USBFAT & USBwiz Development System Tutorial

Rev. 1.12 Date: July 21, 2008 Tutorial

Document Information

Information	Description
Abstract	This document covers complete information about µPICFAT, specifications, tutorials.

GHI Electronics

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1. Development Kit

The development system allows for a fast start up for working with USBwiz, µALFAT or several other available boards. Depending on your choice, you can either the get the USBwiz development system or the USB-FAT development system.

Basically, this is a PIC micro controller that communicates with the provided boards over SPI. GHI has implemented examples and libraries that can be downloaded to the PIC. These libraries simply send and receive data from the OEM boards, so the user is able to use the simple provided 'C' functions to create files/folders for example. You will need the correct example and library downloaded to the PIC in order to be able to use it with the OEM boards. For example, when using USBwiz-OEM, the user must have USBwiz library installed and **not** other libraries such as µALFAT library.

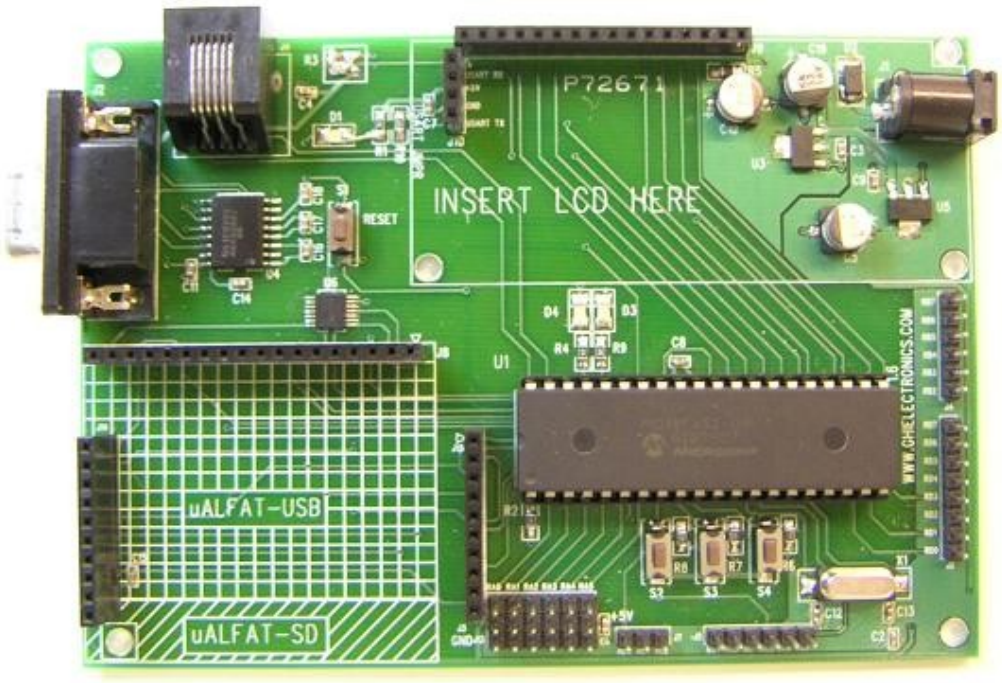
There are many uses for the µALFAT/USBwiz development system. Applications can be written in the C language using the MPLAB IDE™ and the C18™ compiler from microchip. Example applications include MP3 players and using Frame Thrower™ with Microchip's TCP/IP stack.

Several components are included in the development kit:

1.1. µPICFAT™ Development Board

This is the component that provides power and communication to µALFAT/USBwiz. It also provides the serial interface to your computer, and contains the PIC micro controller PIC18F453 that will be used to interface to µALFAT/USBwiz - Complete with a programming port for direct interface to the ICD 2™ programmer. µPICFAT provides both 3.3V and 5.0V.

Communications are done with the daughter boards over SPI. Debug messages and interactions with the user are done though the serial port connected to a PC.



1.2. Provided PCBs

Depending on your choice, you can have one of the following development systems:

- USBwiz Development System (USBwiz-DevSys): Includes USBwiz-OEM.
- USBFAT Development System (USBFAT-DevSys): Includes several modules:
  - µALFAT-USB: µALFAT OEM board with USB connector.
  - µALFAT-SD: µALFAT OEM board with SD connector.
  - SDexp: SD card connector module.
  - GHI3421: MAX3421 USB host/device module.

USBwiz-OEM

OEM board for USBwiz chipset which allows the user to access files on USB and SD

cards simultaneously. USBwiz library and examples are available on the website and they are available on the development system when you receive it. In the example, the user can choose from several options to test the functionality of USBwiz. See USBwiz Page for downloads and full details.

µALFAT-USB / µALFAT-SD

These are OEM boards of µALFAT™ chip. The ease of use, makes them the ultimate solution for OEMs and hobbyists.

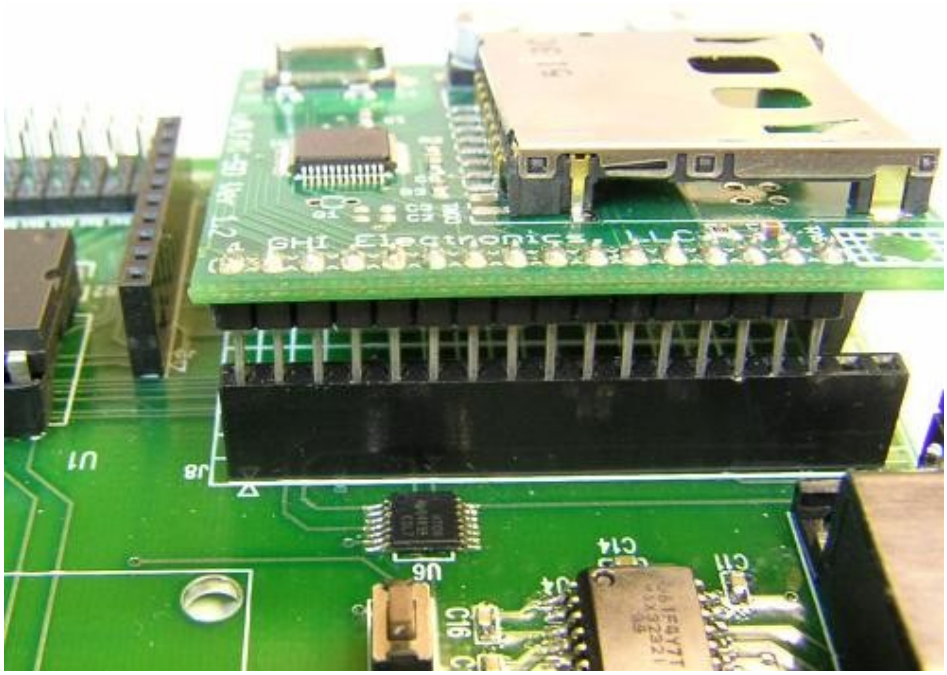
µALFAT library and examples are available on the website and they are available on the development system when you receive it. In the example, the user can choose from several options to test the functionality of µALFAT.

Different firmwares are supported by µALFAT, each can have separate library and examples. Most users need the standard µALFAT firmware which supports FAT Files System. The user must ensure the use of the correct library, if available:

- µALFAT standard firmware: Supports managing files/folders on the connected media.
- GHI3232: A simpler firmware that ,unlike the standard firmware, does not accept user commands but it just write incoming data to the media.

See µALFAT Page for downloads and full details.

When connecting µALFAT-SD to J8 at the lower left corner of the board. Note that it only has 16 pins. It should be inserted so that the pin on the far right of µALFAT (pin 1) is inserted into the far right end of the 18-pin receptacle (pin 1). Look at the picture below.



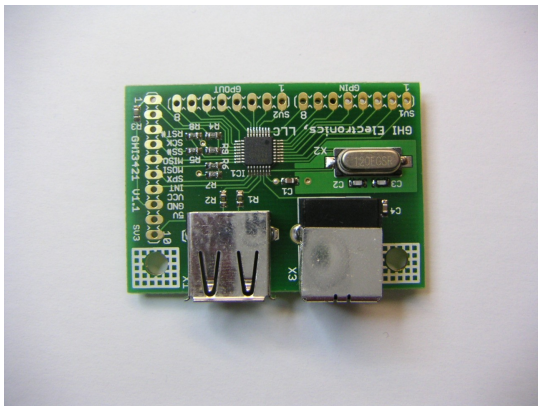
SDexp

This a board with SD card connector on it. The user can start developing for the SD card and testing a File system.

Also, the user can test Microchip free FAT file system by using the SD card. Please see Microchip website for details.

GHI3421

A board for MAX3421 USB controller.



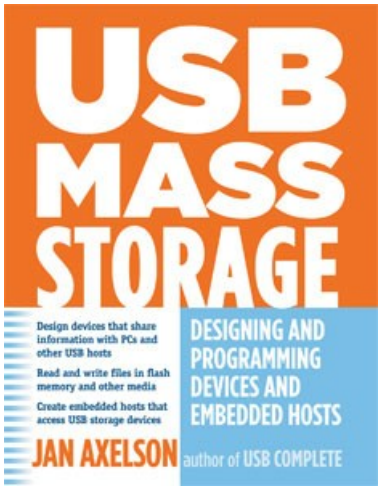
1.3. Other Components

USB Mass Storage Book

Jan Axelson, the writer of "USB Complete", has finished another great book which covers USB mass storage class and FAT file system. This book and "USB complete" are very good references for USB/FAT developers. This book is provided with USBFAT-DevSys only.

ISBN:978-1-931448-04-8

Visit the book's website



Parallel LCD

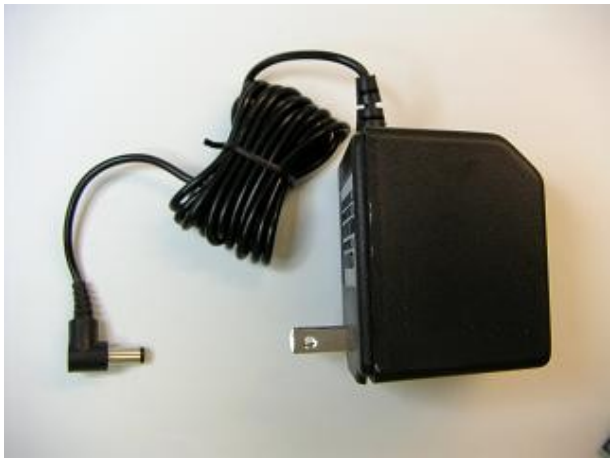
This displays data provided by the PIC via 4-bit parallel communication. Simple examples and library are provided with the other modules libraries. (Included with kit)

Serial Cable

This is a standard DB9 male/female serial cable for interface to your computers serial port or other serial devices such as GPS. (Included with kit)

Volt Power Supply

This is a 9volt DC 1000mA unregulated supply with a center positive. (Included with kit)



2. Starting up

2.1. RS232 Interface

The RS232 interface is used to view data and communicate with µALFAT/USBwiz through the USART provided in the PIC. The data can be viewed through any terminal program. In this tutorial we will use TeraTerm. You will need the following items:

a) Serial cable (provided with system).

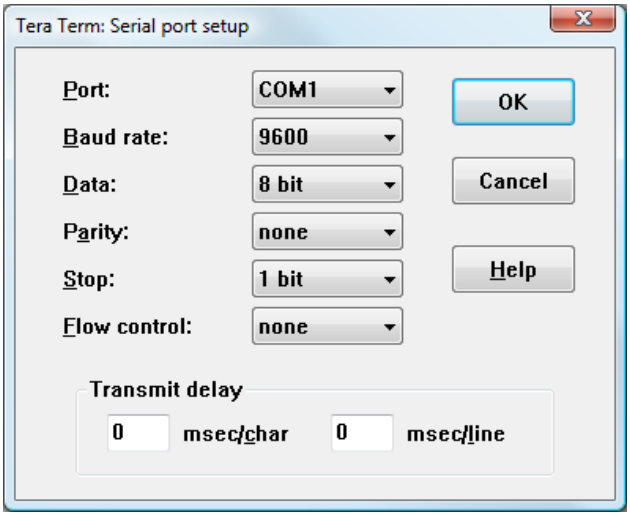
b) A computer with TeraTerm installed, a serial port or USB to serial converter.

c) µPICFAT with OEM board inserted and power supply attached.

2.2. Connecting to µPICFAT

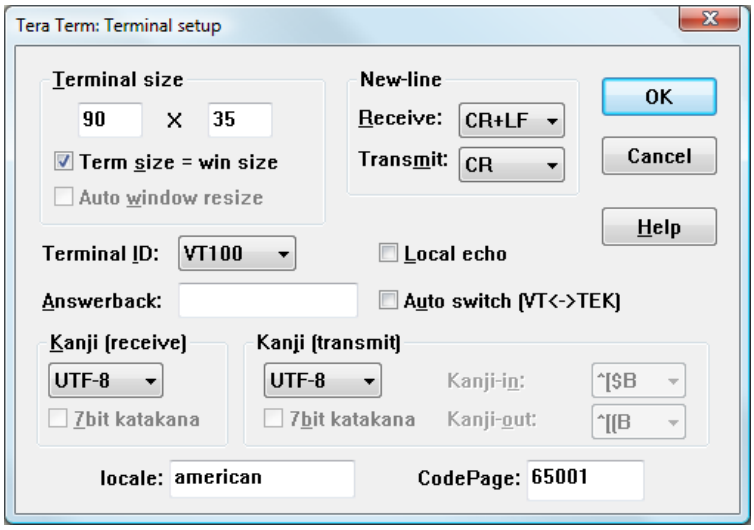
The first step is to connect the serial cable provided to µPICFAT's DB-9 connector. The connector is located on the left side of µPICFAT. Now connect the serial cable to your computers serial port.

Select the COM port number of the port you want to use on your PC. Usually it is COM 1 if you have COM port on the motherboard, and COM4 if you are using a USB to serial converter. Now, we need to configure the terminal. You need to set the baud rate to 9600, no parity, 8 bits, 1 stop bit and no handshaking.



µALFAT/USBwiz returns "carriage return" at the end of every line. It will not return, "line

feed". For that, you need to append line feeds to the received carriage returns. For transmit, make sure you only send a "carriage return" with **no** line feeds.

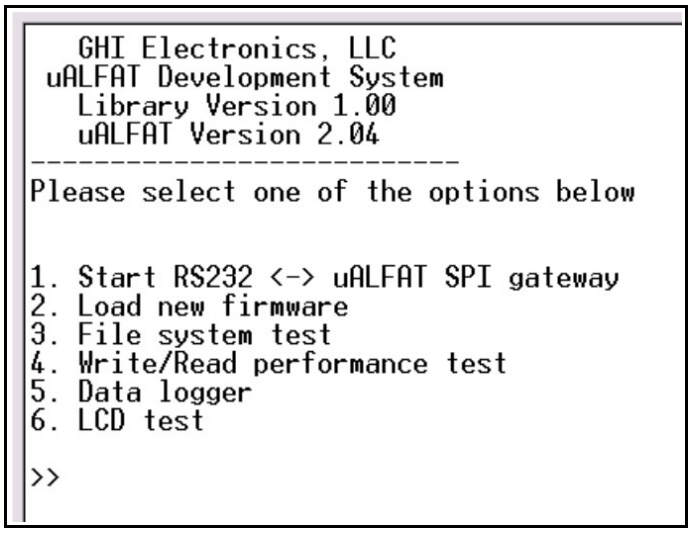


2.3. Connecting the power

Now that everything is in place, and serial (RS232) communication is established, power must be connected. At this time, the power supply should be plug into an outlet. To connect power to µPICFAT, simply insert the power jack into the power connector, J1, on µPICFAT's upper right corner just under the LCD. Confirm proper insertion by checking to see if the red LED, D1, in the upper left corner of µPICFAT is lit.

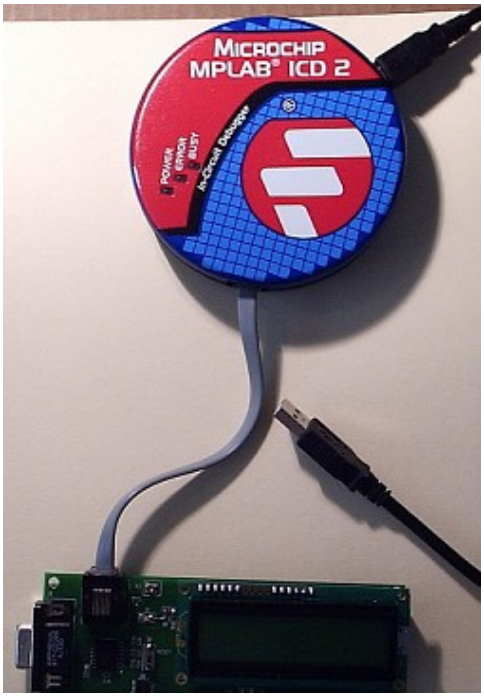
2.4. Running the Test Application

Once power is applied the application should start on its own and you should see the prompt similar to the one shown below. If this does not occur, press and release the reset button, S1, located in the upper left corner of µPICFAT just under the power LED. The default example receives a choice entered by the user to run certain operations.



2.5. Deploying New Programs

New software, examples and libraries can be downloaded to the PIC development system using ICD2. This is a in-circuit Debugger/Programmer that allows the user to step through code one line at a time, jump to a specific location in memory, or start the PC at any place in the code. It is a wonderful tool for programming PIC's, and it plugs directly into µPICFAT for easy programming. It is available on Microchip's website.



2.6. µALFAT/USBwiz Library Examples

These are the options provided when running µALFAT library example (USBwiz has similar options):

Start RS232 <-> µALFAT SPI Gateway

This option allows the user to send and receive data directly from µALFAT using µPICFAT's PIC as a gateway. The data is sent from the terminal on PC via RS232, to the USART module on the PIC. The PIC then sends the data via SPI, to µALFAT. Use this option if you want to familiarize yourself with the ASCII commands that µALFAT uses. These are the same commands that are used in the firmware and in the library.

Load New Firmware

Occasionally µALFAT's firmware will need to be updated. This option allows the user to update the firmware. Latest µALFAT Firmware is available on GHI website. Save it in the root directory of your SD card or USB thumb drive. Do not change the file name and do not save it into a folder. Note: Updating the firmware on µALFAT does not update the firmware on µPICFAT This may be required if µALFAT's firmware is updated.

Select option 2. You should see the following text displayed on the terminal: Enter 1 for SD card, or 2 for USB device. You can select the which ever you are using and then the firmware will be upgraded automatically.

File System Test

This option demonstrates how µALFAT can create directories, subdirectories, and files. It creates a Directory called GHITEST and then three subdirectories called DIR1, DIR2, and DIR3. It also creates a file called, “FILE.EXT, writes 6 Bytes to the file and then read them back. After the test is finished you can remove the media, insert it into your PC and view the created files/folders.

Write/Read Performance Test

This option demonstrates the speed at which µALFAT can read and write files. µALFAT will create a file called “ONEMB.EXT”. Then it will write 1 megabyte of data to the file and read 1 megabyte back. The progress will be sent over serial port. Once done, you can insert your media into your PC and verify the data.

Data Logger

The data logger option demonstrates a simple way to log data using µALFAT. It logs the time and date when a button is pressed. To run the data logger select option 5. When you are asked “is a 32 kHz crystal and back-up battery connected?[Y,N]”. Answer with “N”. Then, you will be required to enter the current time in the exact format shown on terminal program.

LCD Test

This option displays text on the LCD and then allows the user to scroll the text right and left. This is to demonstrate the functionality of the LCD.

Read/Write from Different Media Devices (USBwiz Only)

This test creates a file on one media, then read and write it to another media that is connected at a different slot (direct file contents copying between two storage media devices). When done, you can plug the two media devices in your PC to verify that the files exist.

Run HID Test (mouse, keyboard, ...) (USBwiz Only)

Using this option you can make USBwiz read the data sent by a mouse, keyboard, joystick, ...etc. So every time you strike a key or move a mouse that is connected, USBwiz will tell you what data the device sent you. Every device sends its data in a certain format. The example shows you the sent data byte by byte. It also has a special

sub-option where you can select a mouse device. By selecting this, the program on µPICFAT analyzes the data sent by a mouse and print on the terminal which buttons are clicked and in which direction the mouse moved.

Printer Test (USBwiz Only)

This option tells USBwiz to print a file using a printer. When you connect a printer to USBwiz, you need to send it a printer-specific commands to make it print he needed image. USBwiz does communications with the printer, but we should provide it with some printer commands.

An easy way to test a printer without the knowledge of its commands is to use “print to file” and send the file contents to USBwiz.

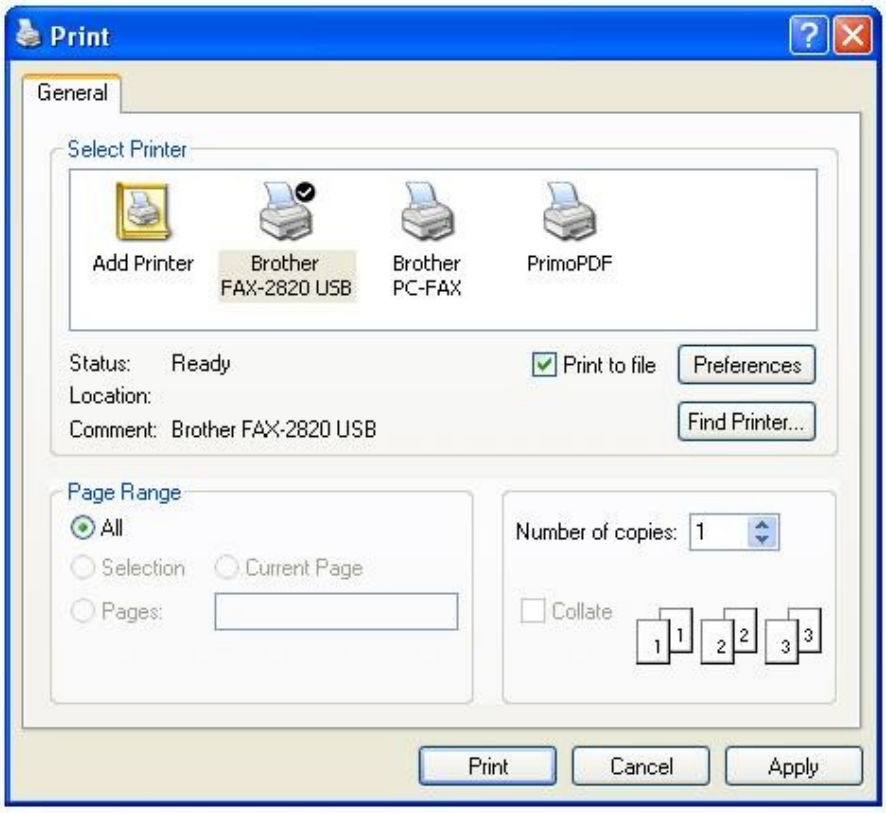
This example makes use of a file called “TEST.PRT” and send it to a printer.

To use this option you should first “print to a file”. Follow these steps:

1. Create a text file and type a string in it:

   “new.txt” has “This was printed using USBwiz!!”

2. Go to file -> print.
3. Select your printer and check print to a file.



4. Hit print and for the output file name type “TEST.PRT” and hit OK.
5. Now we got the file.
6. Save it in the root directory of your SD card or USB thumb drive. Do not change the file name and do not save it into a folder.
7. Just connect the media that has the file, connect your printer to USBwiz and the example will make the printer print what we typed in the file.

Serial Device Test (CDC, FTDI, ...) (USBwiz Only)

Serial devices include USB-to-serial cable, USB modem, cell phone, GPS...etc. In this option USBwiz communicates with a serial device. You can send data to the device by typing it in your terminal window. Any responds by the device are displayed. If you connect a USB modem, consult your modem manual for available commands to communicate with it. Usually “AT” commands are used. When you select this option, in your terminal window you can type AT<CR>, where <CR> is the enter key on your keyboard. If the device understands this command, it will respond.

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