MU Beta

Real-Time In-Circuit Emulator

for the Microchip PIC® microcontrollers

User's Manual

ASIX®

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1. MU Beta

MU Beta is a Real-Time In-Circuit Emulator for the most popular 6-pin to 18-pin Microchip PIC12 and PIC16 microcontrollers with up to 2 kilowords of program memory including devices with A/D converter and two analog comparators.

Integrated development environment software IDEA for Windows 95/98/ME/2K/XP/Vista is available.

Recent list of supported parts, latest software version and possible changes to this manual can be found at http://tools.asix.net/.

1.1 Technical specification

- Connects to PC using standard parallel port (LPT) or USB (using EMUSB)
- Power: 9 V DC, 300 mA
- Dimensions: 13.5 × 6.5 × 3 cm
- Operation temperature range: +10° to +40°C
- Operation relative humidity: max. 90 %

1.2 Packing list

MU Beta	Emulator base unit
BT CABLE	PC connection cable: 25-pin parallel port (LPT), 9-pin MU Beta
	Note: EMUSB (MU Beta USB Interface) can be used instead of BT CABLE.
PROTAB	Pin protection device - connect to target connector
HMU10F2xx	PIC10F2xx (6-pin) devices emulation header: board
HMUB8	PIC12C5xx (8-pin) devices emulation header: board
HMU12F6xx	PIC12F6xx (8-pin) devices emulation header: board
HMU16F6xx	PIC16F6xx (14-pin) devices emulation header: board
HMU10	6 / 8-pin devices emulation header: target application cable
HMU16	14-pin devices emulation header: target application cable
HMU20	18-pin devices emulation header: target application cable
CD-ROM ASIX	Complete electronic manual, software installation files and other information
MW903GS	Power supply, Euro type (PRI: 230VAC, 50Hz, SEC: 9 V DC, 300 mA, 2.1 mm connector diameter) *Shipped only to continental Europe countries.*
MANMUBETA	This User's Manual

2. Hardware installation

- Turn off your computer.
- Connect the communication cable - there are two options:

  - **Parallel port**
    Use *BT CABLE* (Sub-D 25 to 9 pins cable) and connect it to emulator to the connector labeled **LPT** and to parallel port of computer.
  - **USB (using EMUSB)**
    Use EMUSB (MU Beta USB Interface) and connect it to the USB port at your computer (or USB hub). Windows then founds a new hardware and will ask you to install drivers. Drivers are available on installation CD-ROM (in `\drivers\EMUSB\` directory) or from tools.asix.net website. Please note that drivers are not digitally signed and you will have to click a "Continue anyway" button during installation. After successful driver installation you will find that the green EMUS LED will lite.

- Connect power adapter (9 V DC, 300 mA, non-stabilized) to emulator via the connector labeled **9V DC** and then connect to the mains. Power is indicated by green LED labeled **POWER**. (See Note 1).
- Connect the protection module *PROTAB* to the **TARGET** emulator connector. (See Note 2).
- Plug the emulation header of your choice to *PROTAB* and to your application to the microcontroller socket. Pin #1 is indicated by a red point on the header. (See Notes 3, 4 and 5).
- Turn the computer back on.

NOTES:

1. *MU Beta* has no power switch. Do not let the emulator switched on if you do not use it for the extended period. Emulator can be connected to PC even with no external power turned on for unlimited period.

2. Use the protection module *PROTAB* between emulator and emulation header whenever possible. Its purpose is to avoid damaging the emulator output buffer by eventual short circuit. These I/O pin output buffers are capable to sink/source relatively high current (to be compatible with real PIC MCUs) but the short circuit to the ground or power supply can cause permanent damage. Only applications requiring full output current should be debugged without *PROTAB* but even for those applications use *PROTAB* in the beginning of development.

3. Emulation headers usage for various PIC MCU types:

Device	Emulation Header
All 18-pin types	*HMU20*
PIC10F2xx	*HMU10F2xx + HMU10*
PIC12C50x	*HMUB8 + HMU10*
PIC12F6xx	*HMU12F6xx + HMU10*
PIC16F6xx	*HMU16F6xx + HMU16*

4. Any header contains the emulation socket and two clips labeled **TriggerIn** and **TriggerOut** which function is described later in this document.

5. The standard emulation headers support devices in DIP packages, DIP to SOIC converters (XLT08SO and XLT18SO) are available as an option.

3. Hardware operation

- The *MU Beta* emulator is intended for operation on common conditions. Avoid increased humidity, dust, impurity and explosive atmosphere. Do not operate this product in ambient temperature exceeding the range +10° to +40°C. Storage temperature range is -10° to +60°C. Removing covers is not allowed.
- Emulators are not intended to be connected directly into mains. Use only the **proper power adapter**. This must be in good condition.
- Turn off both the computer and *MU Beta* any time you are about to connect or disconnect the emulator.
- Use only the **communication cable shipped with the product**. Use only PC parallel port, do not attempt to connect emulator to PC via other port types.
- Only 0 to 5.5 V voltage is allowed to be connected to the emulation header. If a pin is configured as an output, it must not be driven from the target application (short circuit to GND or Vdd). **Exceeding these conditions can result in substantial damage of the equipment.**
- **Use *PROTAB* I/O protection device whenever possible!** Insert *PROTAB* between emulator and emulation header. The only reason for removing *PROTAB* is that you need to exploit full device I/O output current, which should be rare case.
- **Insert/remove emulation header** to/from target application circuitry **only with target power turned off!**
- It is not necessary to hold target application supply voltage turned off when *MU Beta* is powered off. The emulator core and application circuitry I/O interface are powered separately. The emulator core is able to continue emulation even when target power is off but the I/Os cannot work.
- The **Trigger Out** signal (the wire with red hook) is an output. It **must not be overload** (e. g. by grounding or connecting to target power).
- The **TriggerIn** signal is a digital input with allowed voltage range 0 to 5.5V.
- **Emulation header** must be protected from damage. To improve this lifetime, it is recommended to operate the emulator with another (non-precise) DIP socket inserted into this all the time. In case of damage the socket can be easily replaced. The header is shipped with this socket.

4. Software installation

If you use EMUSB (MU Beta USB Interface) please install its USB drivers first (as described in **Hardware Installation** chapter).

Download an installation file from **http://tools.asix.net/dwnld_idea.htm** or insert the installation *CD-ROM ASIX* and run installation program `idea_xxx.exe` where 'xxx' means version number. The installation uses standard "wizzard" style installator (InnoSetup) you should be familiar with.

Default destination directory (or folder) is `C:\Program Files\ASIX\IDEA`. Advanced users can use another base directory than "Program Files". The program icon will be placed on desktop, but you can supress this option.

Now you can run the `IDEA.EXE` for the first time. Note, that if you use Windows NT/2K/XP/Vista, you must use the administrator mode because the parallel port driver `asixio.sys` will be installed (typically to `C:\Windows\System32\Drivers` directory) when performing first access to hardware. Also, you must have write access rights for the directory where `IDEA.EXE` is installed to allow the IDEA application store here the global parameter file `IDEA.INI`.

You may find convenient to associate the `IDP` file extension with program IDEA, because it allows you to start projects using file managers like Windows Commander, ZTreeWin, FAR or even Explorer.

NOTES:
1. If you have already installed any previous version of IDEA, please un-install it before new installation to remove old unnecessary files. Your projects and source files will remain unchanged, only `{IDEA directory}\Projects\Examples\Example.*` files will be rewritten.

2. You must have the **write access** in directories (folders), where IDEA is installed and in project target directories. Thus, is not possible to run the software from e.g. CD-ROM. The settings cannot be saved in such case and software gives an error message.

3. Software **IDEA requires correct date and time setup** on your computer (IDEA compares the date/time information of `.ASM` source files and `.COD` debug file and decides whether the source files must be compiled before using the information contained in the debug file).

5. Quick Start

Step 1

Install *MU Beta* hardware as described in chapter 2. Hardware installation.

Step 2

Install the IDEA software as described in the chapter 4. Software installation. Windows NT/2K/XP/Vista users should have administrator rights for first access to hardware. Then, after automatic driver installation, the standard user rights are sufficient.

Step 3

If hardware and software are installed and emulator is switched on, run the program IDEA, e.g. by click on its desktop icon. In the very beginning, MPASMWIN assembler will be invoked first to build the project *Example*. Then you are asked to select action, choose the default "Continue to use an EXAMPLE project" button. Now you see IDEA desktop with Program Memory window and Console window opened.

Step 4

Now it is necessary to setup hardware communication. Select menu **Options → Global**, a *Global Options* dialog will be opened. Then, select the tab with your equipment name (*MU Beta*) and set-up the communication parameters. Typical setting is LPT1 with base address address 0378h.

Step 5

Change the project equipment to *MU Beta*: Using menu **Project → Edit Project** open the *Edit Project* dialog and set up equipment from default *DEMO* to *MU Beta*. Do not change the part type (PIC16F84A). Confirm change by pressing **OK**, then select **Yes** to next question. Project will be rebuilt using MPASMWIN and then hardware initialization of emulator (FPGA configuration and complete internal set-up) is invoked. You can see that emulator LEDs are now active and indicating hardware status.

Step 6

Now place another window on IDEA desktop - *Watches* window by menu **View → Watches** command. You see the variables HUNDREDS, SECONDS, MINUTES and HOURS in *Watches* window.

Then, start the application by menu **Run → Run** command. You can see the application running, and the variables incrementing. This simple application does not access PIC ports and does not require any target application connected.

Now you can "play" with this project - **Run**, **Halt**, **Step**, **Edit source**, **Build**, open and close various windows, etc.

6. Further information

[1] http://tools.asix.net/

[2] http://www.microchip.com/

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