The USB100 Device Descriptor Table Explained

Fairchild Semiconductor
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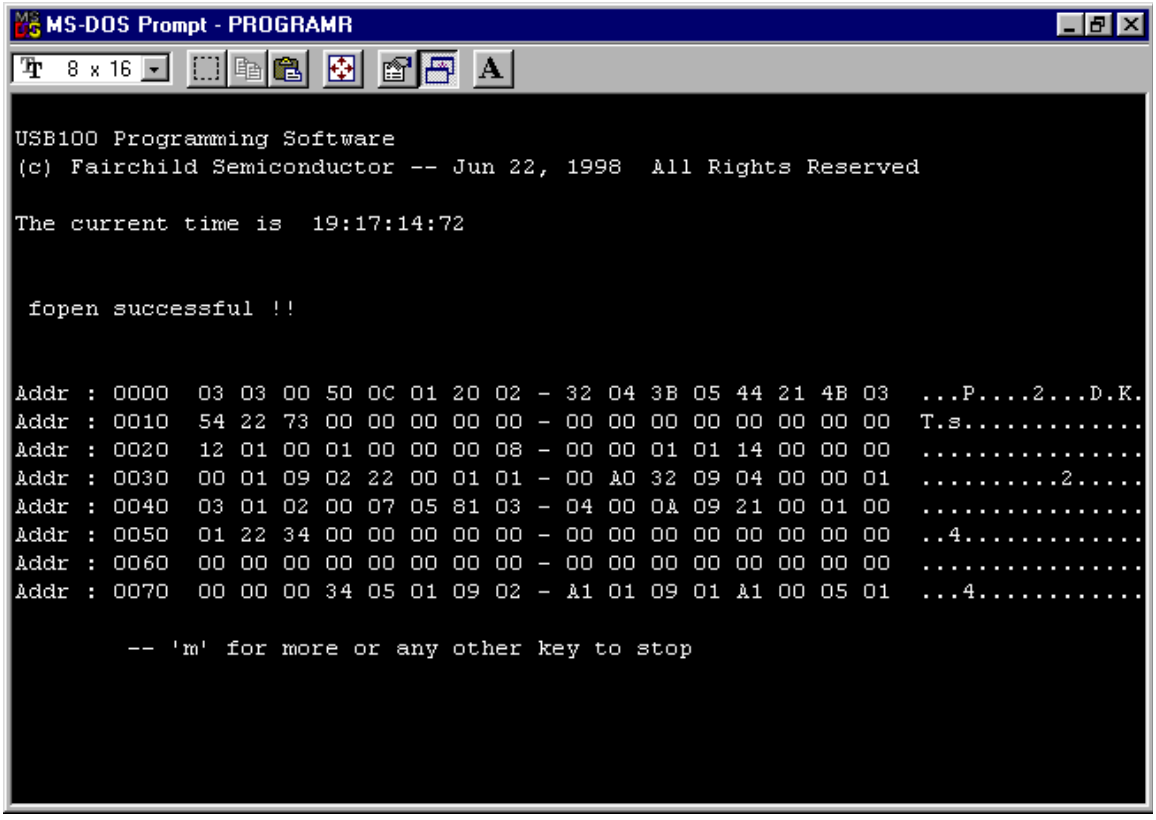
The USB100 device implements the entire set of commands needed to support a HID device. It is intended for use in mouse, trackball, joystick and digital gamepad applications only. When a USB device is plugged into a USB capable computer (hereafter called host), it proceeds to determine the type of device plugged in (full-speed vs low-speed, and the type of function it implements). The full-speed/low-speed determination is made by the presence of a pull-up resistor either on the D+ line or the D- line respectively. The function of the device is determined by sending a set of commands called collectively called as get-descriptor.

The descriptors needed to be implemented by the HID device are device descriptor, configuration descriptor, HID descriptor and the report descriptor. The following figure below shows the data for a USB mouse using the USB100 device. The data at address 0 through address 4 are the device configuration registers described in the USB100 data sheet. There are used to set the operating mode of the device (mouse, joystick, etc), the amount of current to be used by the mouse IR leds, the photo-transistors etc. Beginning address 5 is the device descriptor table. It can consist of upto 14 pairs of bytes. Each pair of byte describes the following. The first byte describes the type of descriptor and the second byte is the starting address in the EEPROM where the actual descriptor is located.



In this table the first pair is

01 20

01 indicates the device descriptor and 20 is the address (in hexadecimal) where the device descriptor begins. In fact, if one looks at address 20, the following data pattern is seen.

12 01 00 01 00 00 00 08 -

The second pair is

02 32

The first byte 02 indicates that it is the configuration descriptor and the 2nd byte 32 indicates that this descriptor begins at address 32 hex in memory. Similarly the other pair - 05 44 refers to the endpoint descriptor and 44 hex is the address in memory where this descriptor begins. The pair 03 54 refers to the sting descriptor. The numbers used in this table are the same as that described in table 9-4 of the USB specification rev 1.0.

The HID related descriptors are HID descriptor and report descriptor. The pair 21 4B refers to the HID descriptor for mouse and 4B hex is the address. Similarly, the pair 22 73 refers to the report descriptor for the mouse starting at address 73 hex. These descriptors are described in detail in the HID device class specification.

When the host requests a configuration descriptor, the USB device is required to respond with the configuration descriptor, all interface and all endpoint descriptors in a single request (as specified in section 9.4.3 of the USB specification 1.0). The USB100 device handles this transparently, as long as these bytes of information are located in the order shown above.

The length of the descriptor is a part of the descriptor (contained as the first byte of each descriptor), with the exception of the report descriptor. The first byte of the report descriptor in the USB100 memory must be the length of the report descriptor. This is followed by the actual descriptor itself.

Fairchild Semiconductor provides a universal data file, that can be used as a template. It contains all the necessary descriptors needed for interoperability with windows98. The end-user just needs to tailor the first five bytes to match the parameters of the photo-transistor and the IR leds being used. All of the other information provided is common to 2D/3D mice as welll as two and three button mice. Please contact your nearest Fairchild Semiconductor Office/Customer response center for obtaining this file.

Conclusion:

The USB100 device ensures full compatibility with the USB specification 1.0 as well as HID specification 1.0 final. The user does not have to spend extra design effort understanding this specifications. By just customizing a few bytes to match the physical characteristics of the device (mouse/joystick), a prototype design for a USB device can be built in a very short time

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