

AVR270: USB Mouse Demonstration

Features

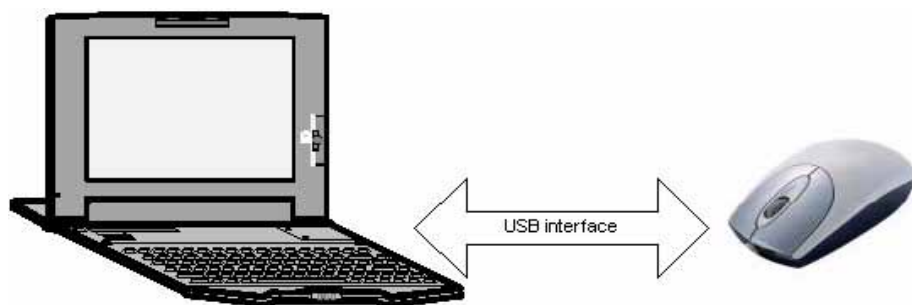
- Runs with AT90USB Microcontrollers at 8MHz
- USB Low Power Bus Powered Device (less then 100mA)
- Supported by any PC running Windows® (98SE or later), Linux® or Mac OS®.
- 3Kbytes of Code Required
- X, Y Movement, Left Button Supported

1. Introduction

The PS/2 interface has disappeared from the new generations of PCs to leave the place to the USB interface. This change has to be followed by the designers of pointing devices, who should integrate the USB interface and allow an easy connection to new PCs.

This document describes a simple mouse project. It allows to quickly test USB hardware using AT90USB without any driver installation.

A familiarity with USB firmware architecture (doc 7603, included in the CD-ROM & Atmel website) and the HID specification (<http://www.usb.org/developers/hidpage>) is assumed.



8-bit **AVR**®
Microcontrollers

Application Note

2. Hardware Requirements

The USB mouse application requires the following hardware:

1. AT90USB evaluation board (STK525)
2. AT90USB microcontroller
3. USB cable (Standard A to Mini B)
4. PC running with Windows® (98SE, ME, 2000, XP) or Linux with USB 1.1 or 2.0 host

3. Software Requirement

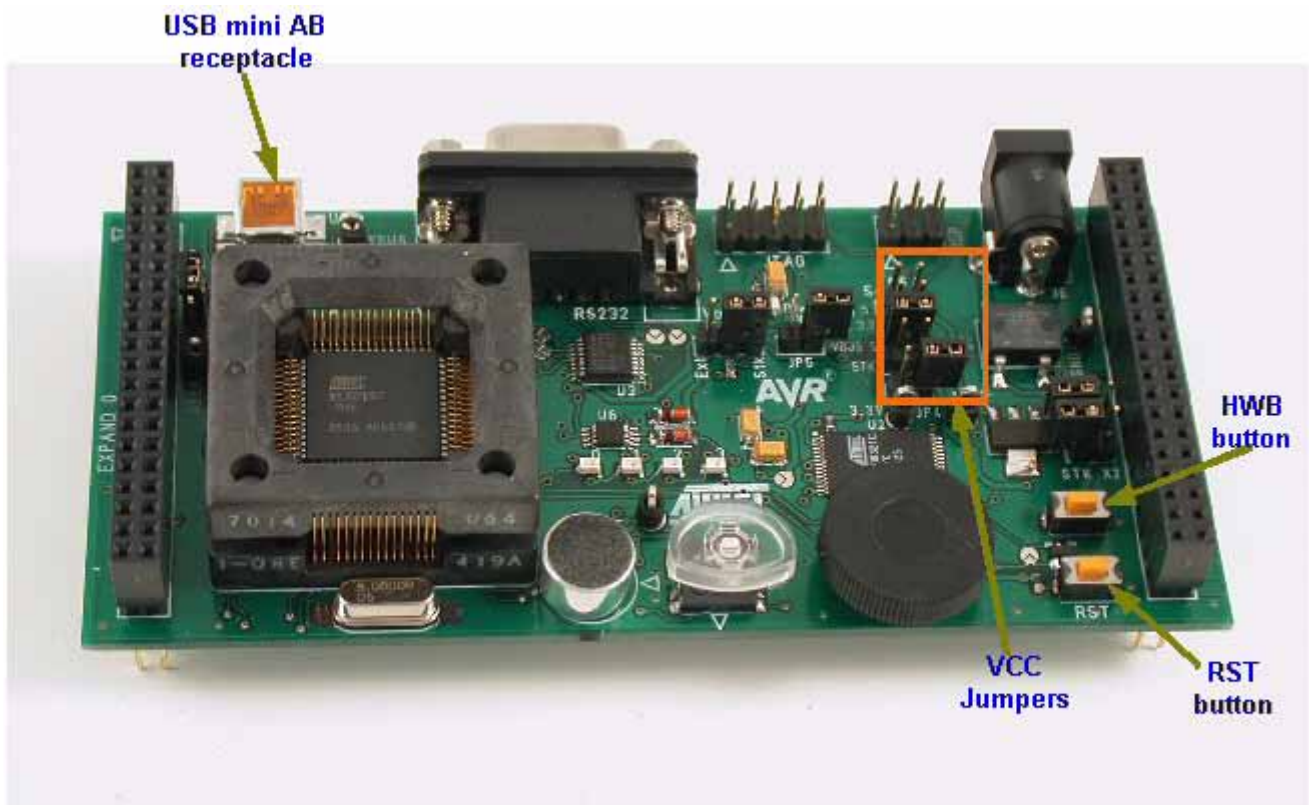
The software needed for this application are:

1. Flip software (Device Firmware Upgrade tool)
2. usb_mouse.a90 (included in the USB CD-ROM)

4. STK525 Default Settings

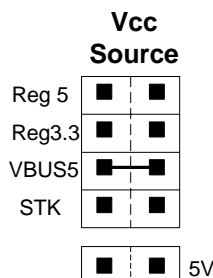
The STK525 board must be configured as below:

Figure 4-1. STK525 Board



All the jumpers should be open, only the Vcc Source jumpers should be set as below:

Figure 4-2. Vcc Jumpers



5. Device Firmware Upgrade

The first thing to do before starting the demo is to load the HEX file into the On-Chip Flash memory of the microcontroller. The “Flip” software is the tool used to upgrade the firmware (available for free in the USB CD-ROM or ATMEL website).

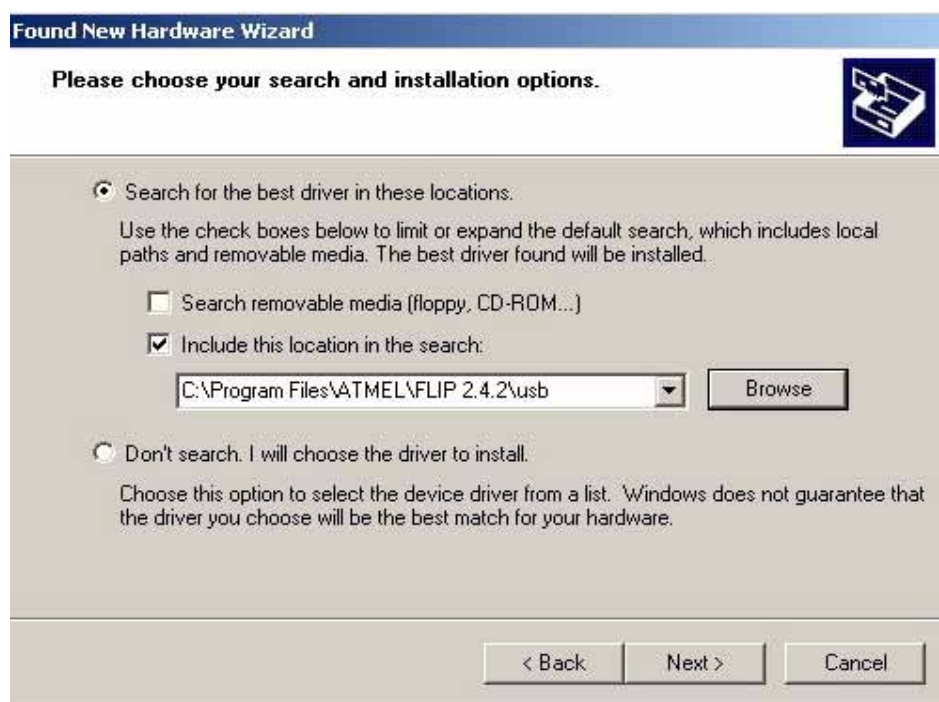
The following steps should be completed to allow the device starting DFU mode, and load the HEX file:

1. Install Flip software. If the latest version of Flip supporting AT90USB is already installed in your computer, please skip the steps 1 and 7 (Flip version 3.0 or above is required).
2. Connect the STK525 board to the computer using the USB cable (Standard A to Mini B).
3. Push the HWB (Hardware Bootloader) button.
4. Push the RST (Reset) button.
5. Release the RST button.
6. Release the HWB button.
7. If your hardware conditions explained above are correct, a new device detection wizard will pop-up. Please follow the instructions (the INF file is located in the USB subdirectory from Flip installation: install path: \ATMEL\FLIP\FLIPx.x.x\usb).

Figure 5-1. New Device Detection Wizard

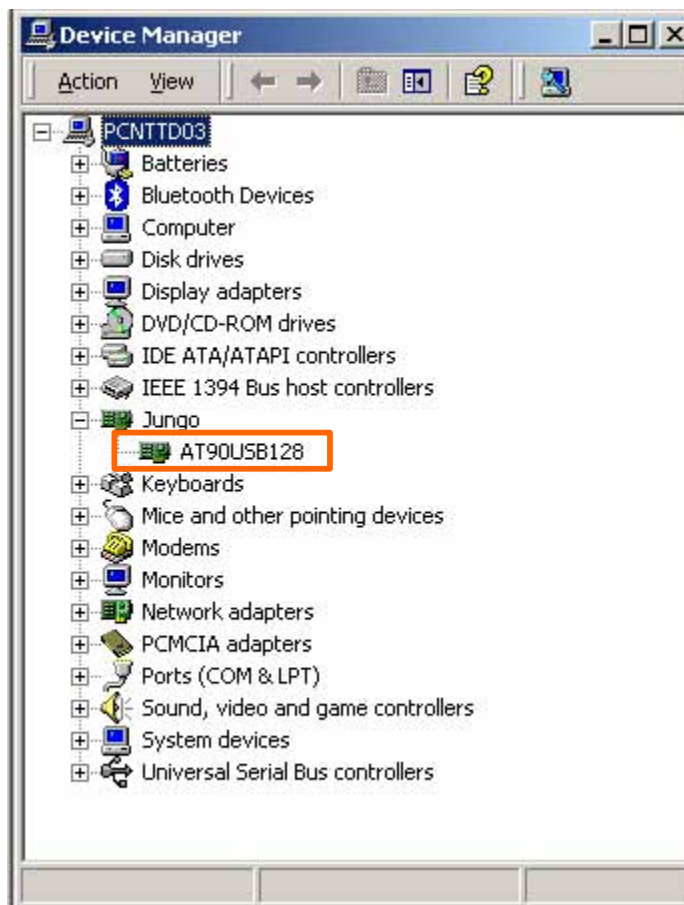


Figure 5-2. Driver Location



8. Check the Device Manager, and you should see the same icon (Jungo icon) as shown in the figure below. If not start again from the step 2.

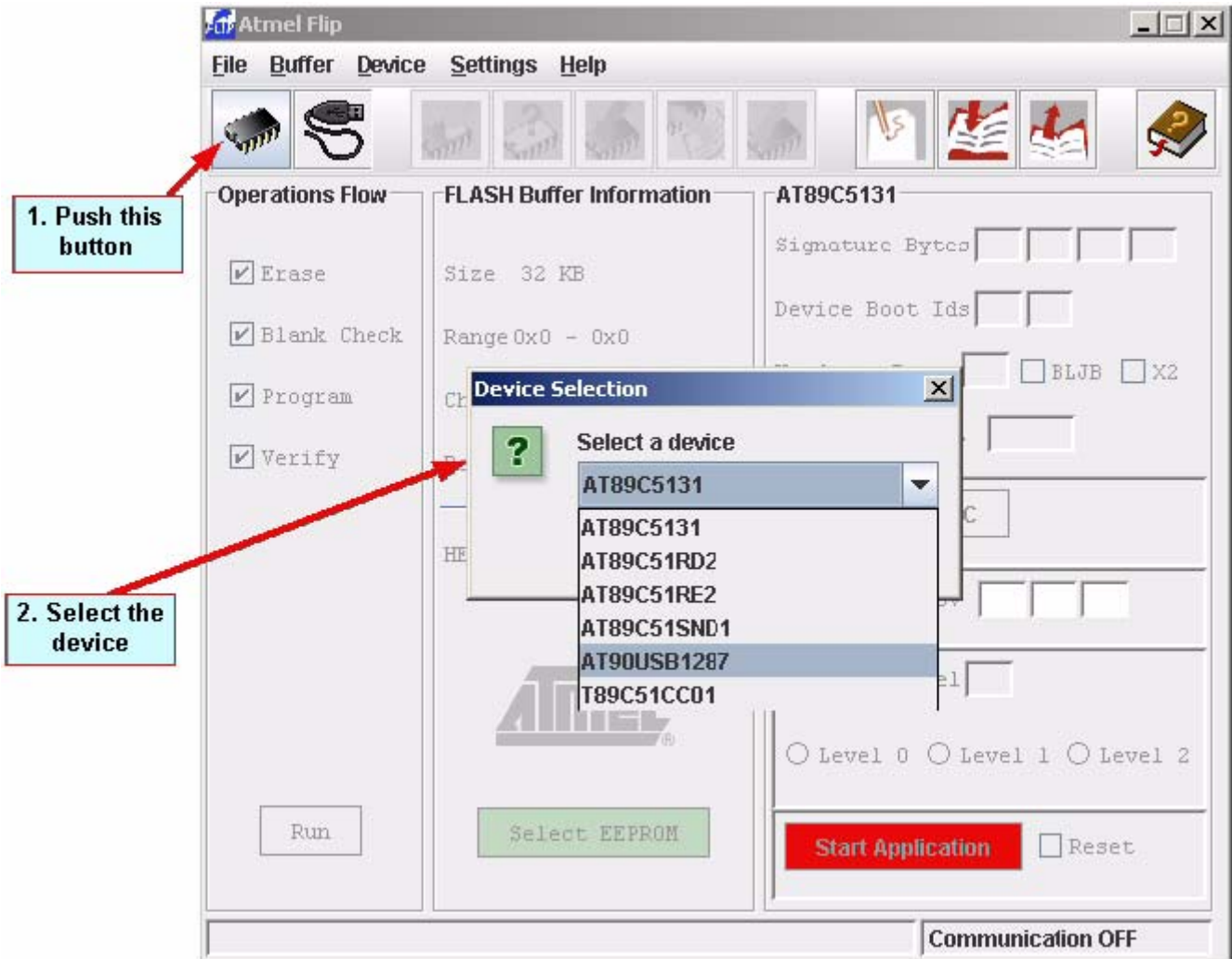
Figure 5-3. Device Manager



Once your device is in DFU mode, launch the Flip software and follow the instructions explained below:

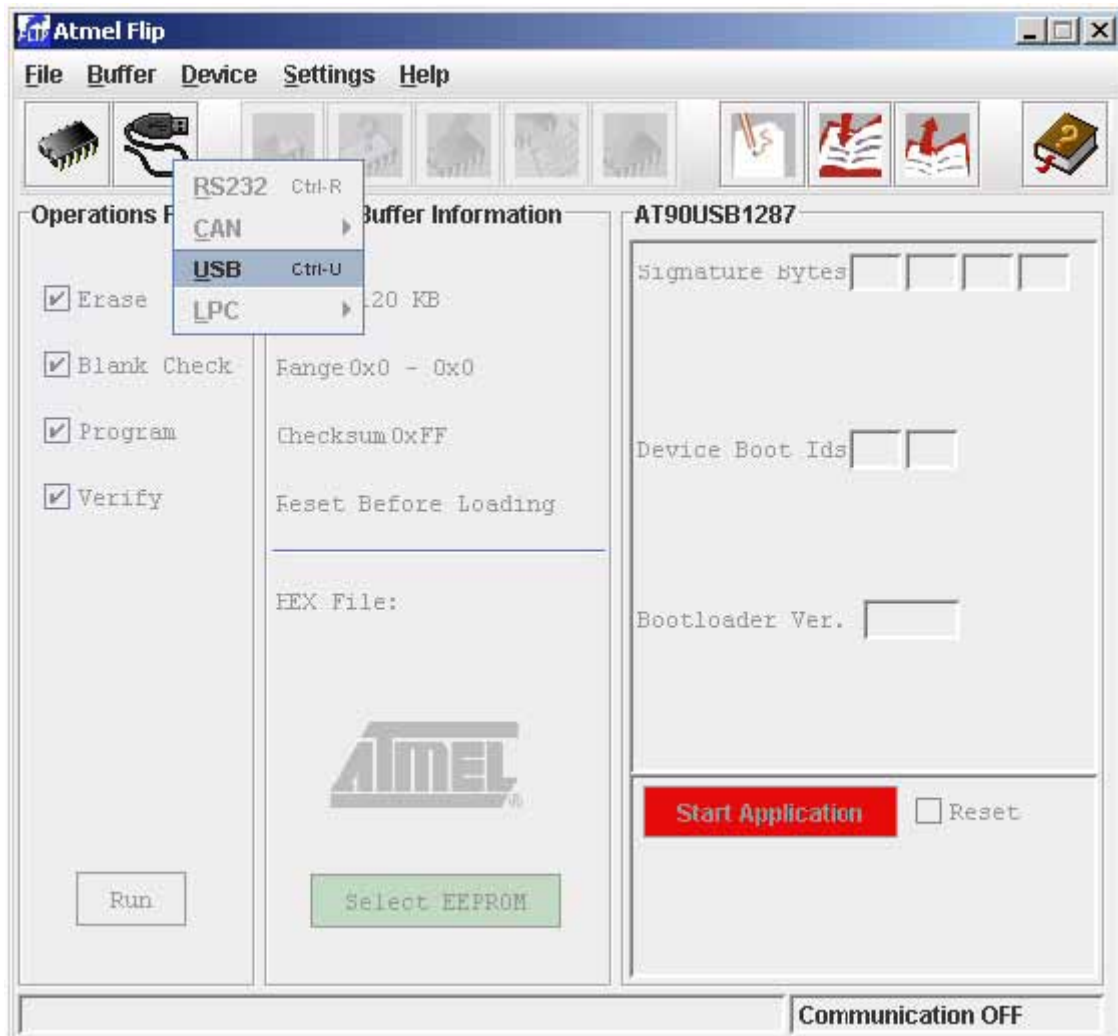
1. Select AT90USB device.

Figure 5-4. Device Selection



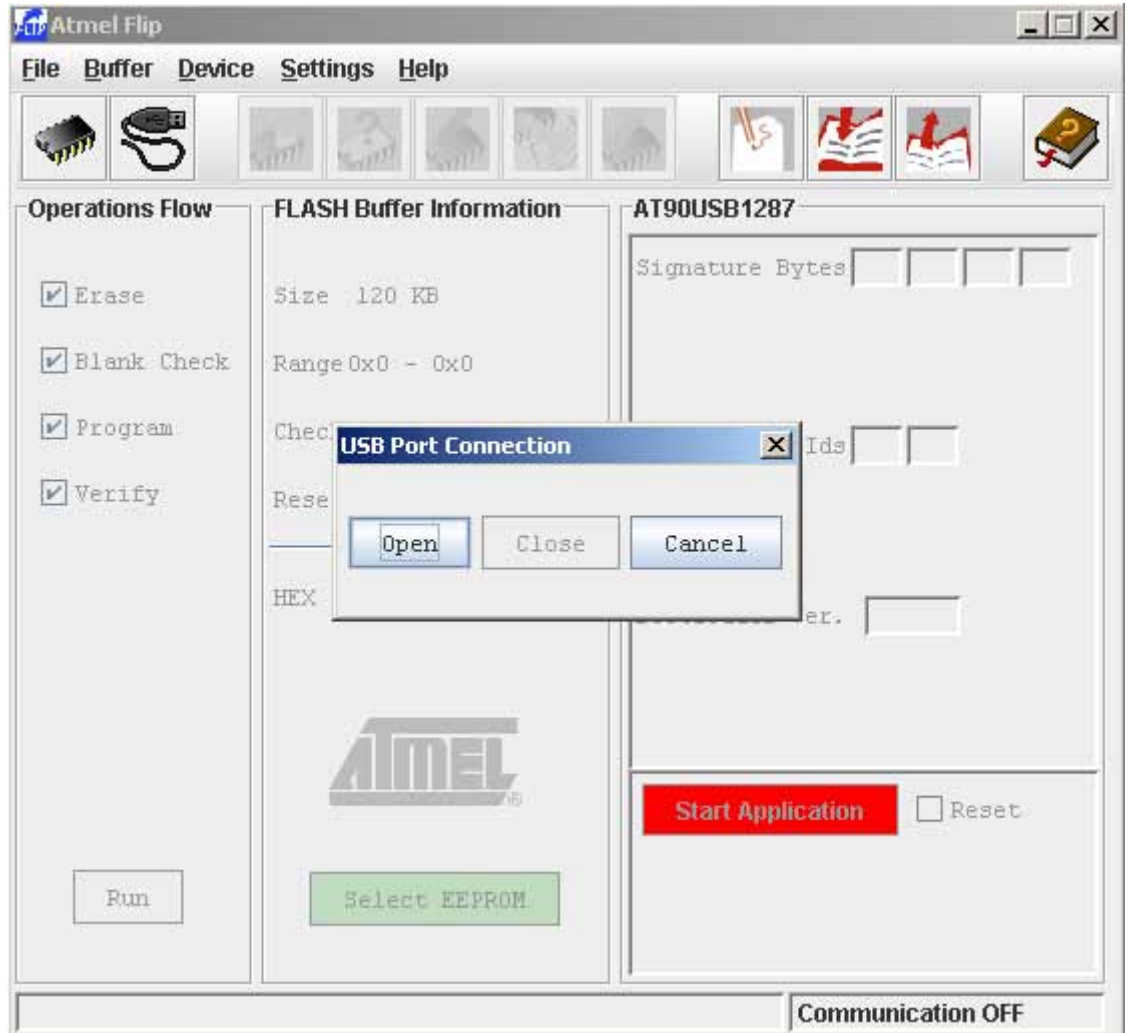
2. Select the USB as communication mode

Figure 5-5. USB Communication Mode



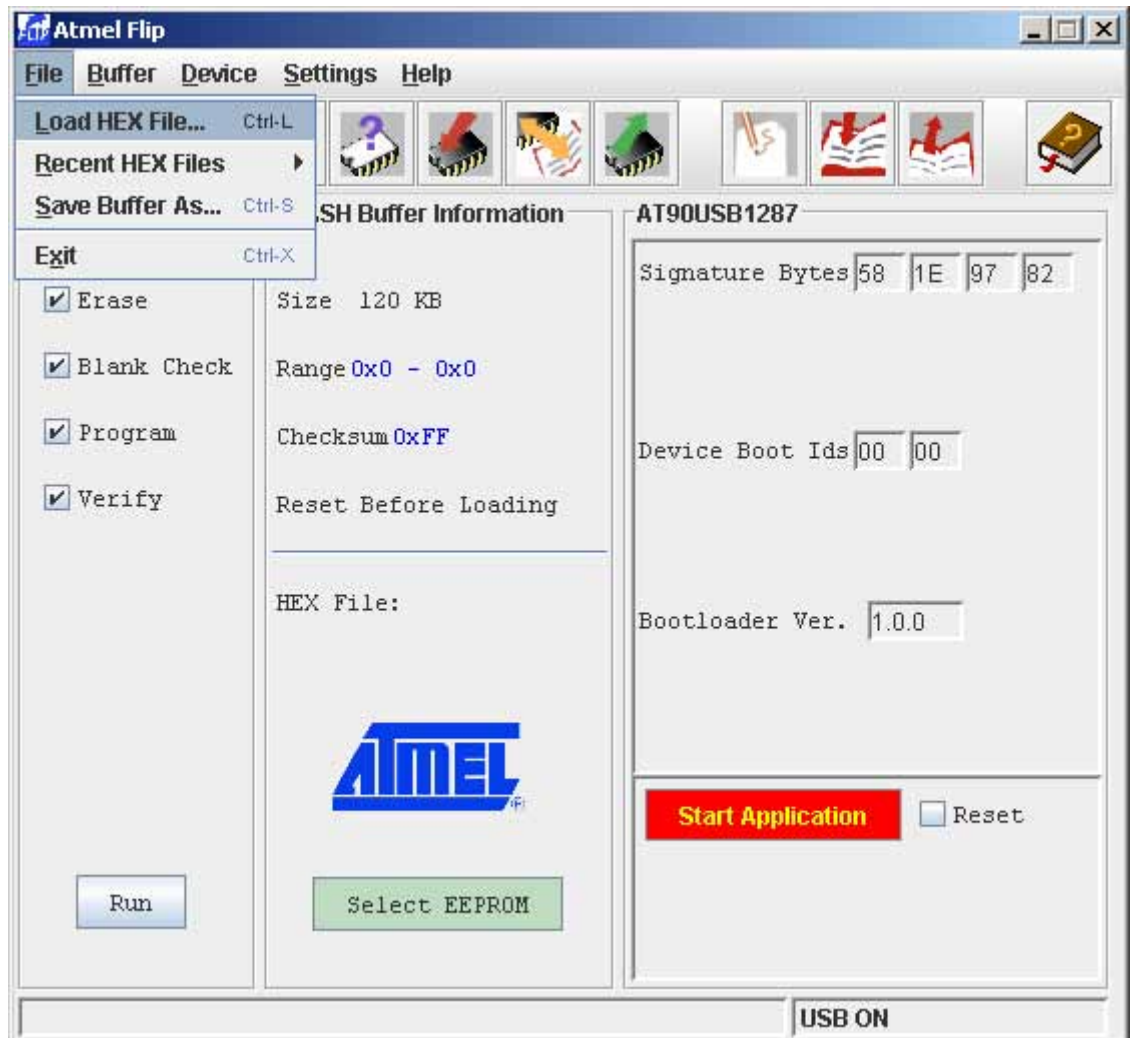
3. Open the communication

Figure 5-6. Open the USB Communication.



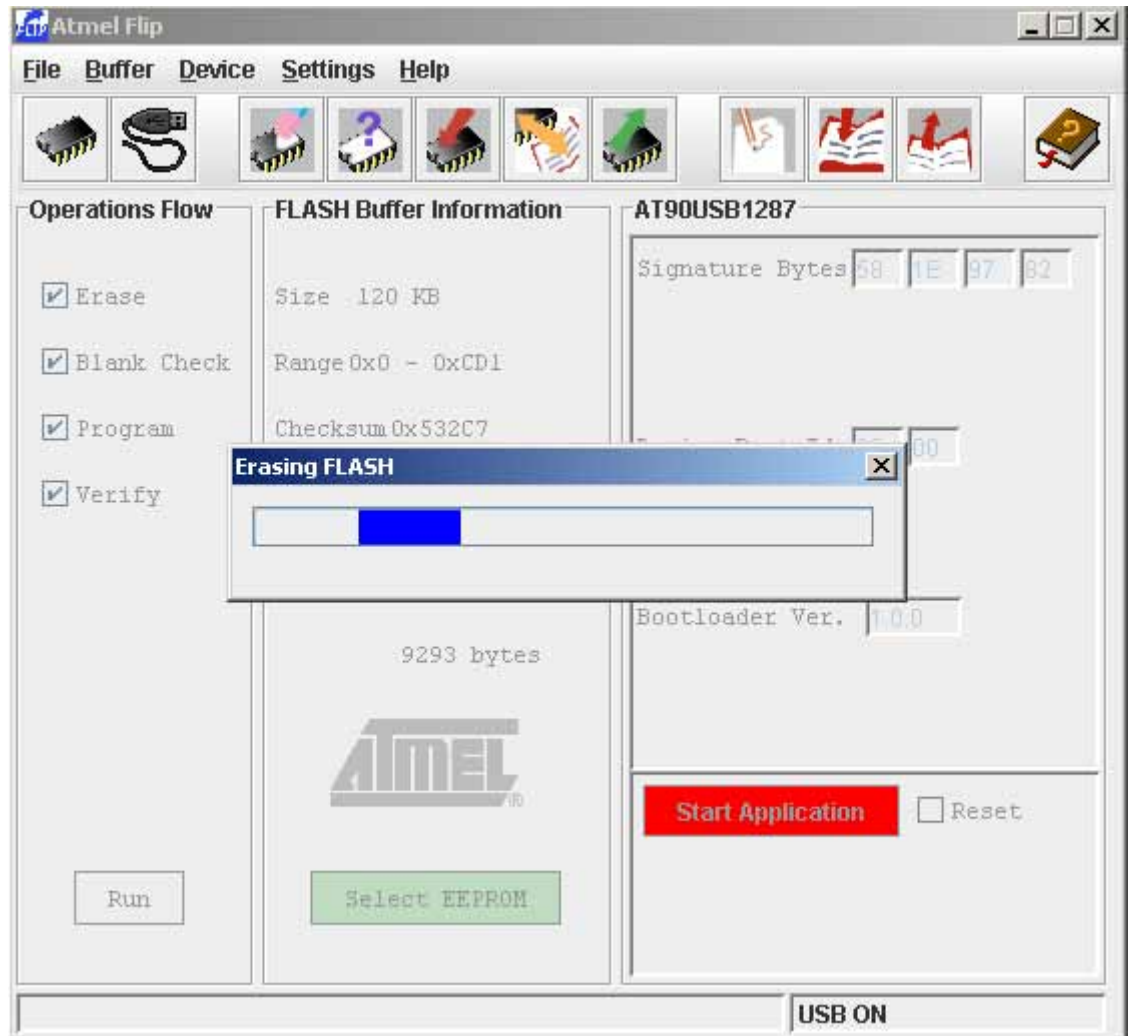
4. Choose the HEX file to load (the HEX file is including in USB CD-ROM: *usb_mouse.a90*)

Figure 5-7. HEX File to Load



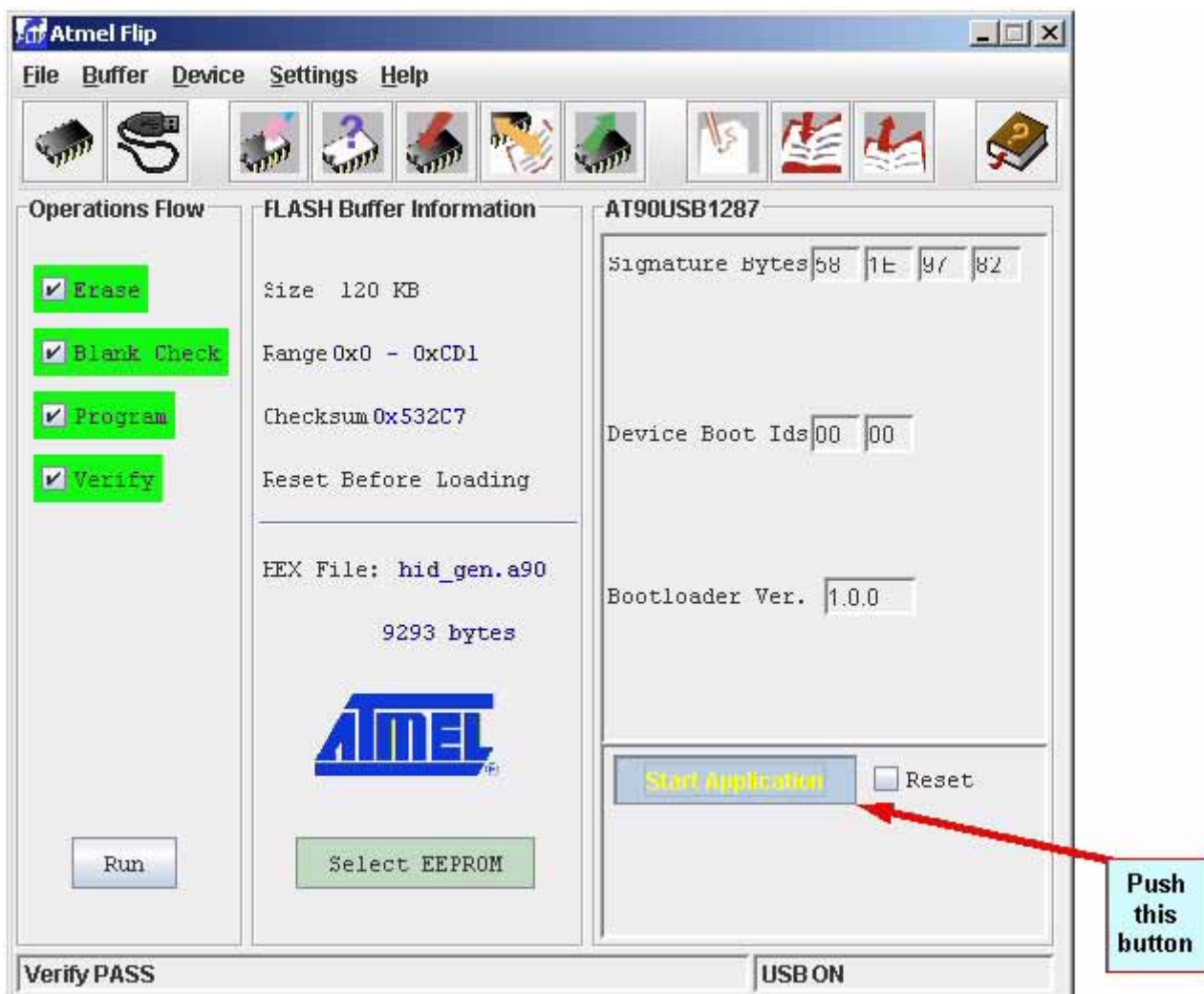
5. Load the HEX file (*Check Erase, Blank Check, Program and Verify, then Push Run button*)

Figure 5-8. HEX File Loading



6. Start the application

Figure 5-9. Start Application

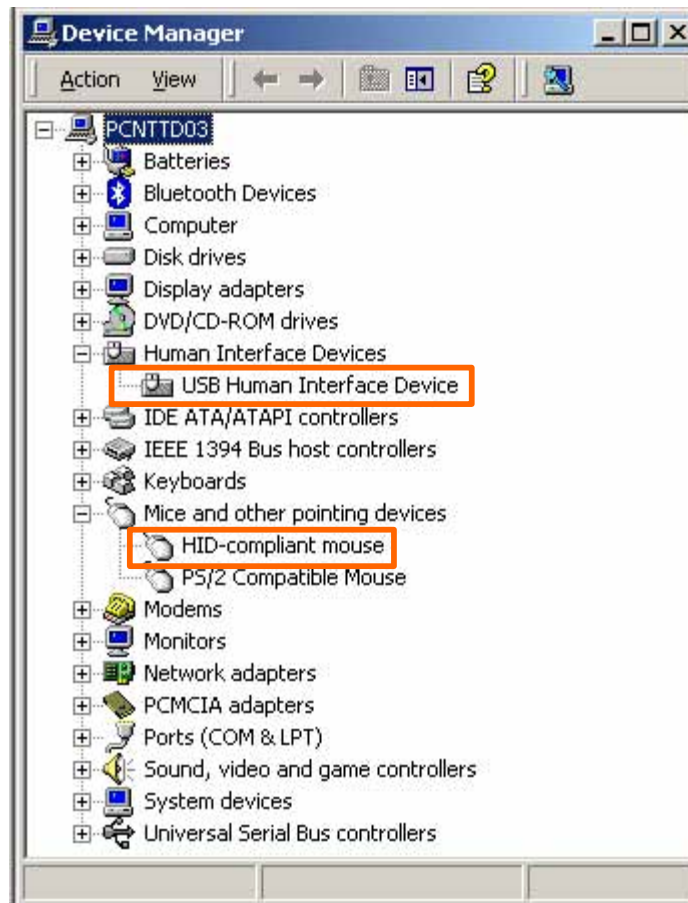


Note: The AT90USB bootloader will detach and jump into the user application when “Start Application” button is pressed.

6. Quick Start

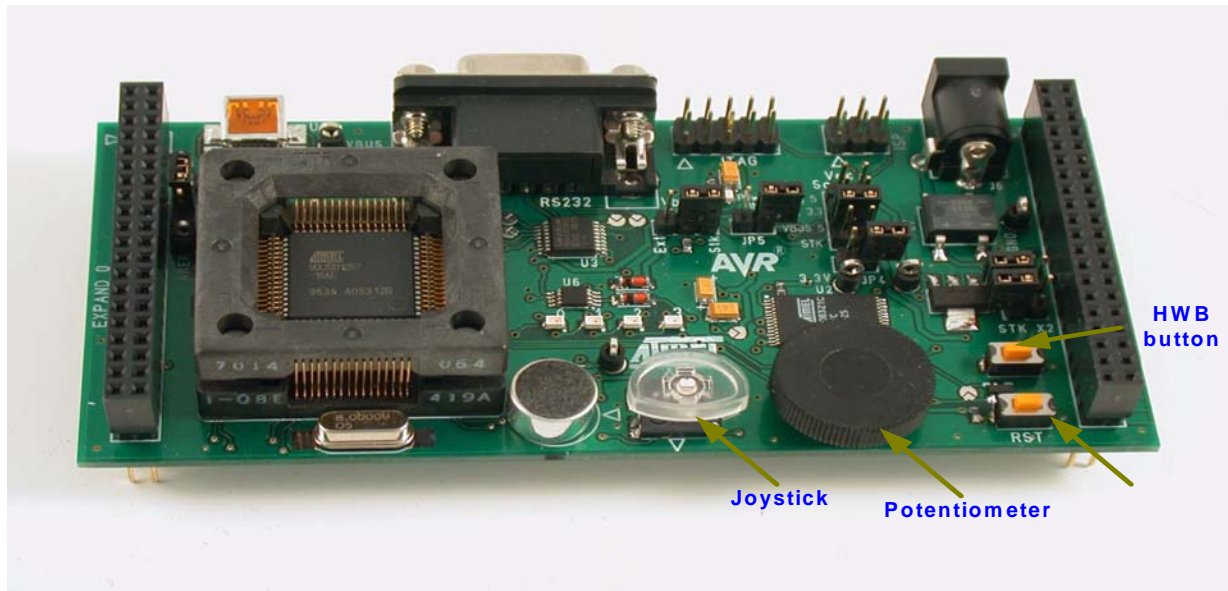
Once your device is programmed with *usb_mouse.a90* file, you can start the mouse demonstration. Check that your device is enumerated as a mouse (see figure 11), then you can use the STK525 as a mouse.

Figure 6-1. Mouse Enumeration



The figure below shows the Hardware used by the demo:

Figure 6-2. Demonstration Board Hardware



To move the mouse pointer in several directions (up, down, left, right) just to move the joystick. The potentiometer will be used as a wheel, and the HWB button will be used as a left button.

7. Application Overview

The USB mouse application is a simple data exchange between the PC and the mouse.

The PC asks the mouse if there is new data available each P time (polling interval time), the mouse will send the data if it is available, otherwise it will send a NAK (No Acknowledge) to tell the PC that there is no data available.

The data sent to the PC is called 'report'. This report has the structure below:

Figure 7-1. USB Report Structure

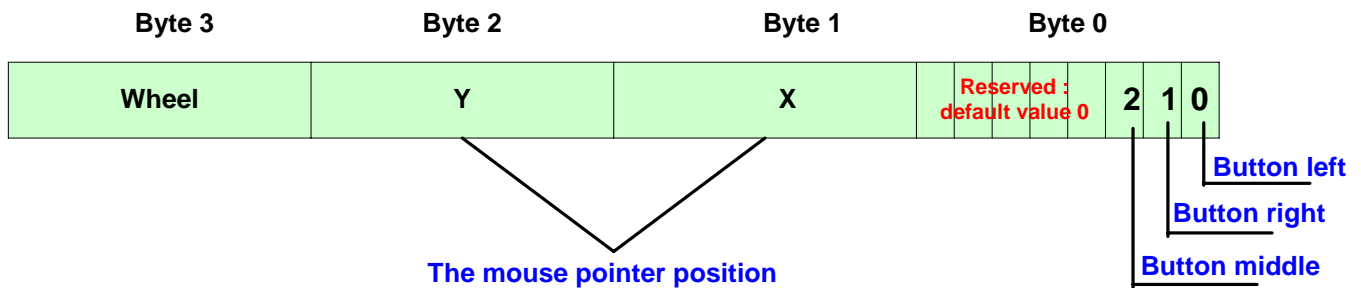
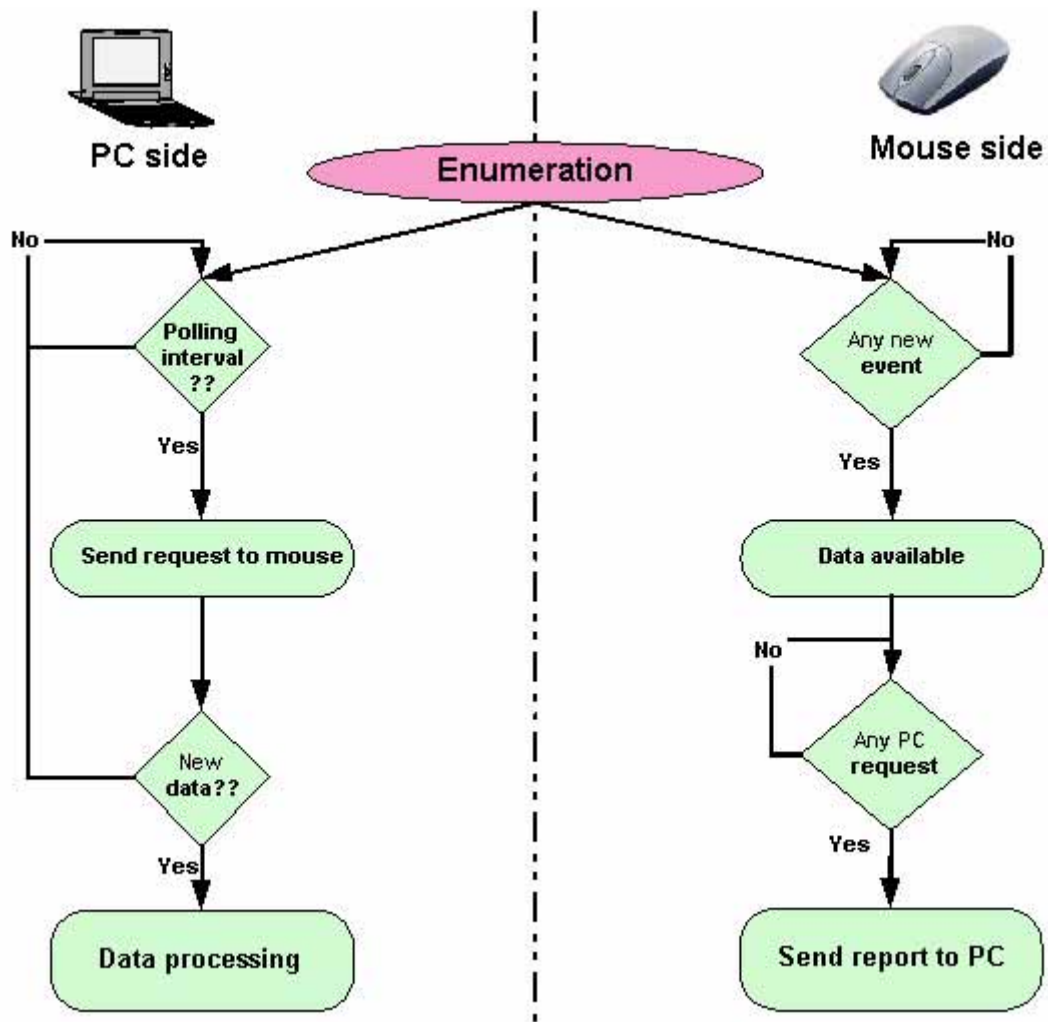


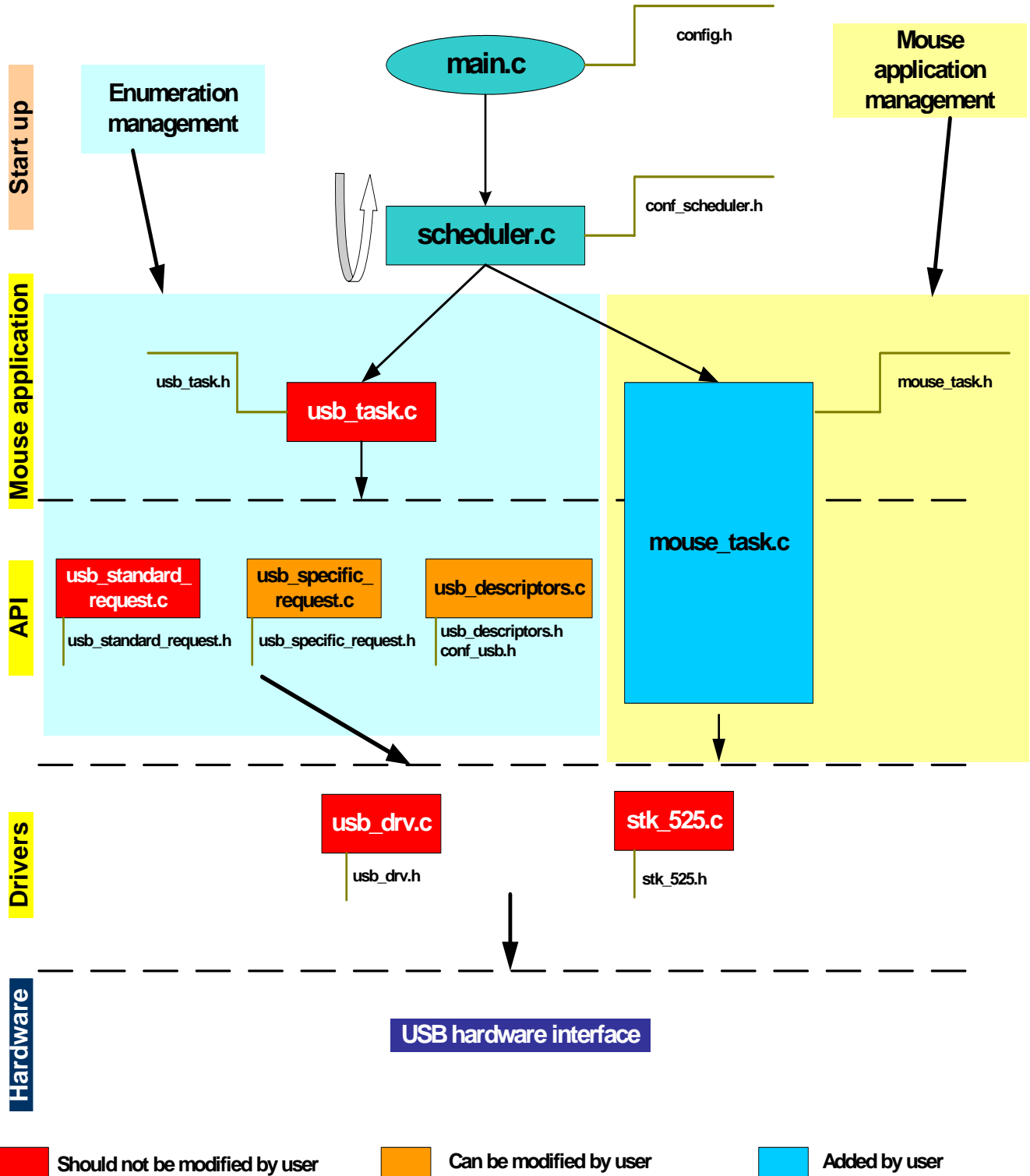
Figure 7-2. Application Overview



8. Firmware

As explained in the USB Firmware Architecture document (doc 7603, included in the USB CD-ROM) all USB firmware packages are based on the same architecture.

Figure 8-1. USB Mouse Firmware Architecture

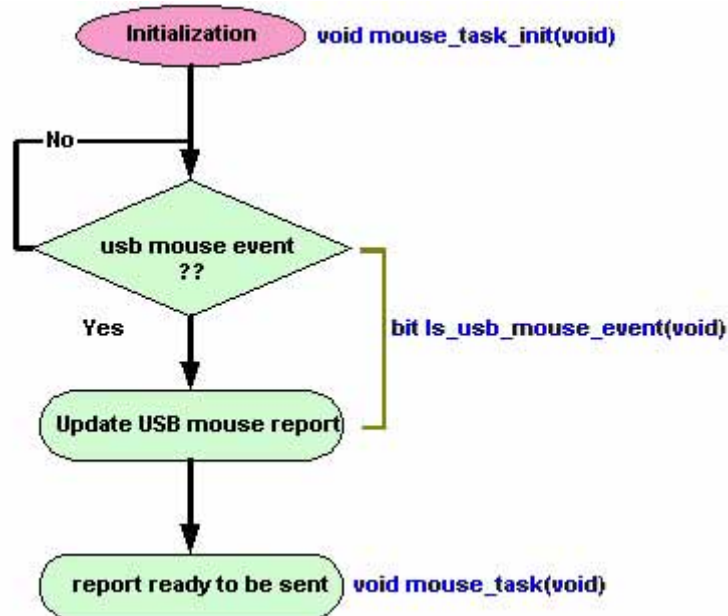


This section is dedicated to the mouse module only. The customization of the files described hereafter allow the user to build his own keyboard Application.

8.1 mouse_task.c

This file contains the functions to initialize the mouse, collect the report data and put it in the endpoint FIFO to be ready to be sent to the PC.

Figure 8-2. Mouse Application



8.1.1 mouse_task_init

This function performs the initialization of the mouse parameters and hardware resources (joystick, knurl...).

8.1.2 Is_usb_mouse_event

If a mouse event occurs, this function update the USB mouse report and return true. Otherwise it return false.

8.1.3 mouse_task

This function checks if `Is_usb_mouse_event` is true and loads the report in the usb endpoint fifo to be transmitted to the host.

8.2 stk_525.c.

This file contains all the routines to manage the STK 525 board resssources (Joystick, potentiometer, Temperature sensor, LEDs...).

9. PC Software

The USB mouse application does not require any PC software.

10. Limitations

The middle and the right buttons are not supported by this demonstration

11. Related Documents

AVR USB Datasheet (doc 7593)

USB Firmware Architecture (doc 7603)

USB HID class specification (doc 7599)



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