6502 Assembly programming for the BBC Micro B

The BBC Micro was made by Acorn for the UK's public broadcasting system, it was presented as part of the TV show "BBC Micro Live"

The BBC had highly configurable hardware, with support for many external devices, and even non 6502 coprocessors... it's Basic even supported in-line assembly language!

the Model A was the cheaper model, however it's 16k limit will be rather restrictive, so we will be covering the more usable 32k system the Micro B

	Model A	Model B	Master
Cpu	2mhz 6502	2mhz 6502	2mhz 6502
Ram	16k	32k	128k
Vram	Uses internal		

View Options
Default Dark
Simple (Hide this menu)
Print Mode (white background)

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Main Menu
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Dec/Bin/Hex/Oct/Ascii Table

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	memory		
Resolution	640x256	640x256	640x256
Colors	8	8	8
Sound chip	SN76489 (4 channel)	SN76489 (4 channel)	SN76489 (4 channel)

ChibiAkumas Tutorials

Lesson P1 - Bitmap Functions on the BBC
Lesson P10 - Joystick Reading on the BBC
Lesson P17 - Palette definitions on the BBC
Lesson P22 (z80) - Sound with the SN76489 on the BBC Micro

Video Registers

Write the regsiter you want to set to $FE00

then write the new value to $FE01

RegNum	register description	Mode 1 320x256 4 color
$FE20	Screen mode	$D8
0	Horizontal total	$7F
1	Horizontal displayed characters	$50
2	Horizontal sync position	$62
3	Horizontal sync width/Vertical sync time	$28
4	Vertical total	$26

Z80 Platforms
Amstrad CPC
Elan Enterprise
Gameboy & Gameboy Color
Master System & GameGear
MSX & MSX2
Sam Coupe
TI-83
ZX Spectrum
Spectrum NEXT
Camputers Lynx

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Atari Lynx
BBC Micro
Commodore 64
Commander x16
Super Nintendo (SNES)
Nintendo NES / Famicom
PC Engine (Turbografx-16)
Vic 20

68000 Content

5	Vertical total adjust	$00		
6	Vertical displayed characters	$19		
7	Vertical sync position	$22		
8	Interlace/Display delay/Cursor delay	$01		
9	Scan lines per character	$30		
10	Cursor start line and blink type	$00		
11	Cursor end line	$08		
12	Screen start address H (Address /8)	$30		
13	Screen start address L (Address /8)			
14	Cursor position H			
15	Cursor position L			
16	Light pen position			
17	Light pen position			
18	Cursor width (BBFW)			

Physical Colors

the way Screen Bytes map to visible colors is strangely configurable, they are defined by the "Video ULA palette"... which maps nibbles to colors... if we map colors wrong, the same byte may appear a different color depending if it's on odd or even vertical strips

Color Num	EOR	Color
0	7	**Black**
1	6	**Red**
2	5	**Green**
3	4	**Yellow**
4	3	**Blue**
5	2	**Magenta**
6	1	**Cyan**
7	0	**White**

Hardware Addresses

From	To	Purpose	Details

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Amiga 500
Atari ST
Neo Geo
Sega Genesis / Mega Drive
Sinclair QL
X68000 (Sharp x68k)

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MsDos

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$FE00	**$FE07**	6845 CRTC Video controller 18	Set these to change screen mode
$FE08	**$FE0F**	6850 ACIA Serial controller 20.3	
$FE10	**$FE1F**	Serial ULA Serial system chip 20.9	
$FE20	**$FE2F**	Video ULA Video system chip 19	Set these to change screen mode
$FE30	**$FE3F**	74LS161 Paged ROM selector 21	
$FE40	**$FE5F**	6522 VIA SYSTEM VIA 23	Sound & Keyboard
$FE60	**$FE7F**	6522 VIA USER VIA 24	
$FE80	**$FE9F**	8271 FDC Floppy disc controller 25.1	
$FEA0	**$FEBF**	68B54 ADLC ECONET controller 25.2	
$FEC0	**$FEDF**	uPD7002 Analogue to digital converter 26	
$FEE0	**$FEFF**	Tube ULA Tube system interface 27	

Sound Controller - SN76489

The Sound Chip shares a port with the keybord... Before we can send any data to the sound chip, we have to set the port to WRITE... we do this by writing 255 to address $FE43 (we only do this once)

We've covered the sound chip in the **Z80 tutorials here**

Once we've done that, we can write our data to $FE41 in the format below

		Bits							
Command	**Bit Details**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Format Template	L=Latch C=Channel T=Type XXXX=Data	L	C	C	T	D	D	D	D
Tone - Command 1/2	C=Channel L=tone Low data	1	C	C	0	L	L	L	L
Tone - Command 2/2	H= High tone data (Higher numbers = lower tone)	0	-	H	H	H	H	H	H
Volume	C=Channel (0-2) V=Volume (15=silent 0=max)	1	C	C	1	V	V	V	V
Noise Channel	(Channel 3) M=Noise mode (1=white) R=Rate (3=use tone 2)	1	1	1	0	-	M	R	R

Sheila ADC - Analog to Digital Converter (Joystick)

The Joystick is analog on the BBC... we need to read UD and LR, which will return a value from 0-255....

When it comes to reading the Fire, we use $FE40 - part of the sound/keyboard controller!

Port	R/W	Purpose	Bits	Details

ARM Platforms
Gameboy Advance
Nintendo DS
Risc Os

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TMS9900 Content
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TMS9900 Cheatsheet
Sources.7z
DevTools kit
TMS9900 Platforms
Ti 99

6809 Content
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6809/6309 Cheatsheet
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DevTools kit
6809 Platforms

$FEC0	W	Data Latch / Conversation Start	----MFCC	M=Mode (0=8 bit 1=10 bit)... F=Flag (usually 0)... CC=Channel (0/1 = joy1 2/3=joy2)
$FEC0	R	Status	CBMMm-CC	C=Conversation complete (1=no)...B=busy... M=top two bits of conversiation... m=mode (8/10 bit)... CC=Channel
$FEC1	R	High Data byte	DDDDDDDD	8 Bit Data
$FEC2	R	Low Data byte	DDDD----	extra 4 low bits of 10/12 bit data

Key Reading

Key reading on the BBC is a little weird and rather poorly documented

Essentially you have to select a row (0-8) and Column (0-9), then read in the state of each key one bit at a time!.. these are both read and written to port $**FE4F**

7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
K	R	R	R	C	C	C	C

When Written Bits 0-3 (Marked C) select the Column (0-9) and bits 4-6 (Marked R) select the Row (0-8)... Bit 7 has no purpose

When Read Bit 7 returns the Keystate and bits 6-0 have no purpose

An example working piece of code is shown to the right, it's partially based on the disassemblies of the firmware.

You will need a PrintHex command to show the read byte to screen.

```
    LDA #$7F    ;set port A for input on bit 7 others outputs
    STA $FE43
    LDA #$03    ;stop auto scan
    STA $FE40
    ;    This section may not be needed
    ;LDA #$0F    ;select non-existent keyboard column F (0-9 only!)
    ;STA $FE4F   ;
    ;LDA #$01    ;cancel keyboard interrupt
    ;STA $FE4D   ;

    ldy #0
KeyNextLine:
    ldx #8
    tya
KeyNextBit:
    pha
        sta $FE4F
        lda $FE4F
        rol
    pla
```


Dragon 32/Tandy Coco
Fujitsu FM7
TRS-80 Coco 3
Vectrex

My Game projects
Chibi Aliens
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Work in Progress
Learn 65816 Assembly
Learn eZ80 Assembly

Misc bits
Ruby programming

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```
    rol z_as
    clc
    adc #%00010000
    dex
    bne KeyNextBit

    lda z_as
    iny
    sta (z_hl),y
    jsr PrintHex
    tya
    cmp #8
    bne KeyNextLine

    LDA #$0B    ;select auto scan
of keyboard
    STA $FE40   ;tell VIA
```

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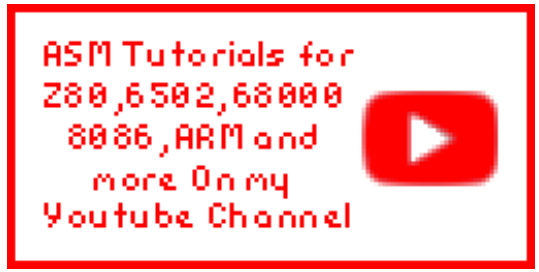
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