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# Flash Drive Communication Using Embedded System

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**Abstract:** ***In the modern era the popularity of the Universal Serial Bus storage device is very vast. But disadvantage of USB is that being a peripheral device, it needs a host usually a PC to initiate and mediate communications between two USB storage devices. With help of this project two USB can communicate directly without PC. USB devices directly connected to embedded system. There is a controller that hosts the flash devices. Insert pen drive into USB port, then an signal will sent to the processor indicating that source pen drive is inserted so now processor will wait for the signal from other USB device. When the controller gets the signal from other USB drive then controller is ready to transfer the data between two. Controller gets the input only from external hard key from the user. Once the user presses the hard key, controller gets the information to transfer the data between two drives. The user interface consists of keypad 20x2 LCD display. User can see the data of both the flash drive and can send in either direction from first flash drive to other or from second to first.***
**Keywords:** AVR, USB flash drive, VDIP2, VNC1L.

## 1. Introduction

In the modern world flash drives have becomes the preferable choice for all as a portable device. Pendrives maximize the capacity and the speed of data transfer from a place to other. But the disadvantage off the flash drives is being a portable device. So to copy or move data from one pen drive to other is impossible when there is no computer or laptop is available. Even if there is a computer or laptop is available then there is some time required to boot it up properly. After that any one is able to transfer the data between pendrives. If data transfer is the only purpose for doing this then it seems very time consumable and wastage of power. So to overcome this problem a system has been designed which can transfer data between pendrives. In this system VDIP2 module is used along with a microcontroller. VDIP2 consist a chip named as VNC1L that provides the platform to allow the controller to host the USB devices. VDIP2 consist two USB ports and this module controlled through a microcontroller. VNC1L operates in different modes and support many firmware. To able to connect two flash drives at a time the firmware updated to VDFC. VDIP2 module interfaced with a microcontroller in UART mode. VDIP2 support three different modes UART, SPI, PARALLEL. Any mode can be selected by making different combination of the pins. The user can see the data on LCD and control the various operations using keypad. When there is traffic between the pen drives the blinking rate of LED's is high, when there is no traffic then LED's stop blinking.

## 2. Literature Review

1. IEEE paper published by Zhang Xiaoyan and Tie Yong in 2010 titled "Design and Realization of an embedded storage system based on LPC2387 microprocessor"
2. V.S. Gawali and A.M. Agarkar had presented their data entitled "Pen Drive to Pen Drive and Mobile Data Transfer Using ARM" in Second International Conference on Emerging Trends in Engineering (SICETE) which was conducted by College of Engineering, Jaysingpur and published their data in IOSR Journal of Electronics and Communication Engineering, PP: 43-47
3. J. Ducloux, P. Petrashin, had published their paper in IEEE in 2012 titled by an Embedded USB dual role System Integrated for mobile devices
4. Subhash Suman and A. A. Shinde had published their data in International Journal of Emerging Technology and Advanced Engineering (2013) which was entitled "Data Transfer Between Two USB Disk Without Use of Computer"

## 3. Methodology

In the system a AVR atmega32 microcontroller is used to control the VNC1L chip on VDIP2 module. It has two USB ports, either port can be configured as source or target. The communication mode between VDIP2 and microcontroller can be set using the select pins in the hardware. In this system communication mode is set to UART mode. To access two flash drives at the same time firmware is updated to VDFC. USB flash drives are connected to the ports of VDIP2. To do specific operation, appropriate command is send to the VDIP2 on communication channel. User can select any option from the menu using keypad and display on LCD. System is powered by a battery, which makes it handy and portable.

## 4. Hardware Description

The main object of this project is to do data transfer from one pen drive to another pen drive. The block diagram of this is gien as:-

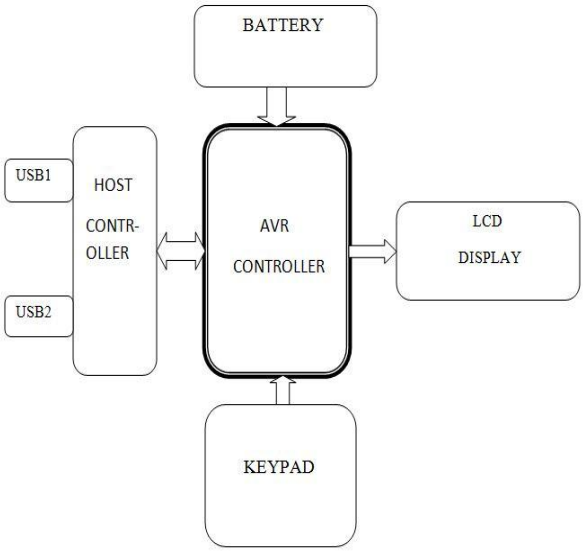



**Figure 1:** Block Diagram

The main components of these modules are VDIP2 module, VNC1L, LCD, AVR controller.

### 4.1 VDIP2 Module

The VDIP2 module is an MCU to embedded USB host controller development module for the VNC1L IC device. The VDIP2 is supplied on a PCB designed to fit into a 40 pin DIP socket, and this module provides access to the UART, parallel FIFO, and SPI interface pins on the VNC1L device, via its AD and AC bus pins. These two pins are directly pulled up or pulled down by the jumper select pins on VDIP2 module. A 12MHz crystal oscillator provides on the chip itself and Traffic indicator LED is embedded on the PCB for each USB port.

All other Vinculum I/O pins are also accessible.

**Figure 2:** VDIP2 Module

### 4.2 VNC1L Chip

The VNC1L is the first of FTDI‟s Vinculum family of Embedded USB host controller integrated circuit devices. Vinculum can also encapsulate certain USB device classes handling the USB Host Interface and data transfer functions using the in-built MCU and embedded Flash memory. When interfacing to mass storage devices, such as USB Flash drives, Vinculum transparently handles the FAT File Structure using a simple to implement command set.

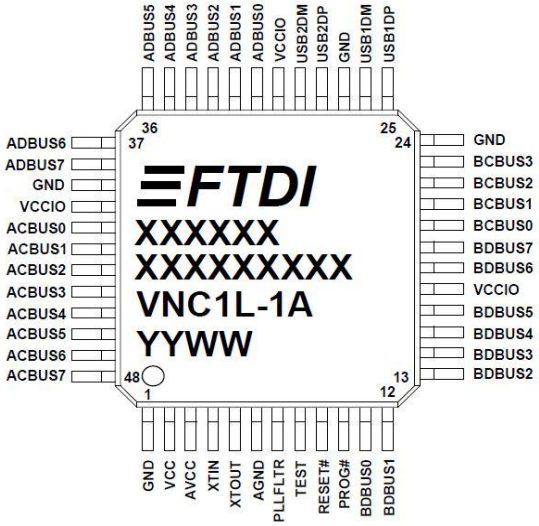



**Figure 3:** VNC1L Chip

Vinculum provides a cost effective solution for introducing USB host capability into products that previously did not have the hardware resources to do so. The VNC1L has a Combined Interface which interfaces a controlling application with the Command Monitor. The combined interfaces are UART, Parallel FIFO and SPI. The VNC1L chip features an integrated 8/32-bit MCU and 64k embedded Flash memory. Not only does the chip handle data transfer functions on two USB Host/Client interfaces; it also encapsulates several USB device classesl. One doesn't have to worry about writing firmware to implement those functions. When interfacing to mass storage devices such as USB Flash drives, the VNC1L transparently handles the FAT file structure communicating via UART, SPI or parallel FIFO interfaces via a simple-to-implement command set. The VNC1L device features two USB ports which can be individually configured by firmware as Host or Slave (client) ports.

### 4.3 LCD

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters.

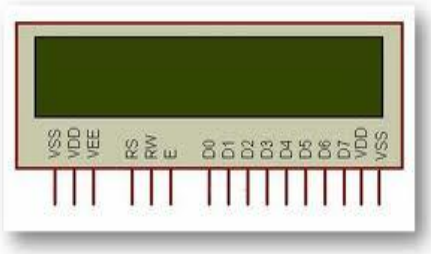



**Figure 4:** LCD

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be

displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

### 4.4 AVR Controller

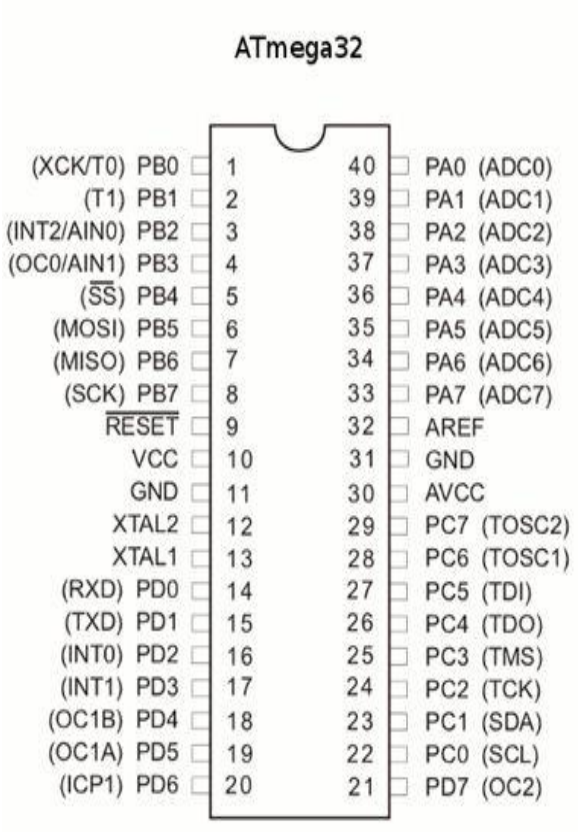



**Figure 5:** Atmega Controller

The high-performance, low-power Atmel 8-bit AVR RISC-based microcontroller combines The ATmega32 provides the following features: 32Kbytes of In-System Programmable Flash Program memory with Read-While-Writecapabilities, 1024bytes EEPROM, 2Kbyte SRAM, 32 general purpose I/O lines, 32 general purpose working registers, a JTAG interface for Boundaryscan, On-chip Debugging support and programming, three flexible Timer/ Counters with compare modes, Internal and External Interrupts, a serial programmable USART, a byte oriented Two-wire Serial Interface, an 8-channel, 10-bit ADC. The device supports throughput of 16 MIPS at 16 MHz and operates between 4.5-5.5 volts. By executing instructions in a single clock cycle, the device achieves throughputs approaching 1 MIPS per MHz, balancing power consumption and processing speed.

## 5. Software Tools

1) AVR studio
2) Extreme burner
3) Pony prog

## 8. Future Scope

With little modification in the project several new features could be added. Following are the things that can be done with few modifications.

- Using Bluetooth in device, user can connect with any Bluetooth enable devices make data transfer wirelessly.

## 6. Firmware Support

There are currently 6 standard firmware versions available for VNC1L:

1) VDAP Firmware: USB Host for single Flash Disk and General Purpose USB peripherals. Selectable UART, FIFO or SPI interface command monitor.

2) VDPS Firmware: USB Host for single Flash Disk and General Purpose USB peripherals. USB Slave port connection for connecting to host PC. Selectable UART, FIFO or SPI interface command monitor.

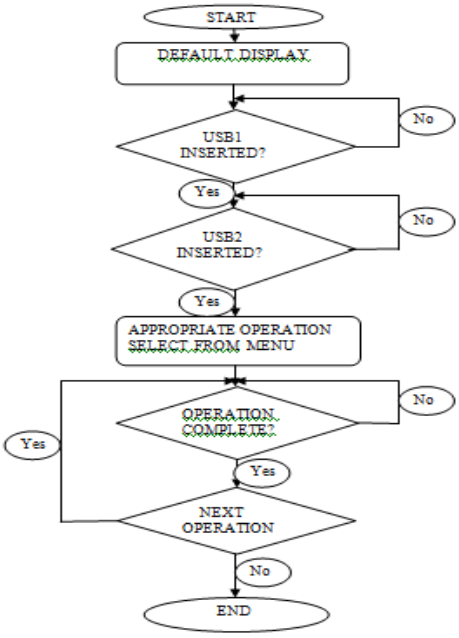
3) VDFC Firmware: USB Host for two Flash Disks, Selectable UART, FIFO or SPI interface command monitor.

4) VMSC1 Firmware: USB Host for single Flash Disk and General Purpose USB peripherals. Audio playback command extensions for VLSI VS1003 series MP3 decoder ICs. Selectable UART, FIFO or SPI interface command monitor port.

5) VCDC Firmware: USB Host for automatic connection to USB Communications Class Devices. UART interface command monitor.

6) VDIF Firmware: USB Host for single Flash Disk and General Purpose USB peripherals. Selectable UART, FIFO, SPI or USB interface command monitor.

## 7. Flow Chart




- Keypad and LCD could be replaced by touch screens which can make human work easier by drag and drop method.
- GPS Interfaces.
- USB Music media playback interface.

## 9. Conclusion

Transferring the data through USB in today's scenario is the most common task. But for transferring the data to a personal computer or laptop is difficult if one does not have any of them. It is affordable to purchase a USB data drive than

purchasing a laptop or PC. Therefore this battery operated affordable device can transfer the data between two USB data drives without the help of PC or laptop. The advantage of this device is that it is battery operated so there is no need of power supply connection and data transfer can take place at any place.

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