USB300Rev2-RDK
RevW User Manual

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1 Introduction

The USB300-RDK kit converts your SATA disk drive into a USB 3.0 mass storage device. The USB300-RDK supports the following features:

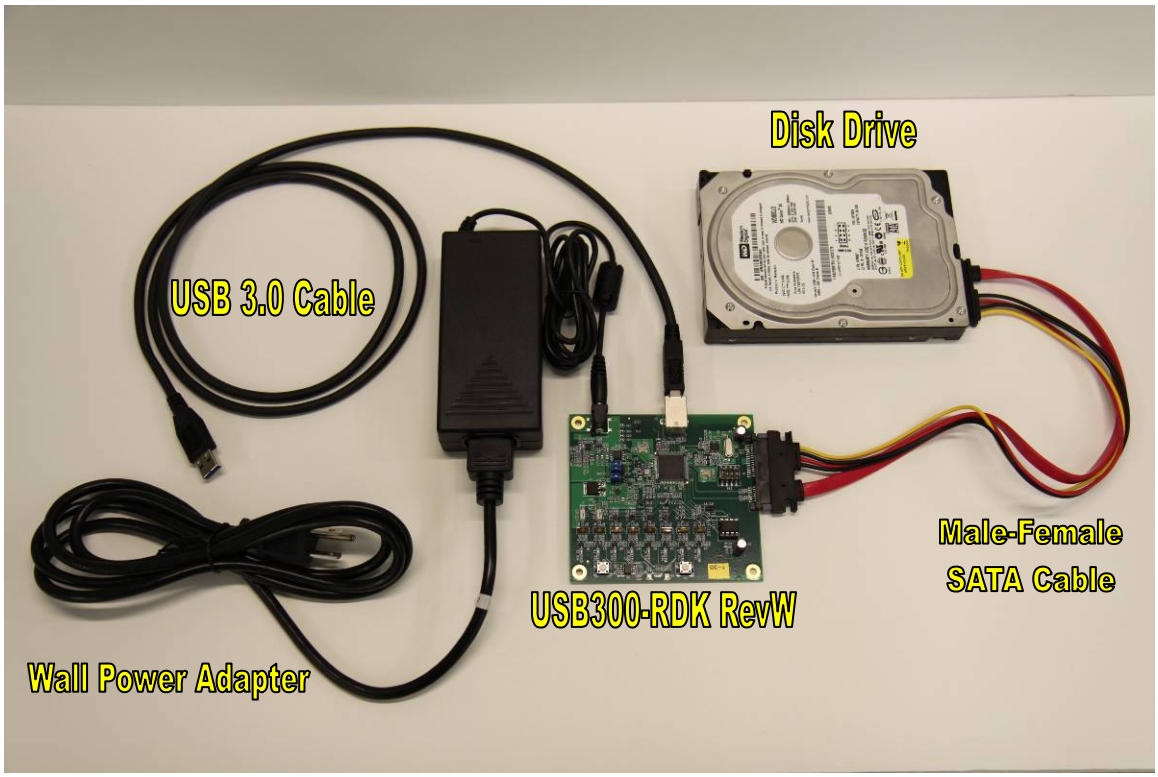
- Full, High, and SuperSpeed USB connections
- SATA 1.5/3.0 Gbps connections
- Standard USB Mass Storage Drivers(BOT)
- USB Attached SCSI (UAS) Protocol
- Firmware Updates over USB

The USB300-RDK board is the same one used by the USB-IF to test other USB 3.0 devices for compliance. You can contact the USB-IF for compliance device firmware and software.

2 Operation

2.1 System Overview

The system consists of a USB 3.0 Host, a USB 3.0 cable, USB300-RDK board, and a SATA-based disk drive.



2.2 Kit Contents

Included in the USB300-RDK are the following:

- 1x USB300-RDK Board
- 1x USB 3.0 Cable
- 1x Male-Female SATA Cable with power
- 1x 12V Wall Power Adapter

Not Included:

- SATA drive
- USB 3.0 xHCI host

2.3 Installation

There are no drivers, applications, firmware required for the USB300-RDK to operate. The only requirements that are needed are an xHCI host with the Windows standard mass storage class driver and a disk drive. Contact LucidPort for optional UAS drivers.

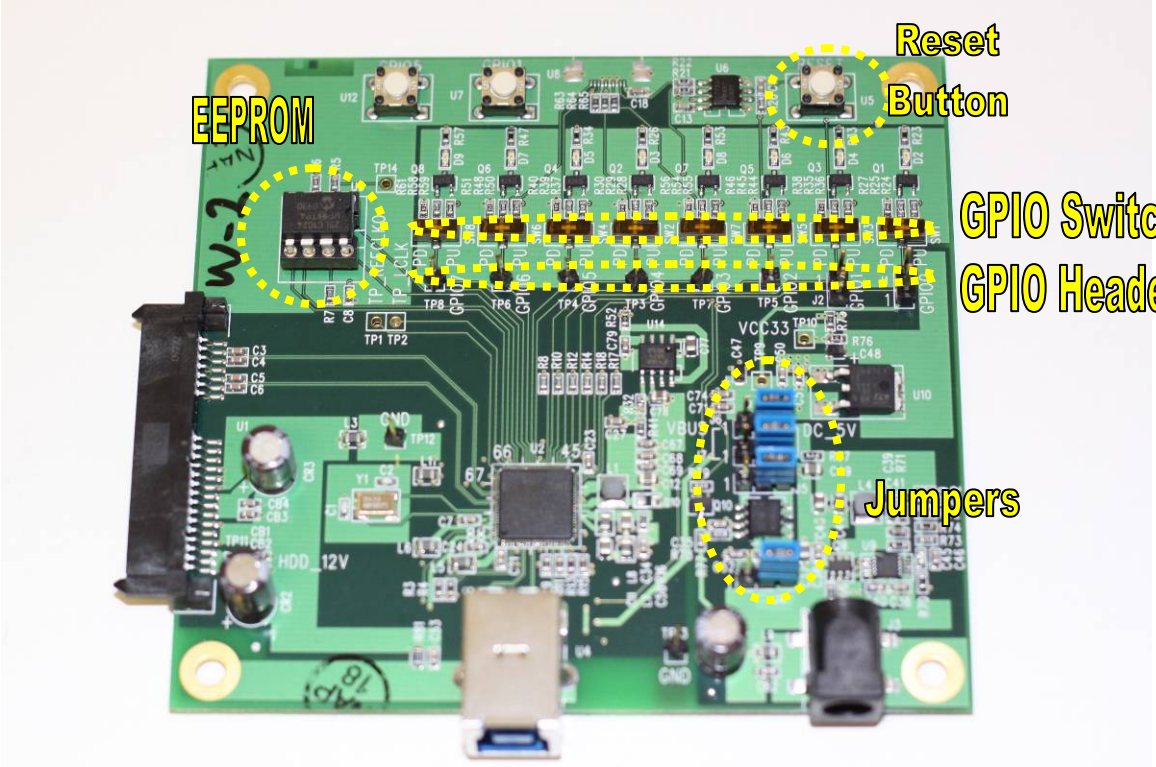
1. Attach a SATA-based disk drive to the SATA host port on the RDK board using the included Male-Female SATA Cable. Transparent RAID bridges will also work with the RDK. SATA-based optical drives do not work with this version. The drive must be in place before connecting the USB cable.

2. Plug in and connect the 12V wall power supply to the USB300-RDK. No additional power is needed for the USB300-RDK. By default, the board is configured for self power (not powered by the USB port).

3. Connect the USB3 cable between the USB300-RDK board and the USB 3.0 host. (xHCI drivers must have been previously installed.) Attaching to a USB 2.0 host will result in a Hi-Speed, rather than SuperSpeed, connection.

4. The USB300-RDK does not have a power switch. A push button reset (U5) on the RDK board resets the chip (not needed)

3 Board Settings



USB300 RevW RDK board

3.1 General Purpose I/O (GPIO) Switch Settings

The USB300 has eight GPIO pins to control LEDs, push button operations, and more. Each GPIO is tied to an LED controlled by a 3-way switch for pull-up(PU), pull-down(PD), or floating. Table 1 defines the preprogrammed settings for the RDK board. These settings are not fixed and can be altered through the firmware.

GPIO#	0	1	2	3	4	5	6	7
LED#	D2	D4	D6	D8	D3	D5	D7	D9
LED Status at USB3 connection	OFF	OFF	OFF	OFF	OFF	ON	ON	ON
Description						USB3 Connect LED	Power and Activity LED	SATA Power Control
Direction	Input	Input	Input	Input	Input	Output	Output	Output

Table 1: GPIO settings

GPIOs 2 through 5 can be used as a secondary SPI.

- GPIO2 – SPI Clock

- GPIO3 – Data In from SPI device
- GPIO4 – Data Out to SPI device
- GPIO5 – SPI Chip Select

Push-button switches are connected to GPIO1 and GPIO5. These can be enabled by firmware. GPIO0 and GPIO1 are connected to a serial port header (Tx/Rx), but is not enabled in released firmware. Test header pins for GPIO2-7 are marked on the RDK by TP3-8.

3.2 Jumper Settings

The USB300-RDK provides both self and bus powered operation. Self powered devices use the supplied power adapter. Bus powered devices get all their power directly through the USB cable. USB 3.0 allows bus powered devices to draw up to 900 mA (at 5V). Make sure your USB 3.0 host is configured correctly before attempting to draw this much current.

Jumper Settings	J4	J5	J6	J7
Self Powered (5V or 12V drives)	2-3	2-3	2-3	2-3
Bus Powered (5V drives only)	2-3	2-3	1-2	1-2

Table 2: Jumper settings for power supply options

3.4 Board Design

The USB300-RDK RevW has many components that can be removed such as LEDs, power on reset circuitry, and the optional 1V regulator. Please refer to the schematics and BOM list in the design kit.

4 Firmware

The USB300-RDK automatically enumerates as a standard USB mass storage device. A SATA drive must be present for the USB300 to enumerate (even if only for updating firmware).

LucidPort provides both 1 click firmware update through USB and mass production update capabilities. GPIO settings, vendor id, and device descriptors can all be modified during firmware upgrade. The serial number can be automatically incremented, or taken from the drive itself. Please refer to AN2_Firmware_Update_Instructions.

The current firmware automatically enumerates as a standard USB mass storage device at Full, High, or SuperSpeed. GPIO5 turns on when connected at SuperSpeed. GPIO6 turns on when connected to USB. It blinks at 6 Hz on SATA activity. It turns off when disconnected. GPIO7 automatically controls power to the SATA drive – turning it off when the PC is asleep. This power circuitry is not implemented in the on the RDK.

Contact LucidPort for UASP firmware.

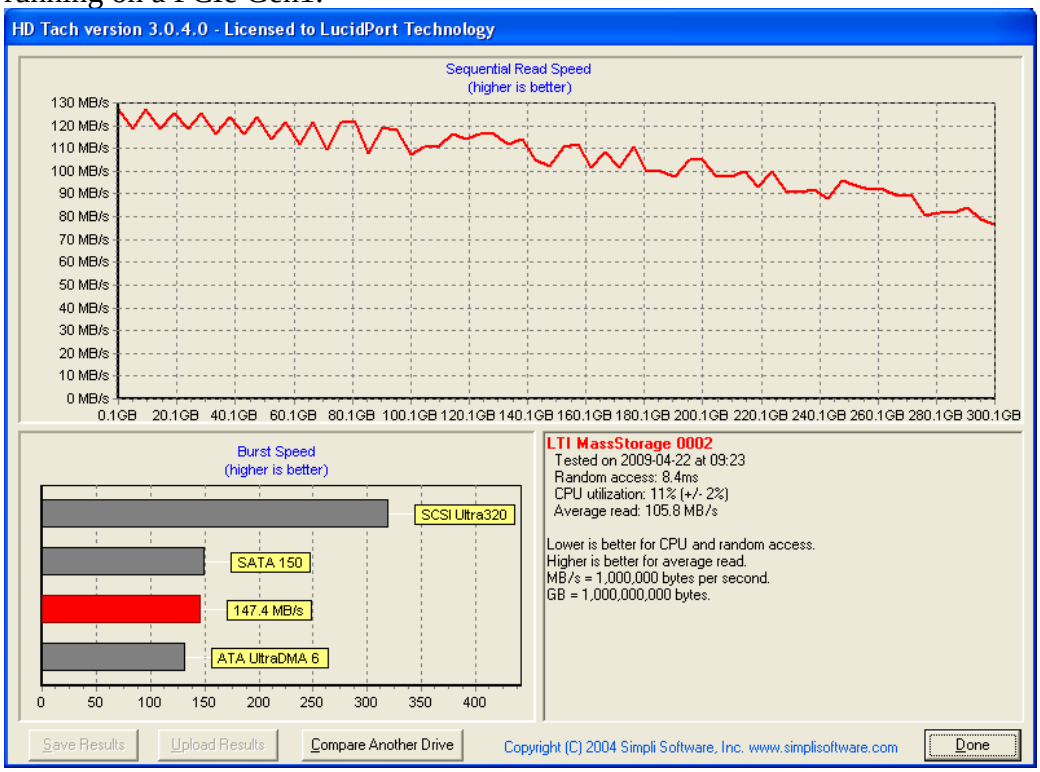
5 Testing

Below are results from in lab testing of the USB300 with the following system configuration:

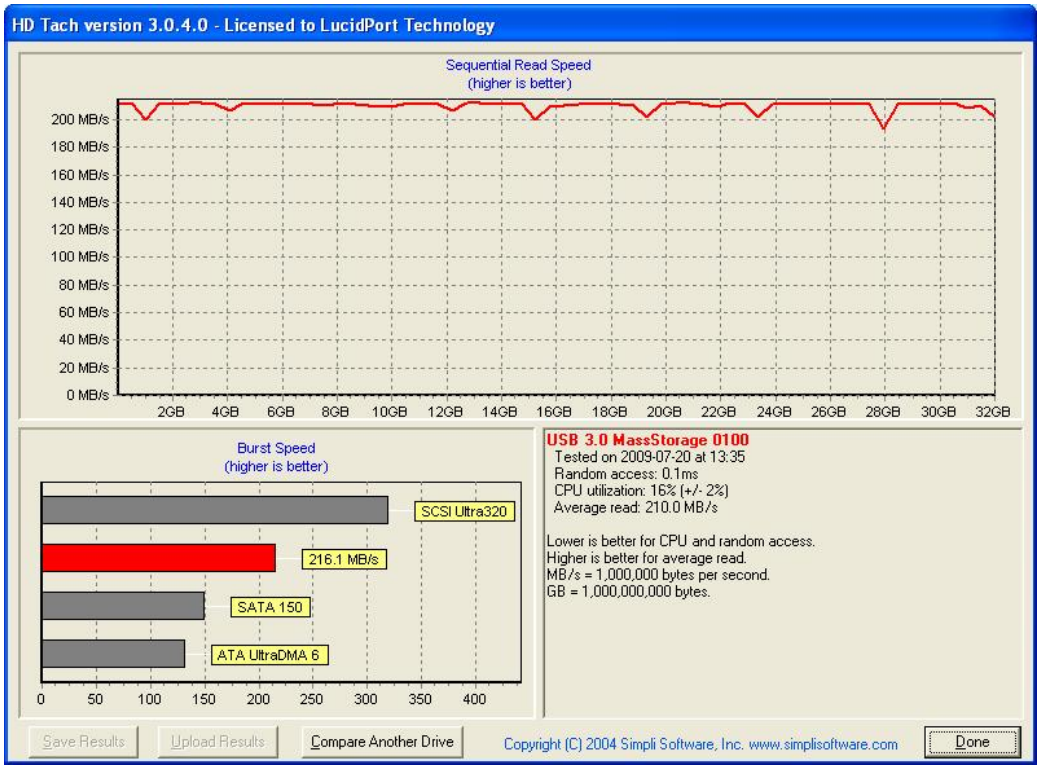
- Intel E7400 CPU (Core 2 Duo) @ 2.8GHz
- 4GB DDR2
- Windows XP Pro, SP3
- P5QL Pro Asus Motherboard

Please note that USB 3.0 is faster than PCIe Gen1 (1 lane). So if a USB 3.0 host is plugged into a PCIe Gen1 slot, USB 3.0 performance will be limited to approximately 140 Mbytes/sec. Other factors may limit performance. Please refer to AN3_Maximizing_Performance.pdf.

Results using HD-Tach with a Western Digital Velociraptor drive using a USB 3.0 Host running on a PCIe Gen1:



Results using HD-Tach with an Intel X-25E SATA SSD on with USB 3.0 Host running on a PCIe Gen2 Slot:



Tested Functions:

- EEPROM Loading/Upgrade
- Serial Port Test
- SATA Test
- USB Compliance Test
- Windows XP, Vista, and 7

The following are benchmarks that have been run:

- IO Meter
- Quick Bench
- HD Tach
- HD Speed

Various SATA drives and devices have been connected such as RAID Port Multipliers and various hard drives and solid state drives. Various motherboards have also been tested. Refer to USB300Rev2_test_report_xxx.pdf for details.

6 Conclusion

The USB300-RDK provides a simple yet powerful testing and development environment in which to build a SuperSpeed USB hard disk. Contact the LucidPort support (support@lucidport.com) with questions or concerns.