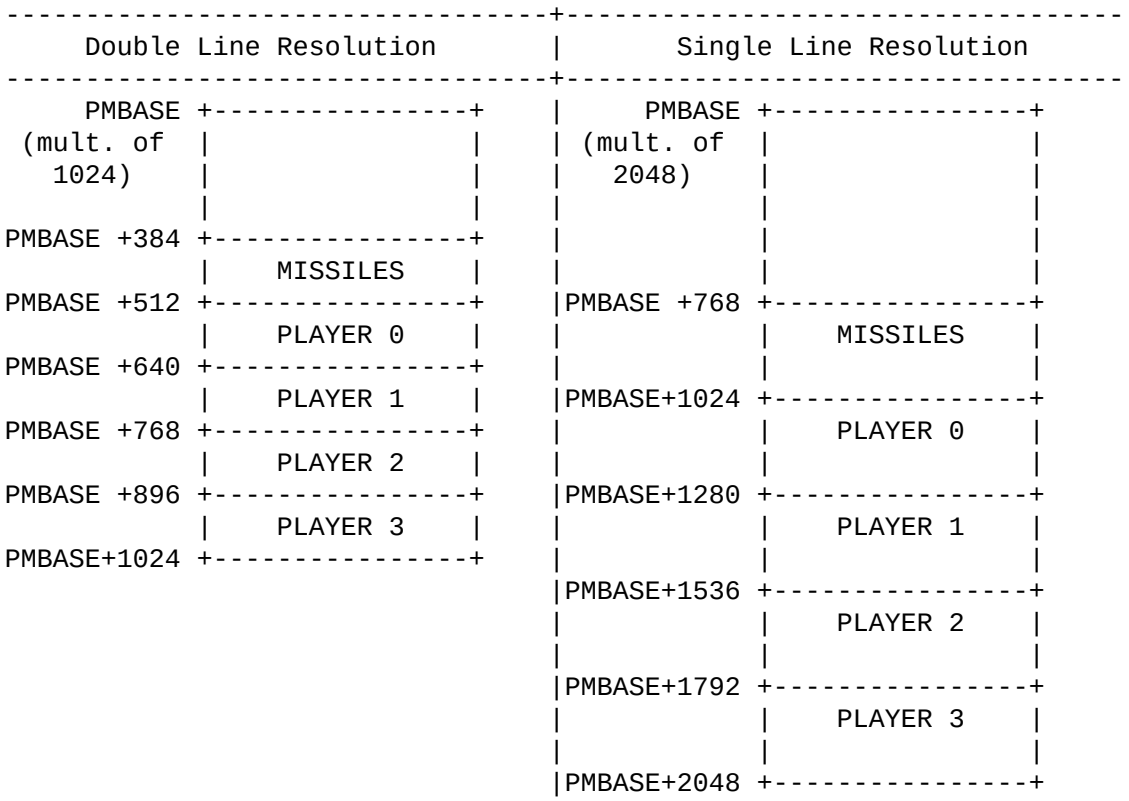
PEEK/POKE ADDRESSES FREQUENTLY USED (multi-byte values are LSB-MSB)

Label	Decimal	Hex	Description
DOSVEC	10-11	A-B	Start vector for disk software, normally to start of DUP.SYS routine
POKMSK	16	10	POKEY interrupt shadow. To disable BREAK key, poke this and 53774 ($D20E) w/ 112.
			BIT 7 = DECIMAL 128 = ENABLED INTERRUPT: break key
			BIT 6 = DECIMAL 64 = ENABLED INTERRUPT: "other key"
			BIT 5 = DECIMAL 32 = ENABLED INTERRUPT: serial input data ready
			BIT 4 = DECIMAL 16 = ENABLED INTERRUPT: serial output data required
			BIT 3 = DECIMAL 8 = ENABLED INTERRUPT: serial out xmit finished
			BIT 2 = DECIMAL 4 = ENABLED INTERRUPT: POKEY timer 4
			BIT 1 = DECIMAL 2 = ENABLED INTERRUPT: POKEY timer 2
			BIT 0 = DECIMAL 1 = ENABLED INTERRUPT: POKEY timer 1
RTCLOCK	18-20	12-14	24-bit TV frame counter/real-time clock
SOUNDR	65	41	Noisy I/O flag: 0=quiet, default=3
ATTRACT	77	4D	0 to suppress attract mode, 128 to start; incremented every time loc. 19 increments
LMARGIN	82	52	Left screen margin, default 2
RMARGIN	83	53	Right screen margin, default 39
GRMODE	87	57	(BASIC) Graphics mode number
RAMTOP	106	6A	Top of RAM in 256-byte pages
STOPLIN	186-7	BA-B	Line number of STOP or TRAP (BASIC)
ERRSAV	195	C3	(BASIC) Error number
FR0	212-3	D4-5	Value returned by USR (BASIC)
VBREAK	518-9	0206-7	Software break vector for 6502 BRK instruction
SDMCTL	559	022F	Shadow for DMA control register
			Playfield size: 1=narrow, 2=standard, 3=wide. Missile DMA=4, Player DMA=8.
			Player resolution: 0=double line, 16=single line.
			DMA enable=32
SDLSTL	560-1	0230-1	Points to display list
COLDST	580	0244	Nonzero = reboot when RESET pressed
KEYDIS	621	026D	0=keyboard enabled, 255=disabled (XL/XE)
FINE	622	026E	0=course scroll, 255=fine scroll (XL/XE)
GPRIOR	623	026F	Player/Missile/PlayField priority:
			1 = P0-3, PF0-3, BAK
			2 = P0-1, PF0-2, P2-3, BAK
			4 = PF0-3, P0-3, BAK
			8 = PF0-1, P0-3, PF2-3, BAK
			16 = allow 5th player (from missiles)
			32 = allow 3rd color
PADDL0-7	624-631	0270-7	values of paddles 0-7, 0-228
STICK0-3	632-5	0278-B	values of joysticks 0-3
PTRIG0-7	636-643	027C-0283	values of paddle buttons 0-7
STRIG0-3	644-7	0284-7	values of joystick triggers 0-3
TXTROW	656	0290	Text cursor row
TXTCOL	657-8	0291-2	Text cursor column
INVFLG	694	02B6	Inverse character flag, XOR'ed w/ATASCII code
			0=normal, 128=inverse; other values result in weirder stuff

SHFLOK	702	02BE	0=lowercase (no shift), 64=uppercase (shift) 128=control key
BOTSCR	703	02BF	Number of text rows available for printing
PCOLR0	704	02C0	Color of player/missile 0
PCOLR1	705	02C1	Color of player/missile 1
PCOLR2	706	02C2	Color of player/missile 2
PCOLR3	707	02C3	Color of player/missile 3
PF0	708	02C4	Color register 0
PF1	709	02C5	Color register 1
PF2	710	02C6	Color register 2
PF3	711	02C7	Color register 3
BAK	712	02C8	Color register 4
KRPDEL	729	02D9	Jiffies before key begins repeating (XL/XE) 0=no repeat
KEYREP	730	02DA	Jiffies between key repeats (XL/XE) 0=repeat only once
NOCLIK	731	02DB	Non-zero=no key click (XL/XE)
HELPFG	732	02DC	HELP key status: 17=HELP pressed alone, 81=SHIFT-HELP, 145=CTRL-HELP; must be manually cleared. (XL/XE)
RUNAD	736-7	02E0-1	Run address of binary file
INITAD	738-9	02E2-3	Initialization address of binary file
MEMTOP	741-2	02E5-6	Top of free memory, below screen memory
MEMLO	743-4	02E7-8	Bottom of free memory
CRSINH	752	02F0	Cursor inhibit: 0=on, otherwise off
CHACT	755	02F3	Character mode register, controls how characters are displayed: VALUE INVERSE CHARS ORIENTATION CURSOR 0 inverse upright absent 1 blank upright absent 2 normal upright transparent 3 solid upright opaque 4 inverse inverted absent 5 blank inverted absent 6 normal inverted transparent 7 solid inverted opaque
CHBAS	756	02F4	Pointer to page of character set (even): default 224; 226=lowercase/graphics; 204=international (XL/XE)
CH	764	02FC	Keyboard code of last key pressed (255 to clear)
FILLDAT	765	02FD	Color data for XIO FILL command
DSPFLG	766	02FE	0=control characters do their function, otherwise control characters display as characters (as if ESC pressed first)
SSFLAG	767	02FF	Start/stop display flag: 255=stop, 0=go; normally manipulated with CTRL-1
HPOSP0	53248	D000	(W) Horizontal position of player 0
M0PF	"	"	(R) Missile 0/playfield collision
HPOSP1	53249	D001	(W) Horizontal position of player 1
M1PF	"	"	(R) Missile 1/playfield collision
HPOSP2	53250	D002	(W) Horizontal position of player 2
M2PF	"	"	(R) Missile 2/playfield collision
HPOSP3	53251	D003	(W) Horizontal position of player 3
M3PF	"	"	(R) Missile 3/playfield collision

HPOSM0	53252	D004	(W) Horizontal position of missile 0
P0PF	"	"	(R) Player 0/playfield collision
HPOSM1	53253	D005	(W) Horizontal position of missile 1
P1PF	"	"	(R) Player 1/playfield collision
HPOSM2	53254	D006	(W) Horizontal position of missile 2
P2PF	"	"	(R) Player 2/playfield collision
HPOSM3	53255	D007	(W) Horizontal position of missile 3
P3PF	"	"	(R) Player 3/playfield collision
SIZEP0	53256	D008	(W) Size of player 0, 1=2X, 3=4X
M0PL	"	"	(R) Missile 0 to player collision
SIZEP1	53257	D009	(W) Size of player 1, 1=2X, 3=4X
M1PL	"	"	(R) Missile 1 to player collision
SIZEP2	53258	D00A	(W) Size of player 2, 1=2X, 3=4X
M2PL	"	"	(R) Missile 2 to player collision
SIZEP3	53259	D00B	(W) Size of player 3, 1=2X, 3=4X
M3PL	"	"	(R) Missile 3 to player collision
SIZEM	53260	D00C	(W) Missile size, 1=2X, 3=4X
P0PL	"	"	(R) Player 0 to player collision
P1PL	53261	D00D	(R) Player 1 to player collision
P2PL	53262	D00E	(R) Player 2 to player collision
P3PL	53262	D00F	(R) Player 3 to player collision
GRACTL	53277	D01D	(W) 1=Missile DMA, 2=Player DMA
HITCLR	53278	D01E	(W) clear collision registers
PMBASE	54279	D407	(W) Player/Missile base address
WSYNC	54282	D40A	(W) Wait for horizontal sync
VCOUNT	54283	D40B	(R) Vertical TV scan line counter
NMIEN	54286	D40E	(W) Non-maskable interrupt enable (192 for DLI)

PLAYER/MISSILE AREA LAYOUT



SOUND COMMAND PITCH VALUES

Note	Octave: / Distort:	-3 / 12	-2 / 12	-1 / 10	0 / 10	+1 / 10	+2 / 10	+3 / 10
B		67	33	128	64	31		
A#		72	36	136	68	33	16	
A		75	37	144	72	35		
G#		82	40	153	76	37	18	
G		85	42	162	81	40		
F#		90	45	173	85	42		
F		98	48	182	91	45		
E		102	51	193	96	47	23	
D#			55	204	102	50		
D			57	217	108	53	26	
C#			60	230	114	57		
C			63	243	121*	60	29	14

* Middle C

code	operation
3	OPEN
5	GET RECORD
7	GET CHARACTERS
8	PUT RECORD
11	PUT CHARACTERS
12	CLOSE
13	STATUS REQUEST
17	DRAW LINE
18	FILL
32	RENAME
33	DELETE
34	CREATE DIRECTORY (MyDOS)
34	LOCK DISK (SpartaDOS 2.3/3.2)
35	LOCK FILE
36	UNLOCK FILE
37	POINT
38	NOTE
39	GET FILE LENGTH (SpartaDOS)
40	LOAD BINARY FILE
41	SAVE BINARY FILE (Atari DOS, SpartaDOS 2.3/3.2)
41	CHANGE DIRECTORY (MyDOS)
42	CREATE DIRECTORY (SpartaDOS)
43	DELETE DIRECTORY (SpartaDOS)
44	CHANGE DIRECTORY (SpartaDOS)
45	SET BOOT FILE (SpartaDOS)
46	UNLOCK DISK (SpartaDOS 2.3/3.2)
49	SET FILE ATTRIBUTES (SpartaDOS X)
253	FORMAT SINGLE DENSITY (DOS 2.5)
254	FORMAT DISK (default format)