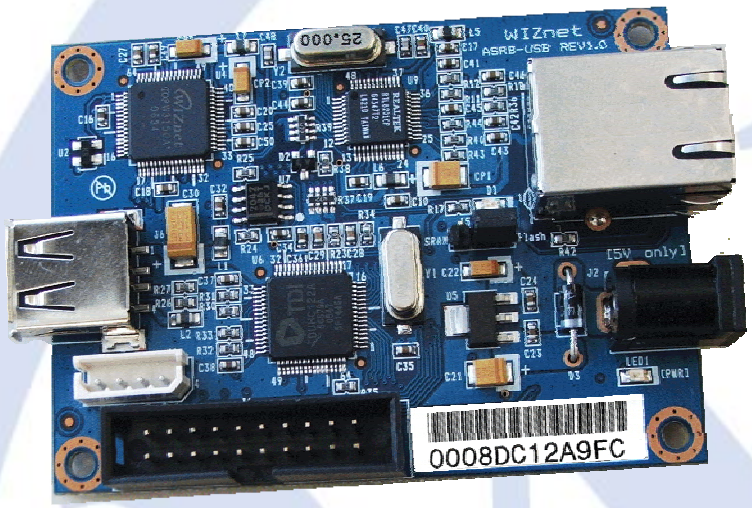
Application Specific Reference Board

for USB Devices



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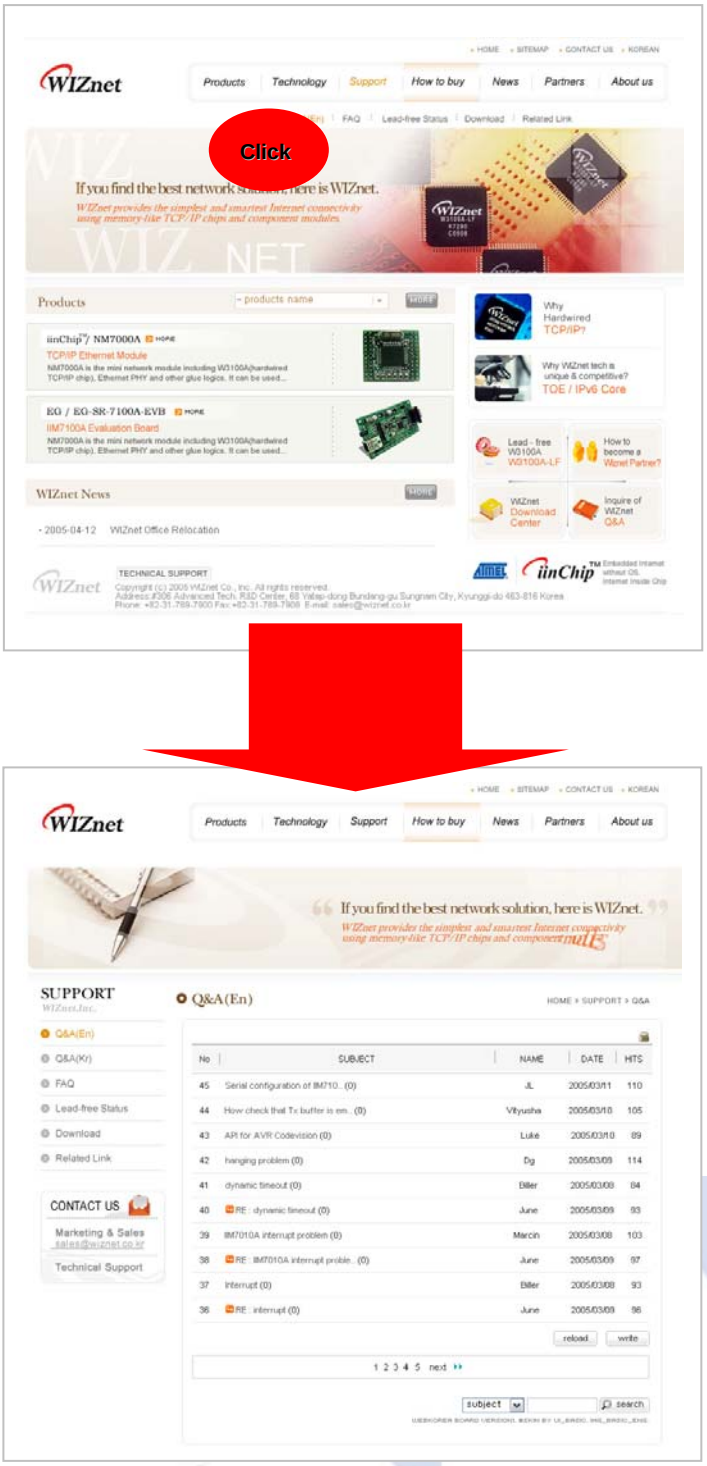
If you have any question about WIZnet Products, write them down onto our Q&A Board on our website at www.wiznet.co.kr. A WIZnet engineer will promptly provide you with an answer.



1. Introduction

USB was originally designed for connecting computers and telecommunication gear, but it became a universal BUS for the desktop, peripherals, and many consumer-electronics. It has been reported that there are more than 2 billion wired-USB connections in the world today.

The ASRB-USB board converts the legacy USB devices to network enabled device by overcoming 5m length limit of USB cable. ASRB-USB board currently supports USB printer, but other USB devices such as USB HDD (Mass Storage) and scanner can be supported by minimum modification of the firmware.

1.1. Key Features

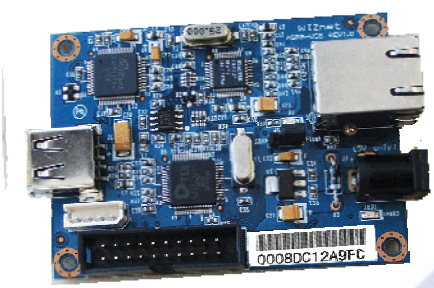
- All-made Reference Board for USB Devices
  - Simple and quick network implementation
  - Providing all source code, hardware schematic, and reference materials that are dedicated to the function of USB to Ethernet
  - Available of firmware customization for various USB devices
- Usable as a USB to Ethernet Gateway Module
- High Stability and Reliability by using a W3150A+ WIZnet Chip, a fully-hardwired TCP/IP stack
- Easy and Powerful Configuration Program
- 10/100 Mbps Ethernet Interface (Auto-Sensing)
- Support Auto MDIX (auto-detecting direct & crossover cable)
- 1 Full-Speed USB 2.0 Device
- Support DHCP
- Firmware Upgrading through Ethernet
- RoHS Compliant

1.2. Specification

- Hardware Architecture
  - MCU : STR710FZ2 (ST ARM7)
  - TCP/IP : W3150A+
  - PHY : RTL8201CP (Ethernet PHY)
  - Network Interface : 10/100 Mbps auto-sensing RJ-45 Connector
  - USB Host : USB 2.0 Full Speed
- Input Voltage : 5V Adaptor
- Power Consumption : under 500mA

- Temperature : 0°C ~ 70°C (Operation), -40°C ~ 85°C (Storage)
- Humidity : 10 ~ 90%

1.3. Products Contents

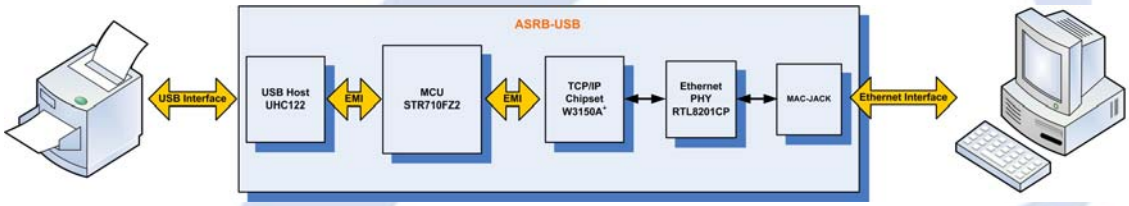
	AS-RB USB Reference Board
	CD (containing f/w source code, H/W schematic and other related materials)
	LAN Cable (Option)
	5V Power Adapter (Option)

2. AS-RB USB Board

2.1. Block Diagram

The STR710FZ2 (ARM7TDMI core, 256KB Flash) controls USB host controller and TCP/IP chip through external memory interface (EMI). In this board, UHC122 of Oxford Semiconductor (www.oxsemi.com) is used for USB host controller, and W3150A+ for the TCP/IP chip.

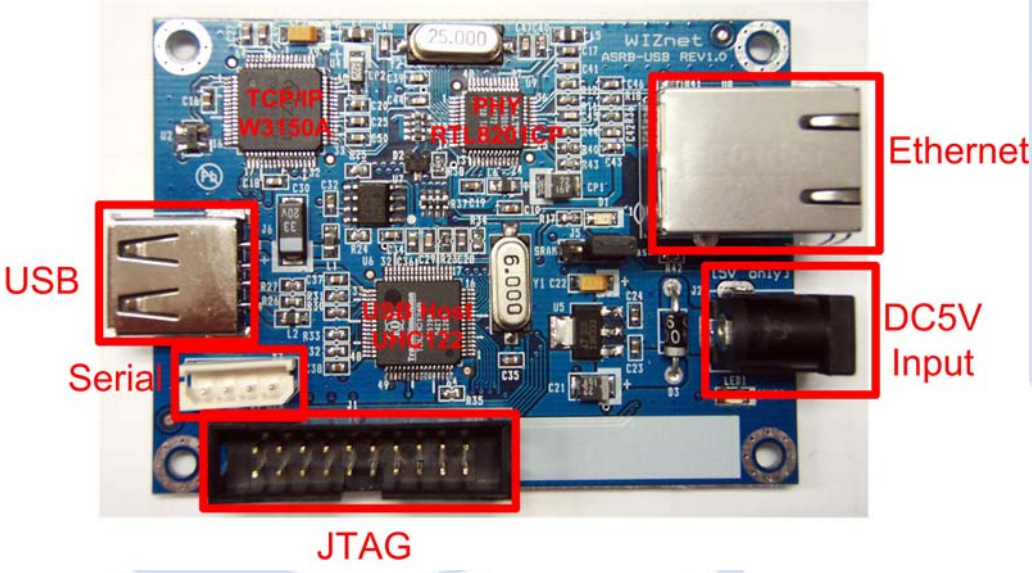
If PC sends the raw data through network, the W3150A+ receives the data and notifies MCU through external hardware interrupt. Then MCU reads the data and sends it to the connected USB printer. All the data is transferred and sent transparently. Below figure is the block diagram of ASRB USB board showing how data is delivered.



<Block Diagram of AS-RB USB>

2.2. Main Functions

The AS-RB USB board is based on the ST ARM7TDMI platform having USB to Ethernet function. The board enables you to convert USB printer to network printer.

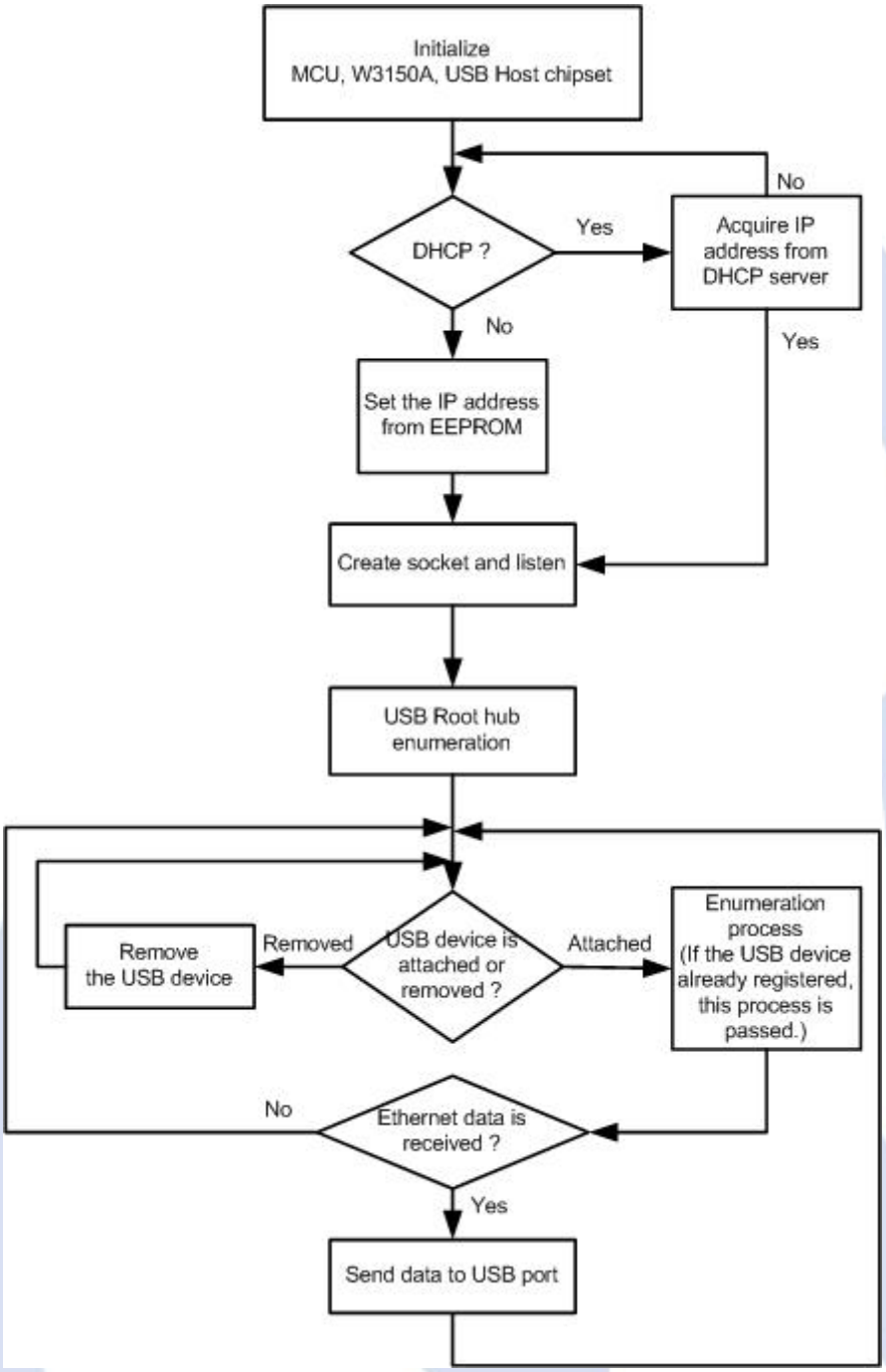


The STR710FZ2 controls the USB host controller and hardwired TCP/IP chip through external memory interface (EMI). The STR710FZ2 is powered by a 3.3V regulator and driven with a single 16MHz clock generator.

The STR710FZ2's boot modes are selected by "Bootmode jumper" on exit from Reset.

- Flash boot mode: The firmware code operates on this mode.
- RAM boot mode: This is useful for debug purpose. The RAM can be pre-loaded by an external JTAG controller or development system (emulator).

2.3. Operation Flow



If power is supplied to ASRB-USB board, the basic setting for MCU is processed. Then, W3150A+ and USB Host chips are initialized. At the DHCP mode, the ASRB-USB will acquire network information from DHCP server. If static IP address is used, the information of the EEPROM will be set. ASRB-USB utilizes sockets for DHCP, communicating with configuration

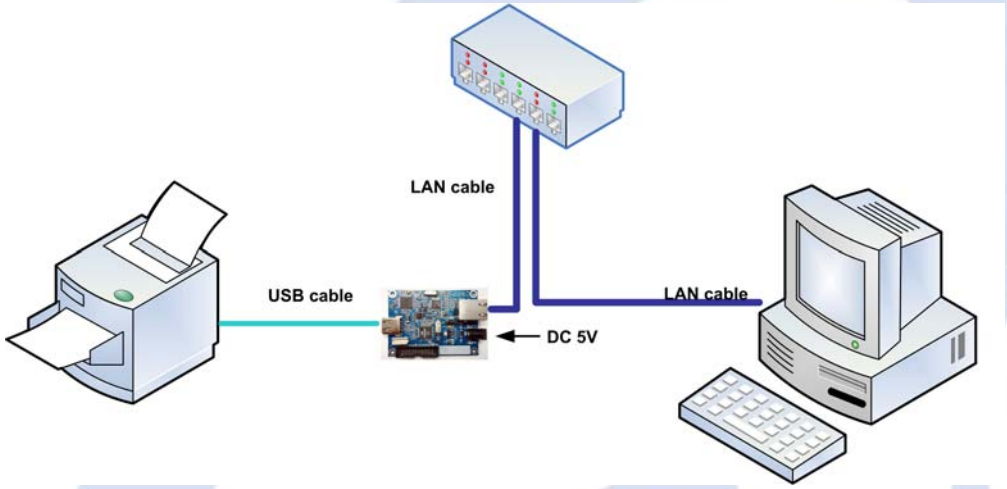
tool, and receiving the data. At the main loop of the F/W, it is watched that USB device is attached or not. If attached, in order to configure the device, it will go to the Enumeration process. If Enumeration process is successfully finished, a virtual data communication pass is established. The data from the network will be transferred to the USB device.

3. Testing AS-RB USB Board

3.1. Connecting AS-RB USB

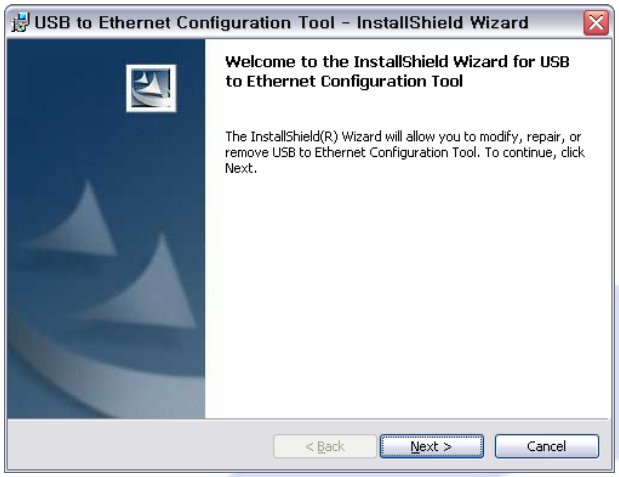
The following items are required to test the ASRB-USB board.

- DC 5V Power
- Serial and Ethernet Cables
- USB Printer
- PC or Laptop having Network Interface Card (hereafter, NIC), and /or RS232 serial port



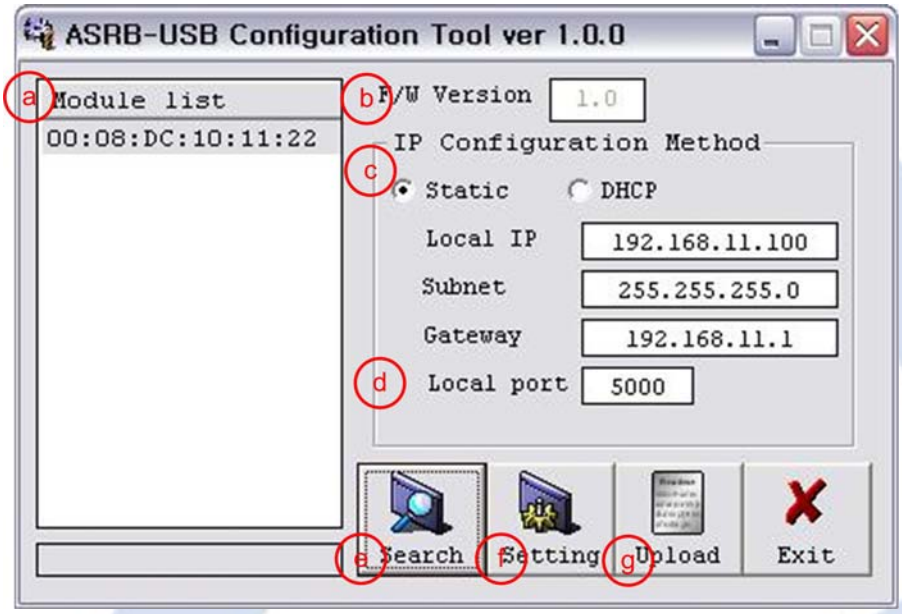
3.2. Configuration Tool Installation

The Configuration tool is used to configure the network setting of the ASRB-USB board. The installation program is included in the CD or can be downloaded from WIZnet webpage (www.wiznet.co.kr)



3.3. Configuration Tool

After installing the Configuration Tool program, if you execute the program, you can see below screen.



ⓐ Module list

It displays the list of the searched MAC address the ASRB-USB existing on the local network.

ⓑ F/W Version

It represents the information of the current f/w version.

ⓒ IP Configuration Method

Static: The IP address can be manually assigned by users.

DHCP: The module assigns IP, subnet and gateway addresses by acquiring them from the DHCP server.

☞ Other configurations should be set manually except for the IP configuration of DHCP.

ⓓ Local Port

It assigns the TCP port number.

ⓔ Search

The Search function is used to search all modules existing on the same subnet. The UDP broadcast is used for searching modules on a LAN.

The MAC address for a searched module will be listed in the “Module list”.

ⓕ Setting

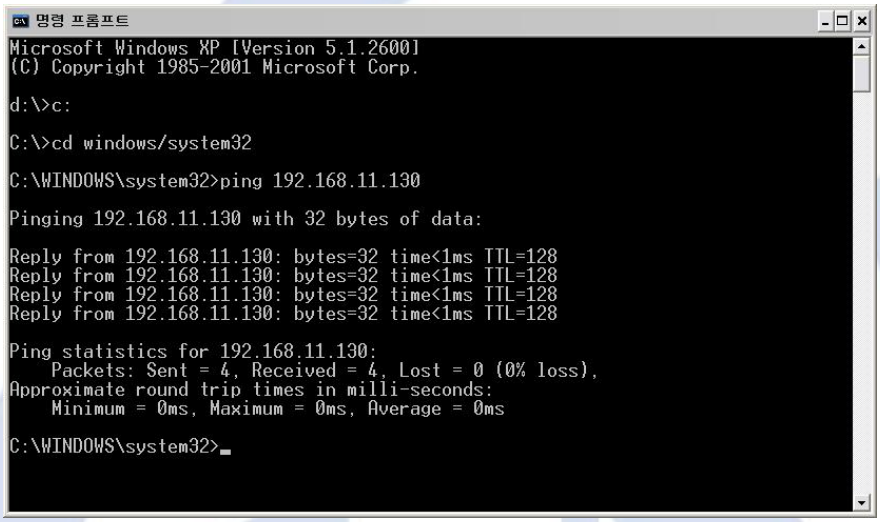
If you select one of the MAC addresses listed in the “Module list”, the configuration value of the selected module will be displayed. After changing each value in the configuration program, click the “Setting” button to complete the configuration. The module will be initialized with the new configuration.

ⓖ Upload

Upload the firmware through the network.

3.4. Confirming Network Configuration

By using above Configuration Tool, network information can be set. After finishing all configuration, perform the ping test to confirm changed network setting.



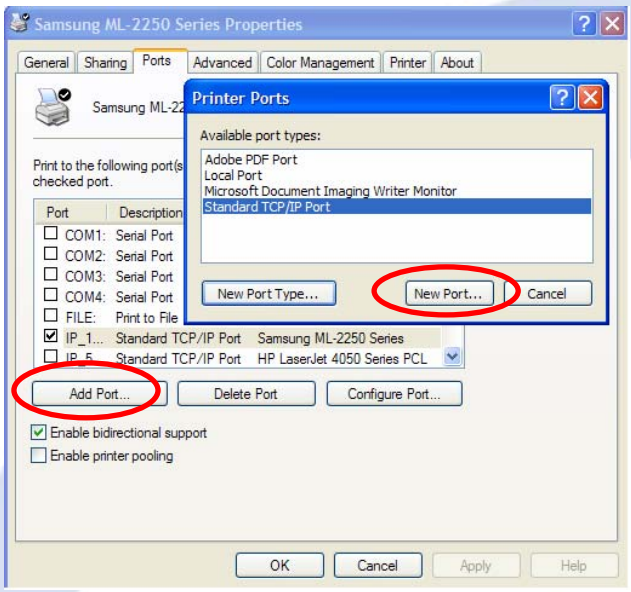
3.5. Printing Test Page

This chapter describes how to set up the USB Printer and configure AS-RB USB board.

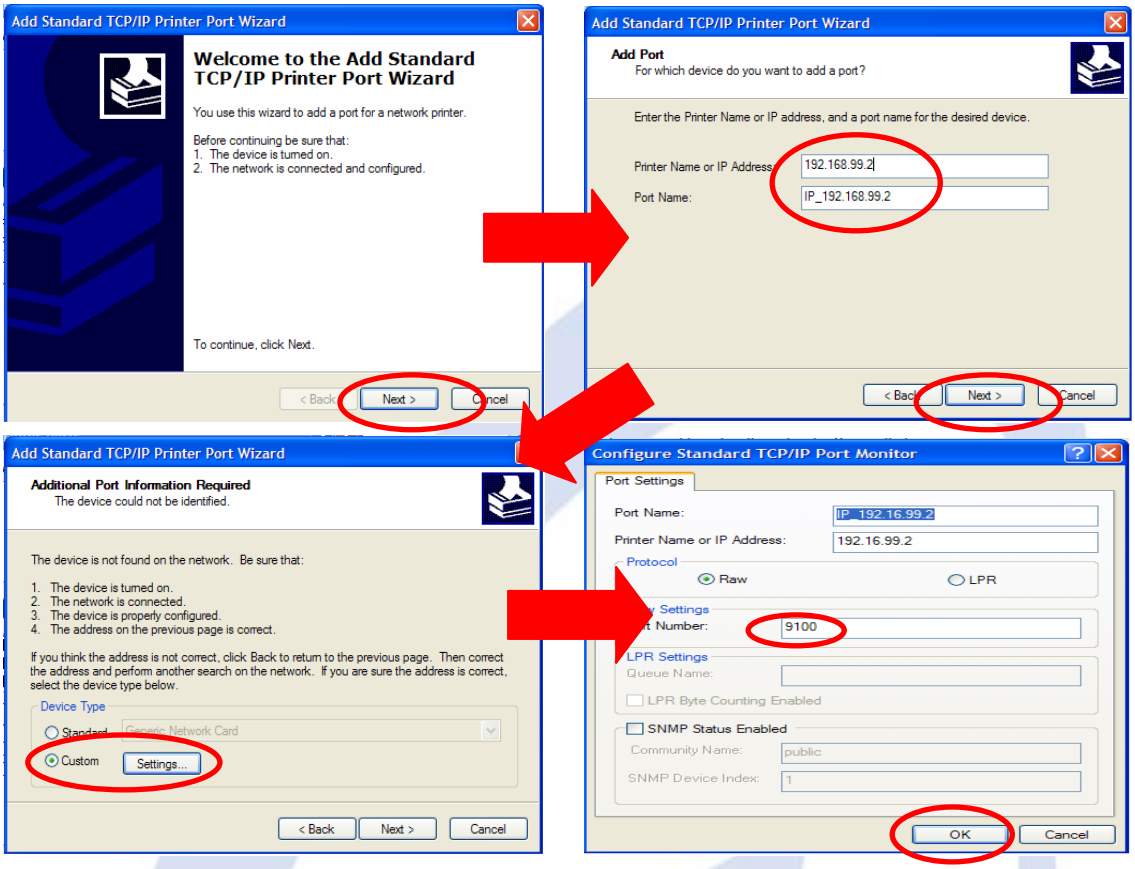
STEP1: Connect the USB Printer to the USB connector of the AS-RB USB.

When the USB Printer is attached to the USB connector, USB enumeration is performed

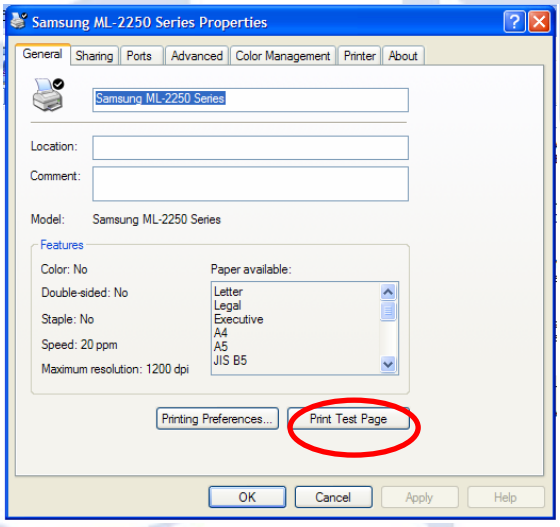
STEP2: Add the Standard TCP/IP Port in the Printer Property Windows as follows.



STEP3: Assign the same IP address & port number which were set by Configuration tool.



STEP4: When click the “Print Test Page”, the test page is printed through network.



3.6. Factory Default

-. IP address: 192.168.11.100

-. Subnet mask: 255.255.255.0

-. Gateway Address : 192.168.11.1

-. Port number: 5000

4. To Modify the Source Code

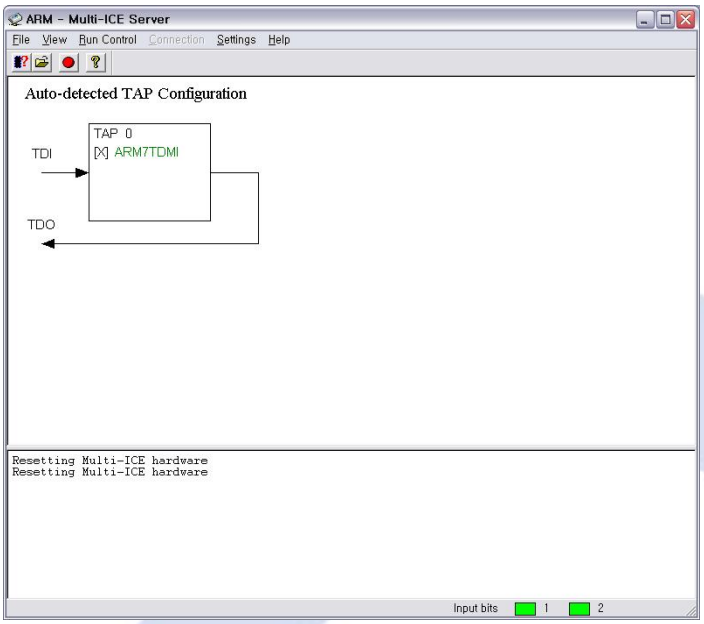
4.1. Modifying at the RAM_MODE by using JTAG

ASRB-USB uses RVDS(RealView Developer Suite Version 2.2) compiler of the ARM, and RealView MultiICE debugger. For more information, refer to "STR7/STR9 32-bit ARM Microcontroller Tools Overview" http://mcu.st.com/mcu/inchtml.php?fdir=pages&fnam=str7_tools

1. Configure J5 jumper of the board as SRAM.
2. Modify the scat file to the RAM_MODE as below,

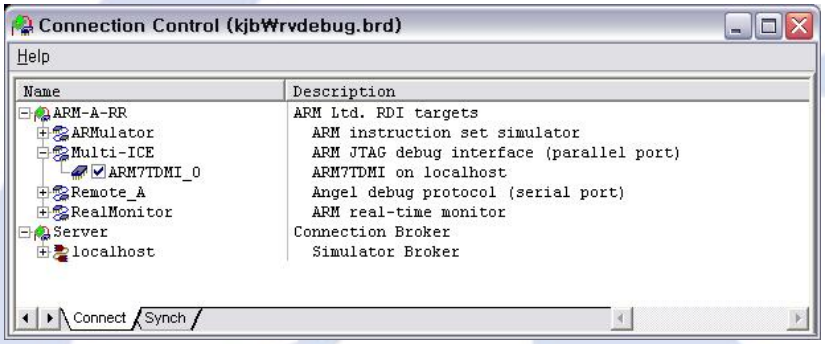
```
RAM_MODE 0x00000000 0x10000
{
 RAM 0x00000000
    {
        71x_vect.o (Vect, +First)
        71x_init.o(Init)
        * (+RO)
        * (+RW)
        * (+ZI)
    }
}
```

3. Connect JTAG cable of MultiICE to the JTAG port in the board, and supply the power.
4. Execute Multi-ICE Server, and select Auto Configure. It will be configured as ARM7TDMI as below.



5. After executing RVDS, and open project file, network.prj.

6. At the Connection Control window, check ARM7TDMI_O of Multi-ICE. The connection will be established.



7. After modifying the source, compile and load the image on the board.

4.2. Modifying at the FLASH_MODE

1. Configure J5 jumper of the board as FLASH.

2. Modify scat file to FLASH_MODE as below.

```
FLASH 0x40000000 0x40000
{
    FLASH 0x40000000
    {
        71x_vect.o (Vect, +First)
        71x_init.o (Init)
        * (+RO)
    }
    RAM 0x20000000
    {
        * (+RW)
        * (+ZI)
    }
}
```

3. Convert the axf file that is compiled after source modification to the binary file as below.

```
fromelf -bin -o network.bin network.axf
```

4. If the binary file is input in the ROM_Tool.exe, the 8 byte header “WIZnet_” will be added.

5. Updating the “rom.bin” file through Configuration tool.

4.3. Memory Map & Flash write

- Application f/w: located in 0x40000000
- Boot f/w: located in 0x40030000, and handle Network F/W update.

At the manufacturing process, create one image with above two firmware and write it by using Flash Writer Tool.

- The contents for external EEPROM are recorded in below order, and recording place is defined in “netconfig.h”.

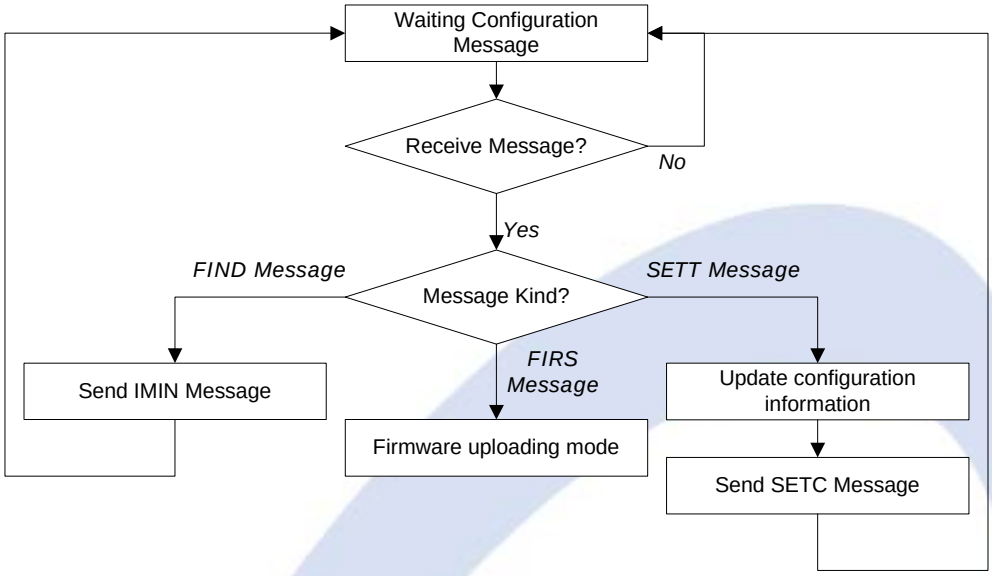
Address	Content	Size
0x00	Test byte	1

0x01	MAC address	6
0x07	IP address	4
0x0b	Subnet mask	4
0x0f	Gateway address	4
0x13	Port number	2
0x15	DHCP option	1
0x16	F/W version	2

```
// EEPROM
#define EEP_CONF        0x00
#define EEP_TEST        (EEP_CONF)
#define EEP_MAC         (EEP_TEST+1)
#define EEP_LIP         (EEP_MAC + 6)
#define EEP_SN          (EEP_LIP + 4)
#define EEP_GW          (EEP_SN + 4)
#define EEP_LPORT       (EEP_GW + 4)
        #define EEP_DHCP        (EEP_LPORT + 2)
#define EEP_VER         (EEP_DHCP + 1)
```

Above information is operated with Configuration tool. Configuration information can be defined as below.

```
typedef struct _CONFIG_MSG
{
        u8 op[4];
        u8 Mac[6];
        u8 Lip[4];
        u8 Sn[4];
        u8 Gw[4];
        u8 Lport[2];
        u8 Dhcp;
        u8 FW_Ver[2];
}CONFIG_MSG;
```



1. Search Board

   The configuration tool broadcast "FIND" message. All ASRB-USBs in local network receive this message and reply "IMIN" message with configuration data.

2. Set Board Information

   The configuration tool sends the "SETT" message with new configuration data to change the ASRB-USB's configuration. The ASRB-USB receive new configuration data and replies with the "SETC" message. Then updates configuration of ASRB-USB.

3. Firmware update

   The configuration tool sends the "FIRS" message that alert uploading new firmware. When the ASRB-USB receives this message, it enters firmware update mode and receives firmware file through Ethernet.

5. Warranty

WIZnet Co., Ltd offers the following limited warranties applicable only to the original purchaser. This offer is non-transferable.

WIZnet warrants our products and its parts against defects in materials and workmanship under normal use for period of standard ONE(1)YEAR for the ASRB-SERIAL board and labor warranty after the date of original retail purchase. During this period, WIZnet will repair or replace a defective products or part free of charge.

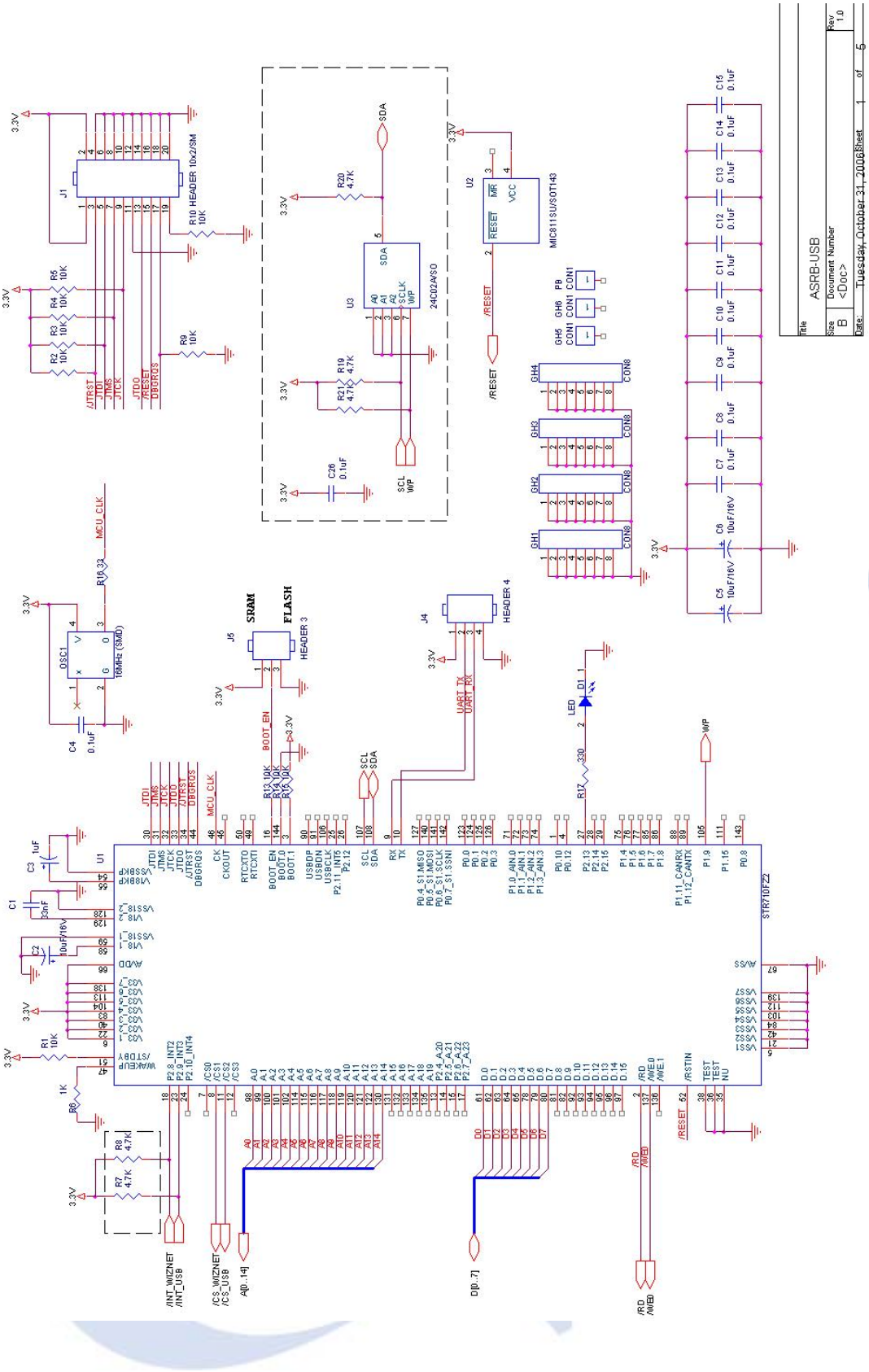
Warranty Conditions:

1. The warranty applies only to products distributed by WIZnet or our official distributors.
2. The warranty applies only to defects in material or workmanship as mentioned above in 6.Warranty. The warranty applies only to defects which occur during normal use and does not extend to damage to products or parts which results from alternation, repair, modification, faulty installation or service by anyone other than someone authorized by WIZnet Inc. ; damage to products or parts caused by accident, abuse, or misuse, poor maintenance, mishandling, misapplication, or used in violation of instructions furnished by us ; damage occuring in shipment or any damage caused by an act of God, such as lightening or line surge.

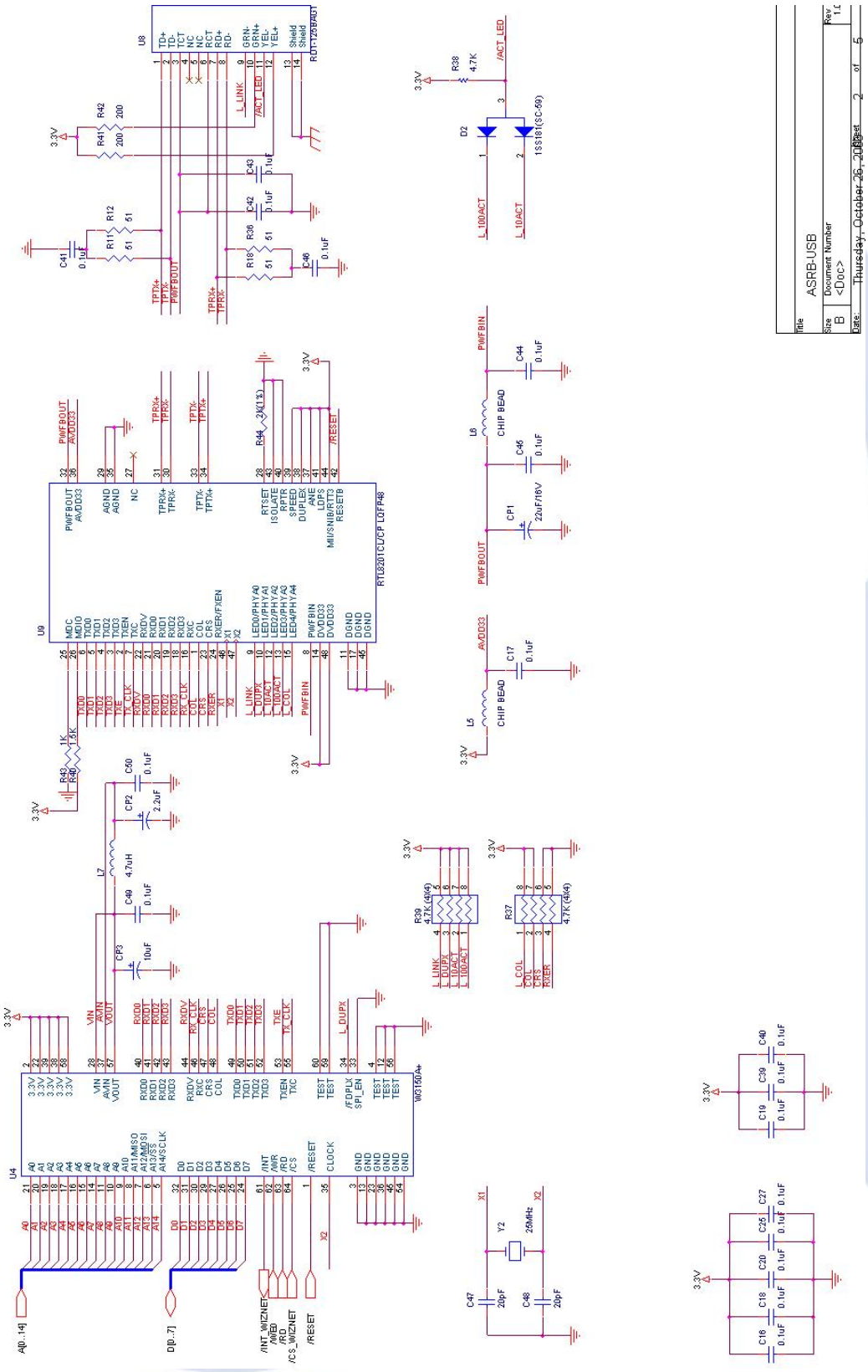
Procedure for Obtaining Warranty Service

1. Contact an authorized distributors or dealer of WIZnet Inc. for obtaining an RMA (Return Merchandise Authorization) request form within the applicable warranty period.
2. Send the products to the distributors or dealers together with the completed RMA request form. All products returned for warranty must be carefully repackaged in the original packing materials.
3. Any service issue, please contact to sales@wiznet.co.kr

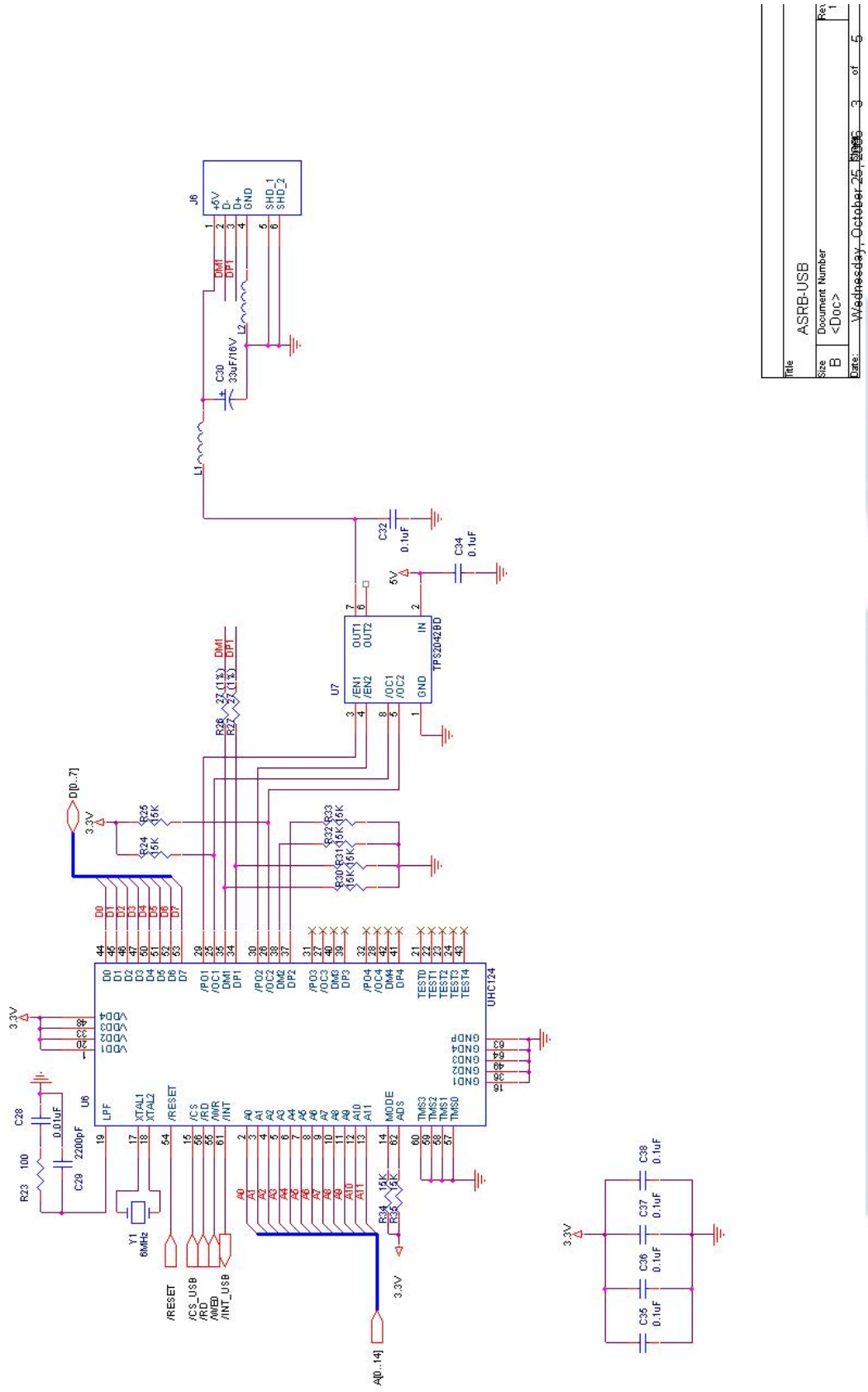
Appendix A – Schematic 1 of 4



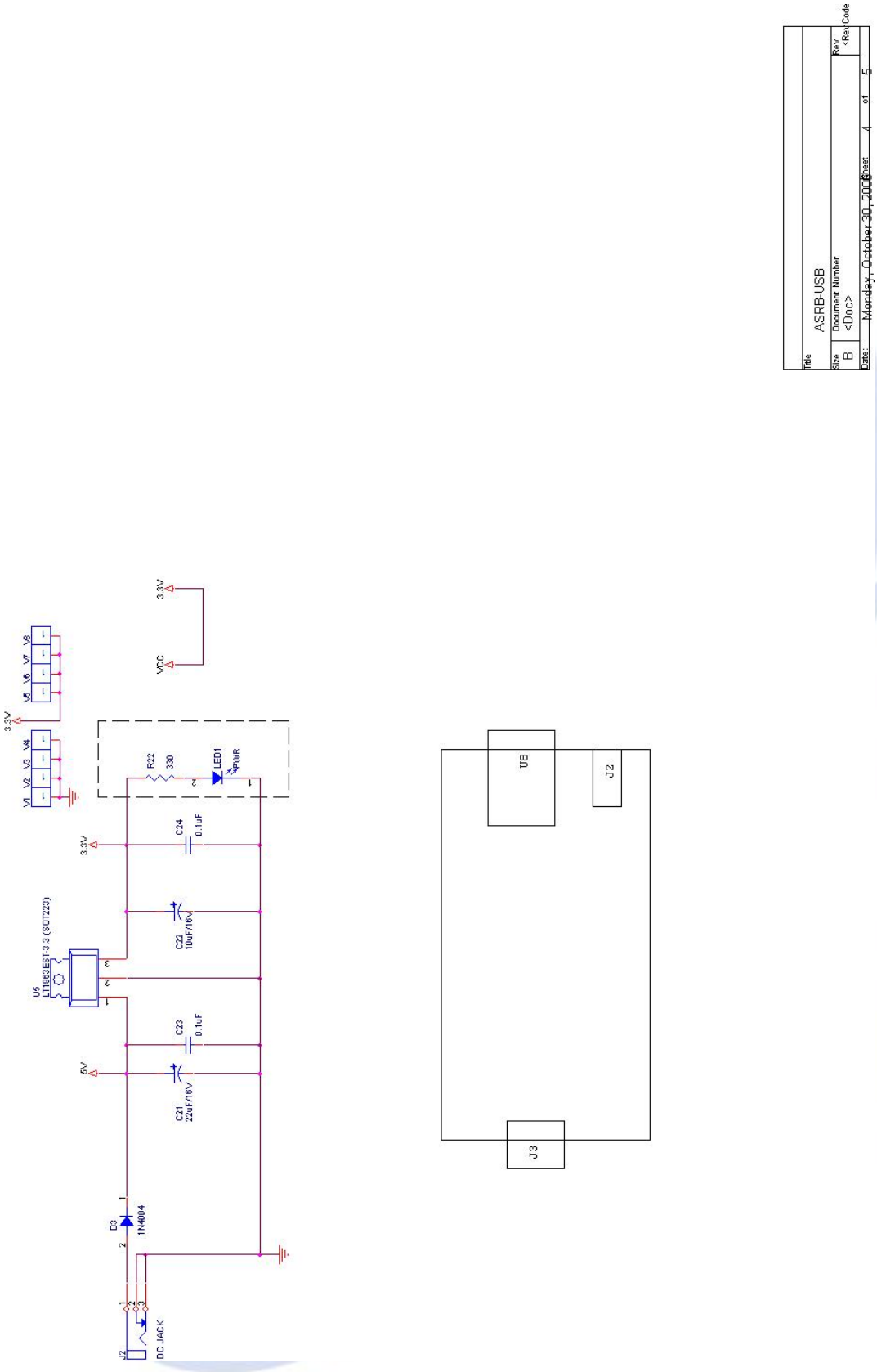
Appendix A – Schematic 2 of 4



Appendix A – Schematic 3 of 4



Appendix A - Schematic 4 of 4



Appendix B - Part list

		ASRB-USB Partlist		
Item	Q'ty	Reference	Part	Maker
1	2	CP1,C21	Tantal 22uF/16V (B case)	
2	1	CP2	Tantal 2.2uF/10V (A case)	
3	1	CP3	Tantal 10uF/16V (A case)	
4	1	C1	33nF	
5	4	C2,C5,C6,C22	Tantal 10uF/16V (A case)	
6	1	C3	1uF	
7	36	C4,C7,C8,C9,C10,C11,C12, C13,C14,C15,C16,C17,C18, C19,C20,C23,C24,C25,C26, C27,C32,C34,C35,C36,C37, C38,C39,C40,C41,C42,C43, C44,C45,C46,C49,C50	0.1uF	
8	1	C28	0.01uF	
9	1	C29	2200pF	
10	1	C30	Tantal 33uF/16V (C case)	
11	2	C47,C48	20pF	
12	1	D1	LED (Green, SMD)	
13	1	D2	1SS181(SC-59)	
14	1	D3	Diode 1N4004	
15	1	J1	Box Header 2x10 (2.54 pitch)	
16	1	J2	DC JACK (5pi)	
17	1	J4	Wafer 1x4 (2.5mm)	
18	1	J5	Pin Header 1x3 (2.54 pitch)	
19	1	J6	SUA-110M1B-P2N (USB connector)	Powerway Electronics
20	1	LED1	LED (Red, SMD)	
21	2	L1,L2	CHIP BEAD	
22	2	L5,L6	100 Ohm @100Mhz	
23	1	L7	4.7uH	
24	1	OSC1	16MHz (Oscillator, SMD)	
25	10	R1,R2,R3,R4,R5,R9,R10,R13, R14,R15	10K	
26	2	R6,R43	1K	
27	6	R7,R8,R19,R20,R21,R38	4.7K	
28	4	R11,R12,R18,R36	51	
29	1	R16	33	
30	4	R17,R22,R41,R42	200	
31	1	R23	100	
32	8	R24,R25,R30,R31,R32,R33, R34,R35	15K	
33	2	R26,R27	27 (1%)	
34	2	R37,R39	4.7K (Array resistor, 4X4, SMD)	
35	1	R40	1.5K	
36	1	R44	2K(1%)	
37	1	U1	STR710FZ2T6	ST Microelectronics
38	1	U2	MIC811SU/SOT143	Micrel
39	1	U3	24C02A/SO	Atmel
40	1	U4	W3150A+	Wiznet
41	1	U5	LT1963EST-3.3PBF (SOT223)	Linear
42	1	U6	TDUHC122-0F0C	Oxford semiconductor
43	1	U7	TPS2042BD	TI
44	1	U8	RD1-125BAG1A	UDE
45	1	U9	RTL8201CL/CP LQFP48	REALTEK,
46	1	Y1	Crystal ATS type : 6MHz	
47	1	Y2	Crystal ATS type : 25MHz	