Application Specific Reference Board

for Parallel Printers

Table of Contents

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

1.1. Key Features

- Convert parallel printer to Ethernet
- Support compatibility mode (IEEE-1284)
- System stability by using fully hardwired TCP/IP chip
- ATmega 128 RISC AVR MCU – up to 16 MIPS throughput
- 128Kbyte In-System Programmable Flash ROM
- 32Kbyte External SRAM
- 4Kbyte In-System Programmable EEPROM
- Provide hardware schematics and firmware source code
- Support DHCP
- Firmware upgrade through network
- Support Auto MDIX function (auto-detecting direct & crossover cable)
- RoHS compliant

1.2. Specification

- Hardware Architecture
  - MCU : ATMEL AVR ATmega 128
  - TCP/IP : W3150A$^+$
  - PHY : RTL8201CP (Ethernet PHY)
  - Network Interface : 10/100 Mbps auto-sensing RJ-45 Connector
  - Parallel Interface : IEEE-1284, Compatibility Mode
- Input Voltage : 5V Adaptor
- Power Consumption : under 500mA
- Temperature : 0°C ~ 80°C (Operation), -40°C ~ 85°C (Storage)
- Humidity : 10 ~ 90%

1.3. Products Contents

	ASRB-Parallel Reference Board
	CD (containing firmware source code, schematic and other related materials)
	5V Power Adapter **(Option)**
	LAN Cable **(Option)**

2. ASRB-Parallel Board

2.1. Block Diagram
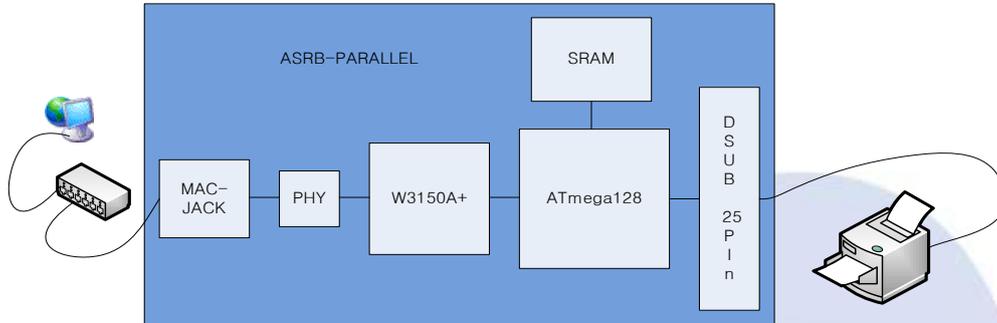
The ATmega128(AVR 8bit RISC) controls W3150A$^+$ (hard-wired TCP/IP chip) and peripheral interface logic. When a PC sends raw data through Ethernet, W3150A$^+$ saves it in its internal buffer. ATmega128 checks if data is arrived or not and sends to peripheral.

1. Printing is executed at the PC
2. The raw data from printing driver is transmitted to ASRB-Parallel board.
3. ASRB-Parallel received the data and transmits it to the printer according to the IEEE-1284 mode.

2.2. Board Layout
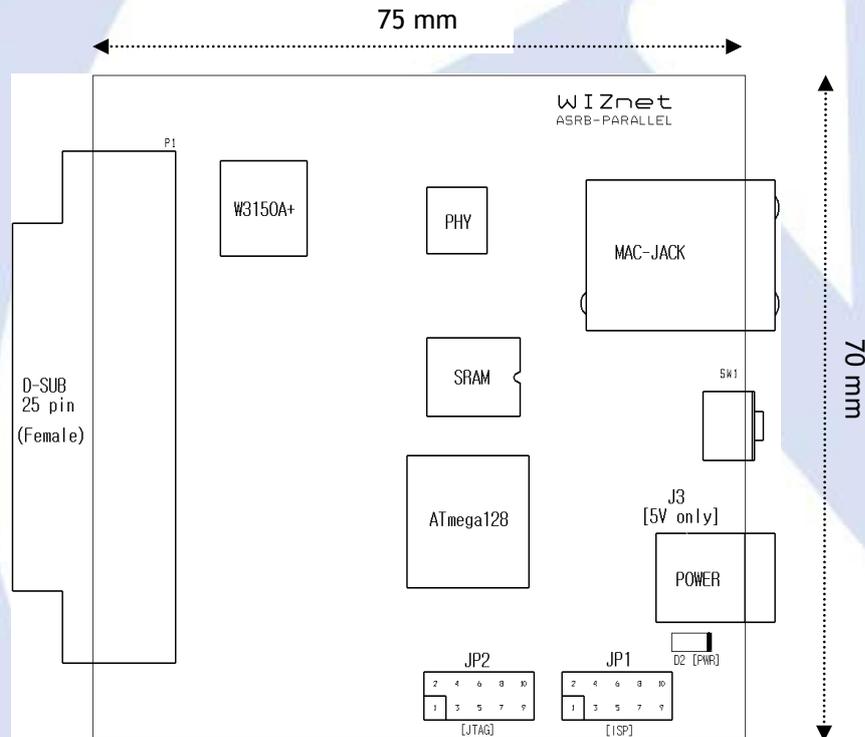
2.3. PIN OUT

P1 (D-SUB 25pin)

PIN #	Source	Name	Description
1	Host	nStrobe	Data into the input latch
2	Peripheral	Data 1 (LSB)	
3	Peripheral	Data 2	
4	Peripheral	Data 3	
5	Peripheral	Data 4	
6	Peripheral	Data 5	
7	Peripheral	Data 6	
8	Peripheral	Data 7	
9	Peripheral	Data 8 (MSB)	
10	Peripheral	nAck	Pulsed low by the Peripheral to ack
11	Peripheral	Busy	Peripheral is not ready to receive data.
12	Peripheral	PError	Reserved
13	Peripheral	Select	Indicate the peripheral is on-line
14	Host	nAutoFd	Reserved
15	Peripheral	nFault	Reserved
16	Host	nInit	Reset the interface
17	Host	nSelectIn	Select Peripheral
18~25		Signal Ground	

JP1 (ISP)

PIN #	Name
1	PDI
2	5V
3	Ground
4	Ground
5	/RESET
6	Ground
7	SCK
8	Ground
9	PDO
10	Ground

JP2 (JTAG)

PIN #	Name
1	TCK
2	Ground
3	TDO
4	5V
5	TMS
6	/RESET
7	5V
8	N.C.
9	TDI
10	Ground

3. Hardware Description of ASRB-Parallel

3.1. Parameters

- Power   5V DC / under 500mA
- Dimension   75mm x 70mm x 18mm (L x W x H)
- Temperature   Operating : 0 ~ 80 ℃
- Ethernet   10/100 Base-T Ethernet (Auto detection)
- Printer interface   IEEE-1284, Compatibility mode

3.2. Specification

- MCU Clock   16 MHz (16 MIPS), using crystal
- FLASH   128Kbyte (MCU Internal)
- SRAM   4Kbyte (MCU Internal) + 28Kbyte(External)
- EEPROM   4Kbyte (MCU Internal)

3.3. Programming

- ISP

The AVRISP combined with "AVR Studio" can program all AVR MCU (in this module, ATmega128) through ISP interface (JP1). The AVRISP can program both of flash and EEPROM, and support fuses and lock bit programming. For more information about AVRISP, go to ATMEL webpage (www.atmel.com)

The AVRISP usually has 6pin connector, but 10pin connector is used in this module. So, ISPGENDER is provided shown below.
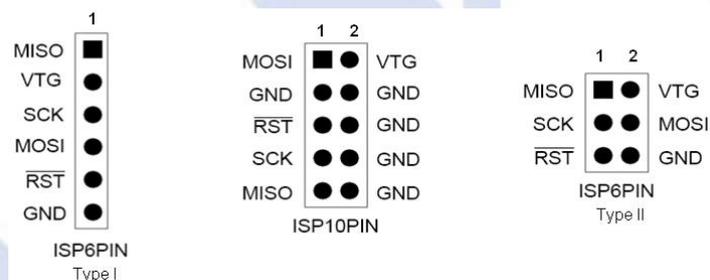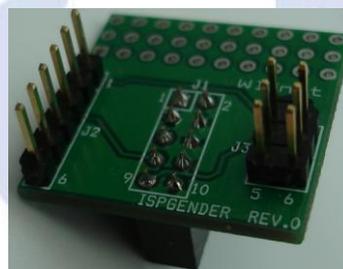
For more information about this gender, refer to "ISP GENDER User Guide Vx.x.pdf"

The ATmega128 use 16MHz crystal (16 MIPS). The AVRISP frequency must be 1/4 of the MCU clock or less. We recommend use 4MHz for AVR ISP frequency.

■ JTAG

The AVR JTAGICE supports debugging through JTAG interface. It can program Flash, EEPROM, fuses and lock bit. The main function is code debugging with "AVR Studio". For more information, about AVR JTAGICE, refer to ATMEL webpage (www.atmel.com)

■ Default Setting Value of ATmega128 Fuses & Lock bits

ASRB-Parallel board is provided with following setting value. In this document, the items of value '1' are displayed.

◆ Fuses

- On-Chip Debug : Enabled

- JTAG Interface : Enabled

- Boot Flash section size=4096 words

- Brown-out detection level at VCC=4.0V

- Brown-out detection enabled

- External Crystal/Resonator High Frequency. Start-up time : 16K CK + 64ms

◆ Lock Bits

- Mode1 : No memory lock features enable

- Application Protection Mode 1 : No lock on SPM and LPM in Application Section

- Boot Loader Protection Mode 1 : No lock on SPM and LPM in Boot Loader Section
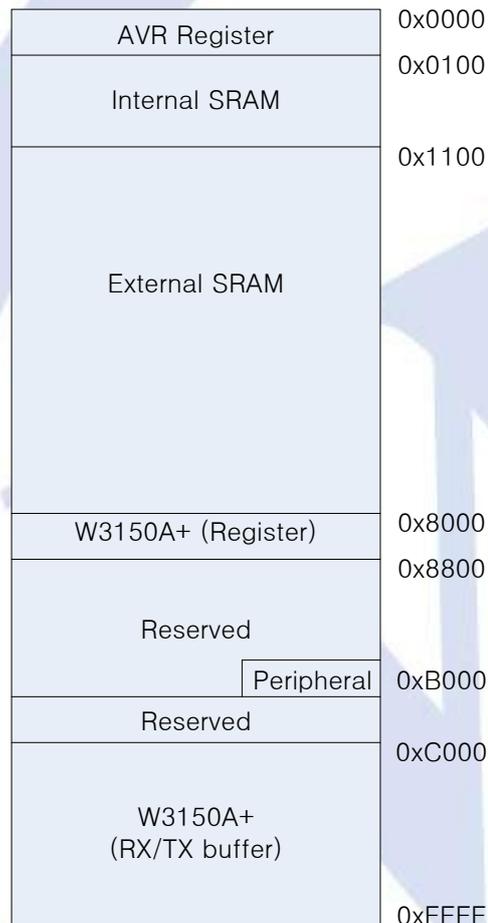
3.4. Memory Map

The memory map of FLASH, SRAM, EEPROM and W3150A[+] is described in this chapter.

The ATmega128 has FLASH, SRAM and EEPROM as below.

- FLASH   :   0x00000 ~ 0x1FFFF
- SRAM   :   0x0100 ~ 0x10FF   (The register space is below 0x0100)
- EEPROM :   0x0000 ~ 0xFFF

The address space of other devices is as below.

- External SRAM :   0x1100 ~ 0x7FFF
- W3150A+   :   0x8000 ~ 0x87FF
                 0xC000 ~ 0xFFFF
- Peripheral   :   0xB000   (Write operation only)

AVR Register	0x0000
	0x0100
Internal SRAM	
	0x1100
External SRAM	
W3150A+ (Register)	0x8000
	0x8800
Reserved	
Peripheral	0xB000
Reserved	
	0xC000
W3150A+ (RX/TX buffer)	
	0xFFFF

4. Software Description of ASRB-Parallel

4.1. Network Parameters

■ Default Values

Item	Address
MAC	00:08:DC:00:00:99
IP	192.168.99.2
Gateway	192.168.99.1
Subnet Mask	255.255.255.0
Port	6000

If you supply the power as pressing the switch of the board, above default value will be applied. In order to change the value, connect to the board through web browser or user Configuration Tool (PC application based on Windows OS)

■ **Configuration Tool**
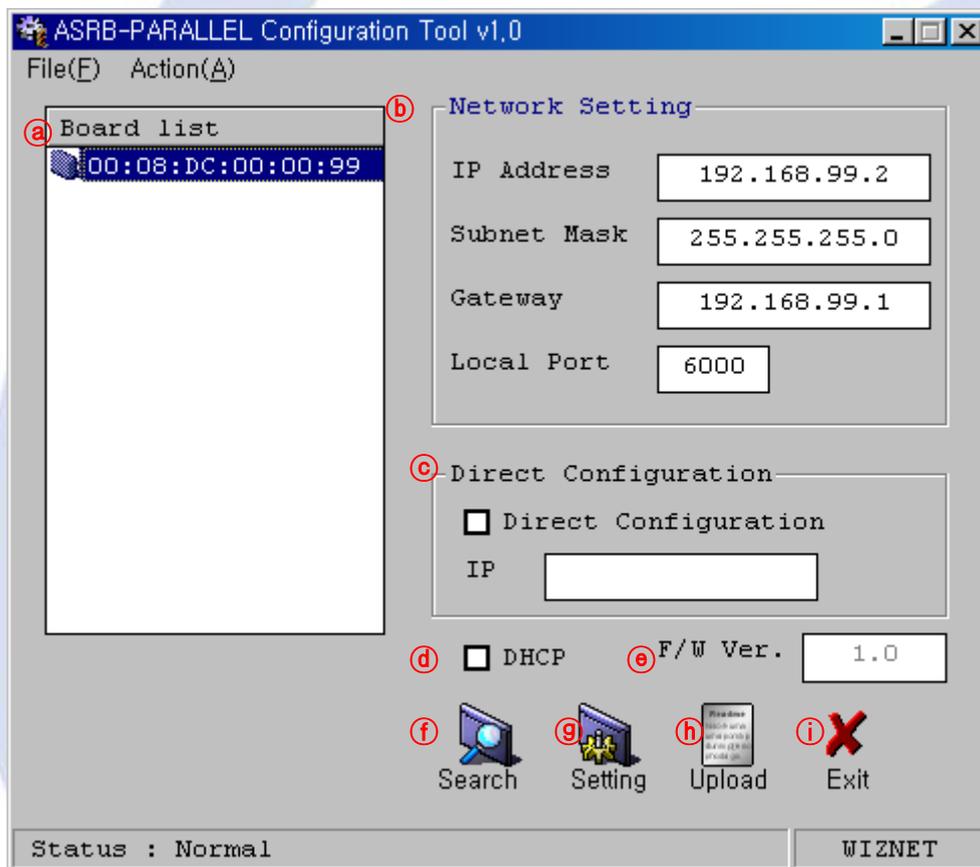
ⓐ Board List

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

ⓑ Network Setting

The network parameters for the board can be configured.

ⓒ Direct Configuration

By assigning the IP address directly, the board can be configured.

ⓓ DHCP

If DHCP is checked, the board will acquire network parameters from DHCP server.

ⓔ F/W Ver

It displays the firmware version of the board.

ⓕ Search

The Search function is used to search all boards existing on the same subnet. The UDP broadcast is used for searching on a LAN.
The MAC address for a searched board 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 board will be displayed. After changing each value in the configuration program, click the "Setting" button to complete the configuration. The board will be initialized with the new configuration.
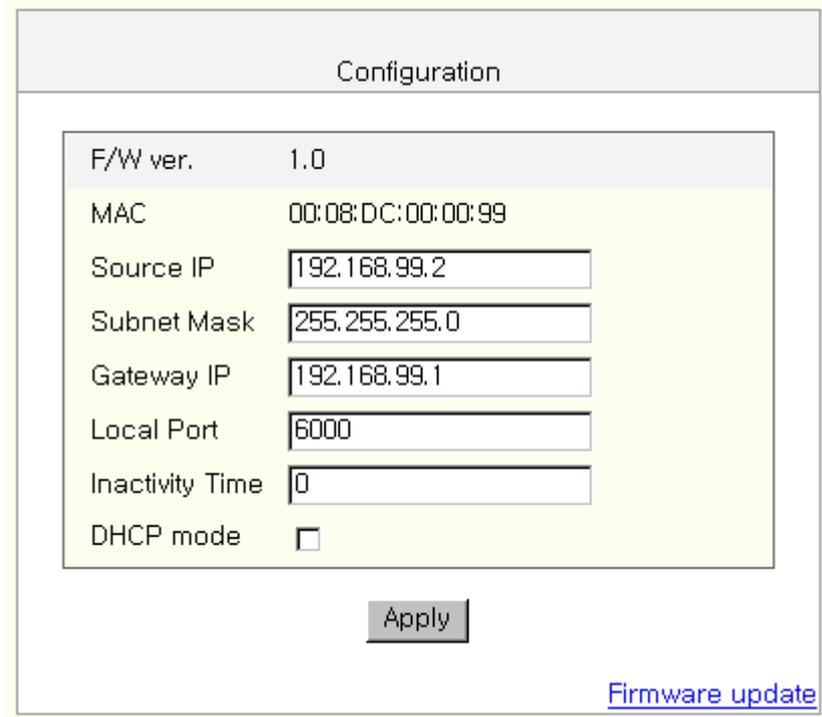
ⓗ Upload

Upload the firmware through the network. Updated firmware (the binary file) can be downloaded from WIZnet website. After upgrading, your can check changed version by clicking "Search" button.

ⓘ Exit

Exit the configuration program.
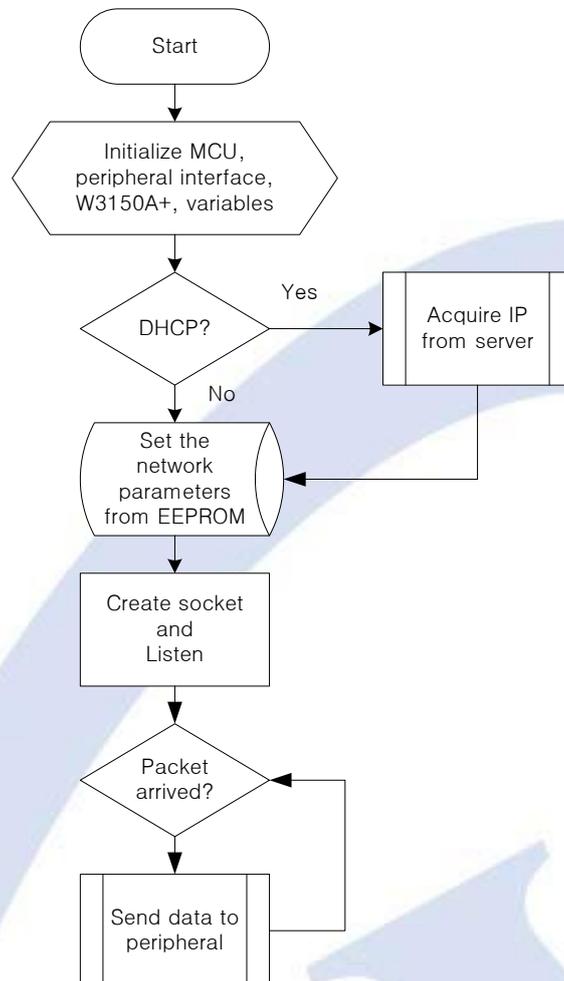
■ **Connection through Web-Browser**

Configuration

F/W ver.	1.0
MAC	00:08:DC:00:00:99
Source IP	192.168.99.2
Subnet Mask	255.255.255.0
Gateway IP	192.168.99.1
Local Port	6000
Inactivity Time	0
DHCP mode	☐

Apply

Firmware update

As ASRB-Parallel can operate web server, it is possible to connect trough web browser and configure various network parameters. Above figure is the screen when connecting at the web browser by using IP address http://192.168.99.2. If any value is changed, click the "Apply" button. "Firmware update" is linked to the WIZnet website (www.wiznet.co.kr)

4.2. Operation Flow

```
                    ┌──────────────┐
                    │    Start     │
                    └──────┬───────┘
                           │
              ┌────────────▼────────────┐
              │    Initialize MCU,      │
              │  peripheral interface,  │
              │  W3150A+, variables     │
              └────────────┬────────────┘
                           │
                        ◇ DHCP? ──Yes──►┌──────────────┐
                           │            │  Acquire IP  │
                           │No          │ from server  │
                           │            └──────┬───────┘
              ┌────────────▼────────────┐      │
              │      Set the            │◄─────┘
              │      network            │
              │      parameters         │
              │      from EEPROM        │
              └────────────┬────────────┘
                           │
              ┌────────────▼────────────┐
              │    Create socket        │
              │        and              │
              │       Listen            │
              └────────────┬────────────┘
                           │
                     ◇ Packet ◄──────┐
                       arrived?      │
                           │         │
              ┌────────────▼─────────┴──┐
              │   Send data to          │
              │    peripheral           │
              └─────────────────────────┘
```
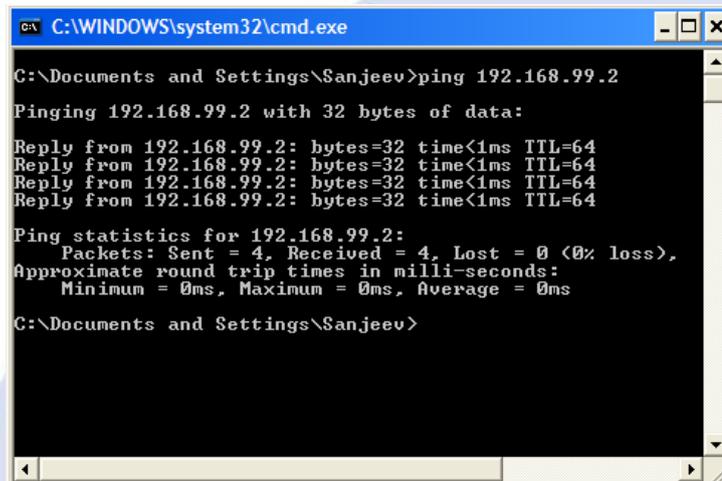
5. Testing ASRB-Parallel

5.1. PING test

After configuring the network parameters (IP address, Gateway, Subnet, etc), you can check network status by performing PING request.

Open the Command Prompt window at the PC.

As shown above, the sent & received packets should be 4 respectively and the Lost 0. If not, check network status.

☞ Note : Check if PC has same network class as the board. In here, if board has the IP address of "192.168.99.2", the PC should have "192.168.99.x". The IP address of the PC (based on Windows) can be changed at the Network Properties menu.

5.2. Print

For the printing test, the printer driver should be installed in the PC. Check the network parameters of the board and network status before testing.
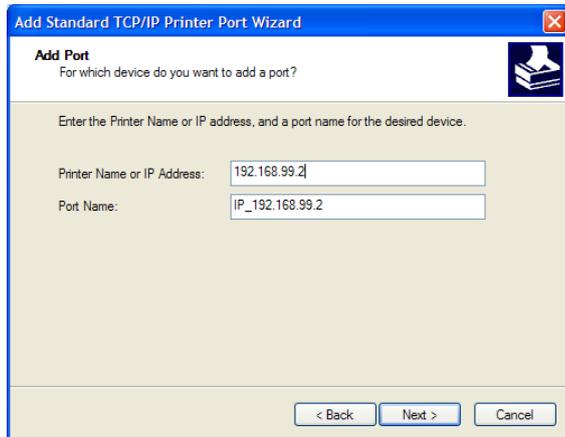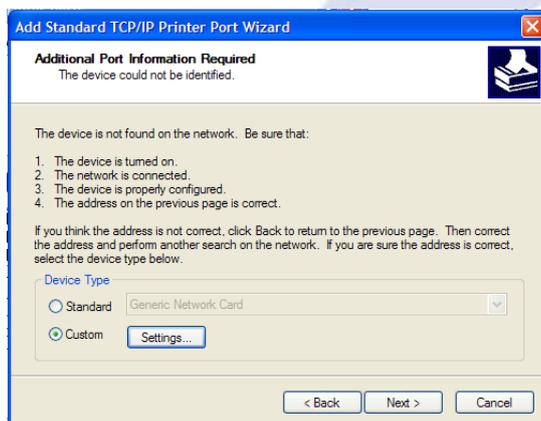
■ Adding TCP/IP port
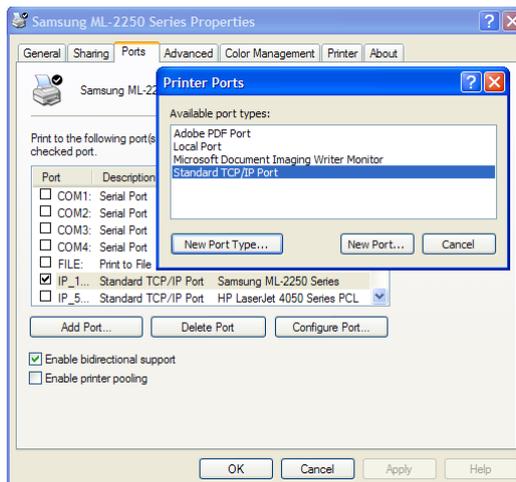
Select "Standard TCP/IP Port" of "port" tab at the Printer Properties menu.
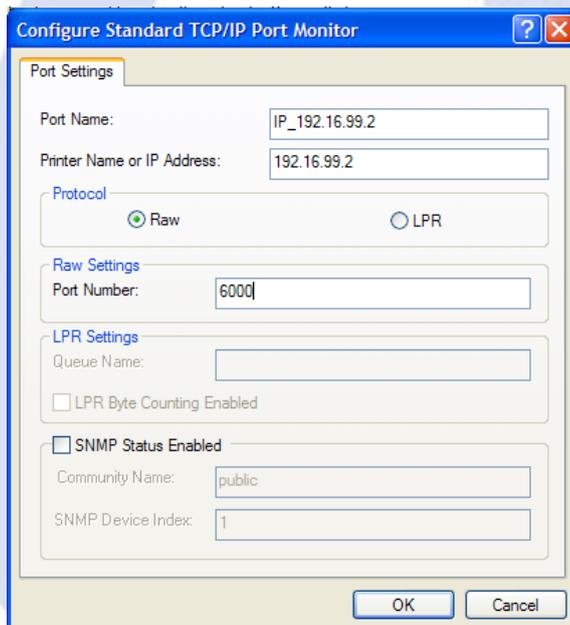

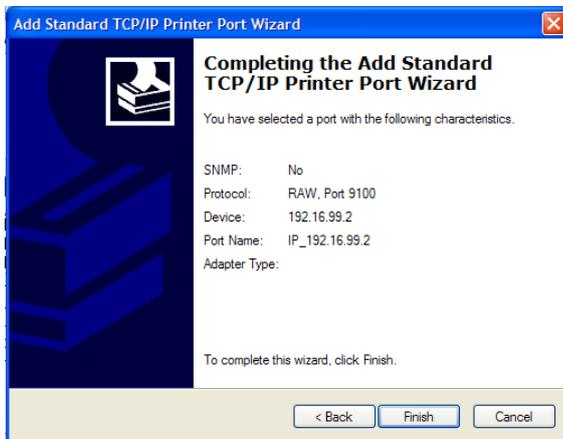Follow the instructions of the wizard to add the TCP/IP port.

Input the IP address of the AS-RB Parallel board. The port name is automatically filled.
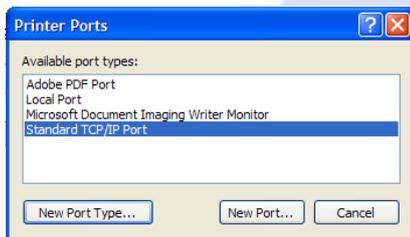

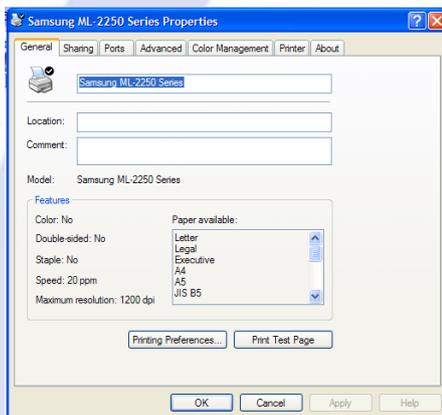Select "Custom" at the Device Type and Click "Setting" button.

Select "Raw" at the Protocol, and input port number same as the value of the Configuration Tool or Web Configuration page.
Click "OK" button.

Click "Finish" button

Click "Cancel"

Click "Print Test Page" and check if printing is appropriately processed.

6. 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-PARALLEL 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 occurring 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 – Schematics 1 of 2

Appendix A – Schematics 2 of 2
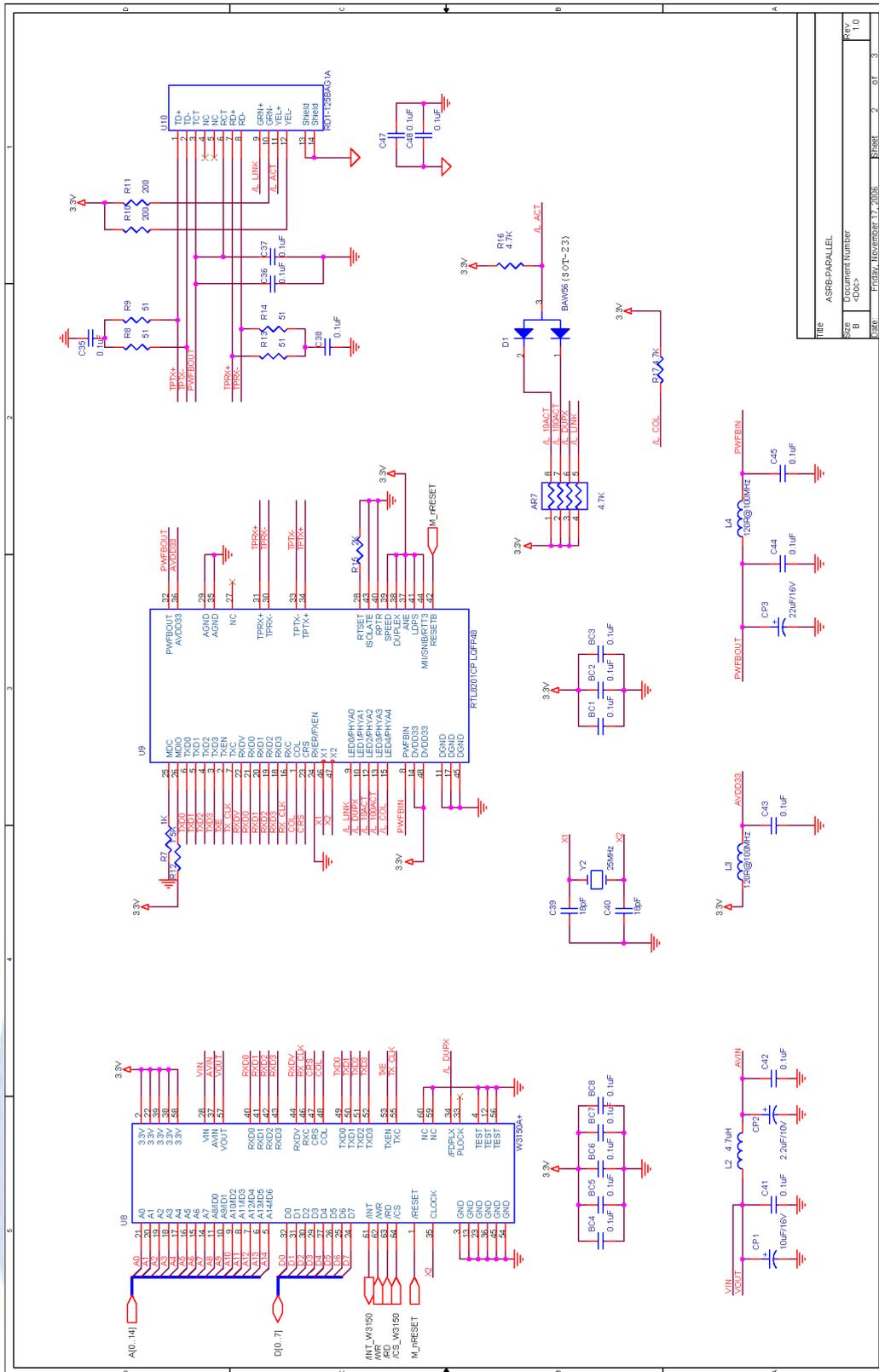
Appendix B – Parts List

Item	Qty.	Reference	Part
1	5	AR1,AR2,AR5,AR6,AR7	array resister 4.7K
2	2	AR3,AR4	array resister 33
3	4	R2,R5,R16,R17	Resister 4.7K
4	29	BC1,BC2,BC3,BC4,BC5, BC6,BC7,BC8,C14,C26, C27,C28,C29,C30,C31, C32,C33,C34,C35,C36, C37,C38,C41,C42,C43, C44,C45,C47,C48	Capacitor 0.1u
5	1	CP1	Tantal 10u/16V
6	1	CP2	Tantal 2.2u/10V
7	1	CP3	Tantal 22u/16V
8	4	C1,C2,C39,C40	Capacitor 20p
9	8	C3,C4,C5,C6,C7,C8, C9,C10	Capacitor 22p
10	1	C13	Tantal 100u/16V
11	1	C15	Tantal 33u/10V
12	9	C16,C18,C19,C20,C21, C22,C23,C24,C25	Capacitor 470p
13	1	C46	Tantal 1u/10V
14	1	D1	1SS181
15	1	D2	LED
16	1	JP1	2x5 Pin Header (2.54mm Pitch)
17	1	J3	DC JACK(5PI) 3pin DIP
18	1	L2	Inductor 4.7u (2012 size)
19	2	L3,L4	120Ohm@100MHz (2012 size)
20	1	P1	D-SUB 25 PIN FEMALE
21	3	R1,R19,R20	Resister 10K
22	4	R3,R10,R11,R18	Resister 200
23	1	R4	Resister 1M
24	1	R7	Resister 1K
25	4	R8,R9,R13,R14	Resister 51
26	1	R12	Resister 1.5K
27	1	R15	Resister 2K
28	1	SW1	Right-Angle 4pin push-button switch
29	1	U1	Atmega128
30	1	U2	62C256
31	1	U3	74HC573
32	1	U5	74HC574
33	1	U7	LM1117MPX-3.3
34	1	U8	W3150A+
35	1	U9	RTL8201CP
36	1	U10	RD1-125BAG1A
37	1	U11	74HC08
38	1	U12	74HC14
39	1	Y1	Crystal 16MHz
40	1	Y2	Crystal 25MHz