

# ULTIMON II

A Firmware based 6502 Monitor/Debugger

For use on **ATARI 1200XL, 600XL, 800XL, 800XLE, 65XE** and **130XE**

Reference Manual



# ULTIMON II

## Trademarks

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## Preface

Where the terminology **XL** is used, it means **1200XL, 600XL** or **800XL** and where **XE** is used it means **65XE** or **130XE**.

## Foreword

To date the firmware that this document refers to has not been changed in functionality, it is a very old product; that was a leader in its day. Please feel free to use this product for your enjoyment. There is no warranty and no support.

*John Lawson*

# ULTIMON II

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# ULTIMON II

A screenshot of the ULTIMON II assembly monitor interface. The screen is divided into several sections. At the top, there are registers: \*-, A, X, Y, NU-BDIZC, BRK1, BRK2, and BRK3, each with a value of 0000. Below this is a memory dump showing addresses from 0100 to 01F4, with hex values and assembly instructions. The instructions include CMP, BEQ, STA, LDX, STX, JSR, TAX, CPX, BCC, LDXF, LDA, STA, CMP, BEQ, and BNE. At the bottom, the text 'ULTIMON II' and 'OSB' are visible, along with a cursor position '301 FF'.

## Running the App

There are several ways to run **ULTIMON II**:

- Press and hold **[SHIFT]+[CONTROL]+[BREAK]** (this method works in most cases depending on what the program is doing to the interrupts).
- From ASSEMBLER JMP (\$DFFE).

During power up, if there is no drive 1 present and cassette boot or basic has not been enabled the system will default to **ULTIMON II**

# ULTIMON II

## Screen Toggling

---

After breaking into a program, you may press the **[TAB]** key to toggle between the **ULTIMON II** screen and the program screen. On first impressions you'll probably think the program is running again, it's not, only the screen display and vectored interrupts are, you can still command **ULTIMON II** Without toggling back to the **ULTIMON II** screen. Just type the command and the **ULTIMON II** screen will appear but, only until you press the **[RETURN]** key for that command.

When using this feature along with a Graphics Mode 0 screen you may also use the screen print facility, by entering **ULTIMON II**, then press **[TAB]**, now press and hold **[CONTROL]** then press **[P]**.

There is a difference between the **XL** and the **XE** versions of **ULTIMON II** and this effects screen toggling:

- The **XL** version uses the highest available RAM for its screen display which can be either \$BC40, \$9C40 or \$7C40 depending on what cartridge, (if any) is fitted, the display list occupies the bytes just below, therefore when you enter **ULTIMON II** its screen will draw there if the program that you have stopped has it's screen there the **ULTIMON II** screen will over write it, hence a screen tab will just display garbage or nothing.
- The **XE** version does not have these problems as it draws its screen in the highest block of the banked 64K, therefore stopping any program on an **XE** with **XE ULTIMON II** will not clear any part of the program at all.

# ULTIMON II

## Hotkeys

### Print Screen

---

#### [CONTROL]+[P]

Printer dump may be called at any time without interfering with what you may be doing with the command line.

### Trace

---

#### [CONTROL]+[T]

The T command will allow the user to single step continually through the code being displayed on the disassembly page. Until the user, presses the **[ESC]** key.

### Single-Step

---

#### [CONTROL]+[S]

The S command will allow the user to single step through the code being displayed on the disassembly page. Holding **[RETURN]** will continually single step until you let go.

### Go at Program Counter

---

#### [CONTROL]+[\*]

The GP command will continue from where the program counter left off.

### Jump to Subroutine at Program Counter

---

#### [CONTROL]+[J]

The JP command will push the **ULTIMON II** go address to the stack then go from the program counter.

# ULTIMON II

## The Commands

**ULTIMON II** uses a space as a parameter delimiter (a space between numbers will force the next number to be read as a new parameter). Spaces are not compressed; therefore 2 spaces or more in a command will cause a syntax error. There should not be any spaces after the last parameter as this will also cause a syntax error.

All the input and output of **ULTIMON II** uses hexadecimal notation.

Pressing just **[RETURN]** repeats the last command.

The command line is only 32 character spaces long, it will go no further.



# ULTIMON II

## App Control

### Quit

---

Syntax: Q[D|C|R]

The Q command will quit from **ULTIMON II** and jump to the particular media you require.

QD = Quit, to disk based media.

QC = Quit to cassette based media.

Example: QD[**RETURN**]

If **CASINI**, **DOSINI** or **DOSVEC** contains zero's then there is likely to be a system lockup depending on which media has been selected.

# ULTIMON II

## Basic OFF/ON

---

Syntax: I[0|1]

The I0 command will disable the built in BASIC then move the screen up into the now available RAM.

The I1 command will move the screen down then enable the BASIC.

Example: I1[RETURN]

## SuperCartridge OFF/ON

---

Syntax: S[0|1]

The S0 command will disable any **SuperCartridge** that may be plugged in then move the screen up into the available RAM.

The S1 command will move the screen down then enable any **SuperCartridge** that may be plugged in.

The only **SuperCartridge** in existence at the time of writing is the **OSS** range namely, **MAC/65**, **ACTION**, **BASIC XE** and **BASIC XL**.

Example: S1[RETURN]

# ULTIMON II

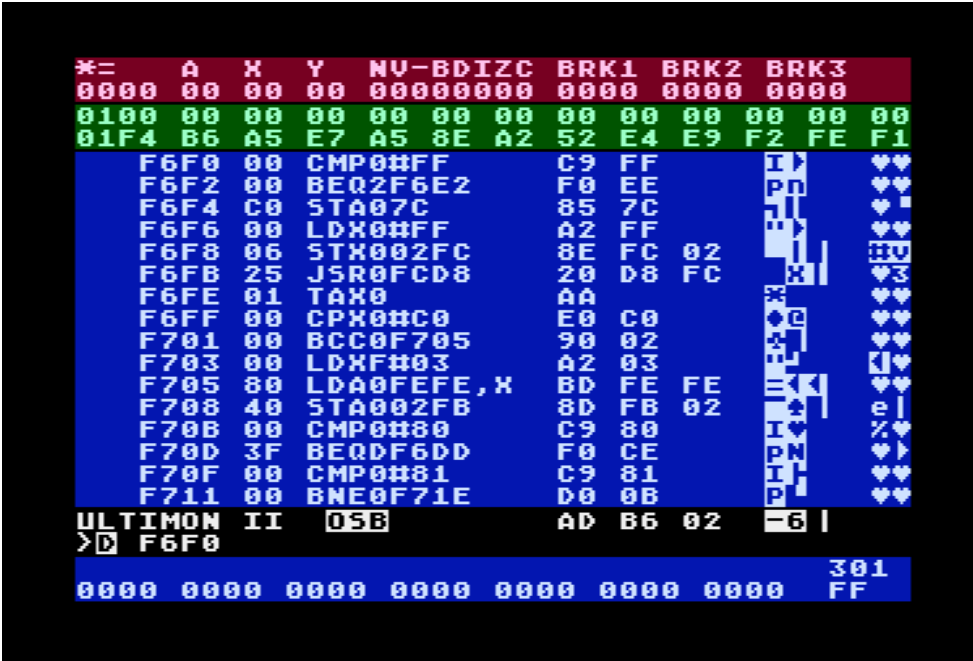
## Disassemble

Syntax: D <address>

Immediate Key: [=] At any time will increment the disassembly by a logical line.

The D command disassembles the memory into standard 6502 op-codes.

To use this command, establish the address that you would like to start disassembling from then type D followed by that address now a return.



```
*= A X Y NU-BDIZC BRK1 BRK2 BRK3
0000 00 00 00 00000000 0000 0000 0000
0100 00 00 00 00 00 00 00 00 00 00 00
01F4 B6 A5 E7 A5 8E A2 52 E4 E9 F2 FE F1
F6F0 00 CMP#FF C9 FF
F6F2 00 BEQ2F6E2 F0 EE
F6F4 C0 STA07C 85 7C
F6F6 00 LD#FF A2 FF
F6F8 06 STX02FC 8E FC 02
F6FB 25 JSR0FCD8 20 D8 FC
F6FE 01 TAX0 AA
F6FF 00 CP#C0 E0 C0
F701 00 BCC0F705 90 02
F703 00 LD#03 A2 03
F705 80 LDA#FEFE, X BD FE FE
F708 40 STA02FB 8D FB 02
F70B 00 CMP#80 C9 80
F70D 3F BEQDF6DD F0 CE
F70F 00 CMP#81 C9 81
F711 00 BNE0F71E D0 0B
ULTIMON II 05B AD B6 02 -6 |
> F6F0 301
0000 0000 0000 0000 0000 0000 0000 FF
```

Example: D 9FAE[RETURN]

The format of each disassembly line is as follows:

ADDRESS OPCODE BYTES ATASCII

ADDRESS = the address of the op-code. OPCODE = the disassembly interpretation of this byte. BYTES = the byte or bytes that form this particular op-code, ATASCII = the ATASCII interpretation of these bytes

# ULTIMON II

## Processor

### Program Counter

---

Syntax: \* <value>

The \* command will change the contents of the **ULTIMON** processor status register shadow, this will be placed into the real processor status register on a 'Go at Program Counter'.

Example: \*=A000[**RETURN**]

### 6502 Registers

---

Syntax: A <value>

Syntax: X <value>

Syntax: Y <value>

The A, X and Y commands will change the contents of the **ULTIMON II** register shadows (these will be placed into the real registers on the JP, J, GP, G, QD and QC commands.

Examples: AFE[**RETURN**] X22[**RETURN**] Y5C[**RETURN**]

Only one register can be changed per command line.

### Status Flags

---

Syntax: S <value>

The P command will change the contents of the **ULTIMON II** processor status register shadow, this will be placed into the real processor status register on a 'Go at Program Counter'.

Example: P24[**RETURN**]

# ULTIMON II

## Breakpoint Set

---

Syntax: B <address> <register>

The B command allows the user to pre-set up to 6 breakpoints throughout the code. To remove a breakpoint just enter zero as the address, followed by the breakpoint register number.

All breakpoints should be cleared manually before leaving **ULTIMON II** through the JP, J, GP, G, QD, QC or QR commands.

Example: B 3E80 2[**RETURN**]

## Jump to Subroutine at Address

---

Syntax: J <address>

The J command will push the **ULTIMON II** go address to the stack then go to the subroutine <address> specified.

Example: J F6A4[**RETURN**]

## Go at Address

---

Syntax: G <address>

The G command will change the program counter to the <address> specified then go to it.

Example: G F11B[**RETURN**]

# ULTIMON II

## Stack

### Push

---

Syntax: + <address>

The push stack command will push an <address> (two bytes) to the stack, using this option you could push a return address for the next RTS.

Example: + 35FC[**RETURN**]

### Pop

---

Syntax: -

The command will remove an address (two bytes) from the stack.

This is useful for removing a return address and then using the push command to replace it with an alternative one.

Example: -[**RETURN**]

Once Pop is issued the address at the top of the stack will be lost.

# ULTIMON II

## View

### Auto Update Field

---

Syntax: 1|2|3|4|5|6 <address>

The X command is for a one byte read the address, the result of that read is stored on the 1st and 2nd lines and is kept there until the next X command.

This command is mainly of use to those electronics experts that wish to experiment with the address and read lines.

Example: 1 D508[**RETURN**]

# ULTIMON II

## Examine

---

Syntax: E <address>

Immediate Keys: [=] at any time will increment the display one page at a time. [-] at any time will decrement the display one page at a time.

The E command displays the contents of a 'half page' of memory beginning at the <address>. At any time you may increment or decrement; the 'half page' display by pressing [=] for increment or [-] for decrement.

At the 5th line down you will see **AD** (meaning address) this is the start of the 'half page' display, the 'half page' display is 16 horizontal lines long, this is referred to during any display memory contents or disassembly.

To use this command, first establish the starting address of the area that you wish to examine, now type E followed by a space then the address and return.

```
*- A X Y NU-BDIZC BRK1 BRK2 BRK3
0000 00 00 00 00000000 0000 0000 0000
0100 00 00 00 00 00 00 00 00 00 00 00 00 00
01F4 B6 A5 E7 A5 8E A2 52 E4 E9 F2 FE F1
0000 00 00 00 00 00 00 D0 00 00 ♥♥♥♥♥♥♥♥♥♥
0008 00 01 23 F2 C0 E4 00 00 ♥♥♥♥♥♥♥♥♥♥
0010 C0 80 00 00 00 17 00 00 00 ♥♥♥♥♥♥♥♥♥♥
0018 00 00 00 00 00 1E 00 00 00 ♥♥♥♥♥♥♥♥♥♥
0020 06 01 0B 01 D5 A4 A3 F6 ♥♥♥♥♥♥♥♥♥♥
0028 25 00 0B 00 A3 F6 00 33 ♥♥♥♥♥♥♥♥♥♥
0030 01 00 00 00 00 00 00 00 00 ♥♥♥♥♥♥♥♥♥♥
0038 00 00 00 00 00 00 00 00 00 ♥♥♥♥♥♥♥♥♥♥
0040 00 03 00 00 00 00 00 00 00 ♥♥♥♥♥♥♥♥♥♥
0048 00 00 FF 00 01 00 FE 00 ♥♥♥♥♥♥♥♥♥♥
0050 80 00 00 00 27 0E 25 00 00 ♥♥♥♥♥♥♥♥♥♥
0058 40 7C 00 24 00 00 65 7C ♥♥♥♥♥♥♥♥♥♥
0060 00 00 00 00 27 65 7C 25 00 ♥♥♥♥♥♥♥♥♥♥
0068 3F CC D0 00 00 02 00 7F ♥♥♥♥♥♥♥♥♥♥
0070 00 00 00 00 00 00 00 00 ♥♥♥♥♥♥♥♥♥♥
0078 00 00 00 00 00 00 9B 00 ♥♥♥♥♥♥♥♥♥♥
ULTIMON II 058
>
A MEM1 MEM2 MEM3 MEM4 MEM5 MEM6 D301
0000 0000 0000 0000 0000 0000 0000 FF
```

Example: E 4000[RETURN]



# ULTIMON II

The format of each display line is as follows:

**AAAA 00 00 00 00 00 00 00 00 12345678**

AAAA = the hexadecimal address of the first byte being displayed on this line, 00 = the hexadecimal contents of successive memory locations beginning at location AAAA, and the 12345678 = the ATASCII character interpretation of the successive memory locations.

# ULTIMON II

## Display Update Mode

---

Syntax: U <address>

The U command will display the memory contents exactly as the D command but will then continue sampling the same area of memory until the [ESC] key is pressed, this is handy if you would like to see if a memory location or string of memory locations is being updated during vertical blank interrupts.

```
*=      A      X      Y      NU-BDIZC  BRK1  BRK2  BRK3
0000  00  00  00  00  00000000  0000  0000  0000
0100  00  00  00  00  00  00  00  00  00  00  00  00
01F4  B6  A5  E7  A5  8E  A2  52  E4  E9  F2  FE  F1
      D200  5B  64  70  79  83  8D  98  A2  [dp]  -  L
      D208  FF  0C  53  FF  FF  32  F7  FF  | 5 | 2w |
      D210  E4  E4  E4  E4  E4  E4  E4  E4  dddddd
      D218  00  00  00  FF  FF  00  F7  FF  |w| |w|
      D220  E4  E4  E4  04  0B  14  1C  26  ddd| |f&
      D228  FF  0C  25  FF  FF  32  F7  FF  | 2 | 2w |
      D230  E4  E4  E4  E4  E4  E4  E4  E4  dddddd
      D238  00  00  FF  FF  FF  00  F7  FF  |w| |w|
      D240  D4  E4  E4  E4  09  13  1E  2E  |ddd| |f&
      D248  FF  0C  A0  FF  FF  32  F7  FF  |  | 2w |
      D250  E4  E4  E4  E4  E4  E4  E4  E4  dddddd
      D258  00  00  FF  FF  FF  00  F7  FF  |w| |w|
      D260  51  69  81  98  B0  C7  D0  E4  0i | 0G | d
      D268  FF  0C  78  FF  FF  32  F7  FF  |  | 2w |
      D270  E4  E4  E4  E4  E4  E4  E4  E4  dddddd
      D278  00  00  FF  FF  FF  00  F7  FF  |w| |w|
ULTIMON II  OSB
>U D200
A      MEM1  MEM2  MEM3  MEM4  MEM5  MEM6  D301
0000  0000  0000  0000  0000  0000  0000  FF
```

Example: U D200[RETURN]

# ULTIMON II

## Locate

---

Syntax: L <start> <end> <value> [<value>] ...

The L command will locate a sequential string of hexadecimal bytes up to 8 bytes long.

To use this command first establish the bytes that you wish to locate, now the address range then type L followed by a space then the starting address then the end address and lastly the byte or string of bytes, there must be a space between every byte and no spaces between the ending byte and the return.

Example: L 2000 8000 20 A4 F6 AD FF[**RETURN**]

## Compare

---

Syntax: C <from> <to> <start>

The C command will compare one block of memory against another and then report the start of where any differences have occurred.

To use this command, first establish the two blocks of memory that you wish compare then type C followed by a space now the starting address of block 1 then another space now the end address of the block 1 then another space and finally the start address of block 2 now return, the end address of block 2 is taken care of automatically.

If the compared blocks were the same then **ULTIMON II** will come back unchanged. If there were differences then the 'Display Memory' part of the screen will split down and display the two blocks (block 1 at the top), starting at where the differences were.

Example: C 2000 4FFF 5000[**RETURN**]

# ULTIMON II

## Change

### Replace

---

Syntax: R <location> <value> [<value> ...]

The A command alters the contents of a sequence of memory

<location> is the starting address. <value> is a byte containing the value that you wish to write, each byte is consecutive from <location>. The maximum number of these bytes per command-line is 9.

To use this command, first find the address where the alteration is to take place then type A then, a space then the byte you would like to store there, followed by either a **[RETURN]** or a sequence of space then byte (up to 9) and finally a **[RETURN]**.

Example: R 84FE 56 78 FF 00**[RETURN]**

### Fill

---

Syntax: F <from> <to> <value>

The F command will fill a block of memory.

Consider the following example:

F 2000 2FFF 55**[RETURN]**

This will fill from 2000 through to 2FFF with 55's.

Example: F 8000 8FFF 55 **[RETURN]**

# ULTIMON II

## Move

---

Syntax: M <from> <to> <start>

The M command will move a copy of a block of memory beginning at, <from> and ending at <to>; to the memory beginning at <start>.

Consider the following example:

```
M 4000 5FFF 7000[RETURN]
```

This will move a copy of the block 4000 through to 5FFF into 7000 through to 7FFF.

Take care not to forward overlap a move, as this will destroy the overlapping part of your code. A backward overlap is okay.

```
Example: M 3000 3FFF 6000[RETURN]
```

# ULTIMON II

## Device Control

### Link Device Type Select

---

Syntax: D[D|C]

The DD and DS commands will link the serial I/O to either Cassette or Disk. 128 byte or 256 byte I/O transfer (can also be used on Cassette).

Example: DC[**RETURN**]

### Link Device Number Select

---

Syntax: N[1|2|3|4]

The N1, N2, N3 and N4 commands will select the linked drive number for disk I/O.

Example: N2[**RETURN**]

This will have no effect on Cassette I/O.

### Link Density Select

---

Syntax: :[S|D]

The :D and :S commands will toggle the device link to either single or double density (128 byte or 256 byte transfer).

ULTIMON supports single, dual or double density disk I/O.

Single Density = DS (default).

Dual Density = DS (default).

Double Density = DD

The first 3 sectors of a Double Density Disk are in Single Density.

Example: :D[**RETURN**]

# ULTIMON II

## Format Diskette

---

Syntax: FM

The FM command will format a diskette in the density that the drive is currently selected to.

Example: FM[**RETURN**]

## Read from Device

---

Syntax: RD <sector> <from> <count>

The R command will read a sector or sequence of sectors from the linked disk device <sector> is the starting sector number, <from> is the starting address that the data is to be stored to, <count> is the number of sectors to be read.

Example: RD 1 4000 2F[**RETURN**]

## Write to Device

---

Syntax: WD <sector> <from> <count>

The W command will write a sector or sequence of sectors from the linked device, <sector> is the starting sector number, <from> is the starting address that the data is to be read from, <count> is the number of sectors to be written.

Example: WD 40 2000 80[**RETURN**]

# ULTIMON II

## Hotkey Quick Reference

---

Keys	Description
[CONTROL]+P	Print.
[CONTROL]+T	Trace.
[CONTROL]+S	Single-Step.
[CONTROL]+G	Go from Program Counter.
[CONTROL]+J	JSR from Program Counter.



# ULTIMON II

## Command Quick Reference

---

Key	Description
Q	<b>Q</b> uit.
*	Program Counter.
X	Processor <b>X</b> Register.
Y	Processor <b>Y</b> Register.
S	Processor <b>S</b> tatus Flags.
B	Set <b>B</b> reakpoint.
D	<b>D</b> isassemble.
G	<b>G</b> o at Address.
J	<b>J</b> SR to Address.
E	<b>E</b> xamine Memory.
U	<b>U</b> ppdate Mode.
L	<b>L</b> ocate.
C	<b>C</b> ompare.
R	<b>R</b> eplace.
F	<b>F</b> ill.
M	<b>M</b> ove.
1	Set Auto Update field <b>1</b> .
2	Set Auto Update field <b>2</b> .
3	Set Auto Update field <b>3</b> .
4	Set Auto Update field <b>4</b> .
5	Set Auto Update field <b>5</b> .
6	Set Auto Update field <b>6</b> .
7	Set Auto Update field <b>7</b> .
8	Set Auto Update field <b>8</b> .

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