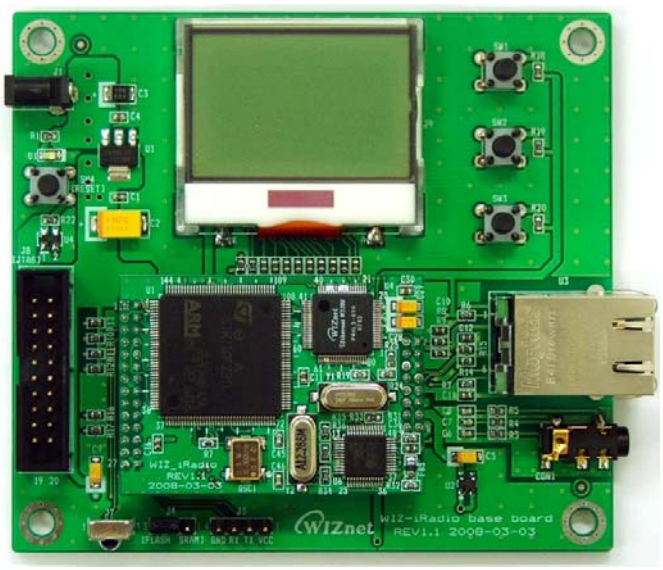
WIZ-iRadio User's Manual

(Ver. 1.0)



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Document History Information

Revision	Date	Description
V1.0	May 1, 2008	Original Document

WIZnet's Online Technical Support

If you have something to ask about WIZnet Products, Write down your question on Q&A Board in WIZnet website (www.wiznet.co.kr). WIZnet Engineer will give an answer as soon as possible.

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1. Overview

WIZ-iRadio receives and plays the data through Internet protocols from a streaming server. With WIZ-i-Radio, you can play all Internet braodcast without PC.

1.1. Evaluation Board Package

WIZ-iRadio Evaluation Board package is composed of below items.

	Item	Quantity
WIZ-iRadio -EVB	WIZ-iRadio module	1
	WIZ-iRadio Base Board	1
	Power Adaptor (5V/500mA)	1
Accessory	Software CD	1
	UTP Cable	1
	Remote Controller	1

Table 1. WIZ-iRadio Evaluation Board

Directory			Contents
WIZ-iRadio	DOCs	Manual	WIZ-iRadio User's Manual (Korean/English)
		Datasheet	All sorts of datasheets
		Application Note	How to use ShoutCast Server
	HW	Schematics	All sorts of schematics
		Part List	All sorts of part lists
	SW	Firmware	EVB B/D Firmware
		PC Utility	All sorts of Tool Program

Table 2. Software CD Contents

- Software CD contents can be different according to the version. Before use, check "ReadMe.txt".

1.2. Feature

1.2.1.Hardware Feauture

- WIZ - iRadio
  - MCU : ARM7TDMI 32-bit RISC CPU(STR710FZ2T6)
  - RAM : 2Mbytes external RAM
  - ROM : 256Kbytes Flash program memory(ARM7 Internal Flash)
  - LAN : WIZnet W5100 Hardwired TCP/IP Embedded Ethernet Controller
  - CODEC : VS1033C
  - Power Consumption : 175mA

- WIZ-iRadio Base Board
  - Power : DC 5V input
  - LCD : 128 x 64 graphic LCD with Blue Backlight
  - JTAG I/F : 2 x 10 male box header
  - SERIAL I/F : 1 x 4 male 2.54mm pin header(GND, RX, TX, VCC)
  - IR Receiver
  - AUDIO Output : 3.5Ø stereo phone jack
  - LAN PORT : RJ45 with Transformer(1CT:1CT), 2LED

1.2.2.Software Feature

- Play streaming audio from Internet radio station
- Support Shoutcast server, HTTP, MMS
- Support DHCP and static IP
- Firmware update through network

2. Hardware description

2.1. Board Configuration

WIZ-iRadio-EVB is composed of a main module and a base board. The main module contains the MCU, RAM, Ethernet Controller, and CODEC that are responsible for the main functions of Internet Radio. In the base board, power for module operation and peripheral devices for input and output are located.

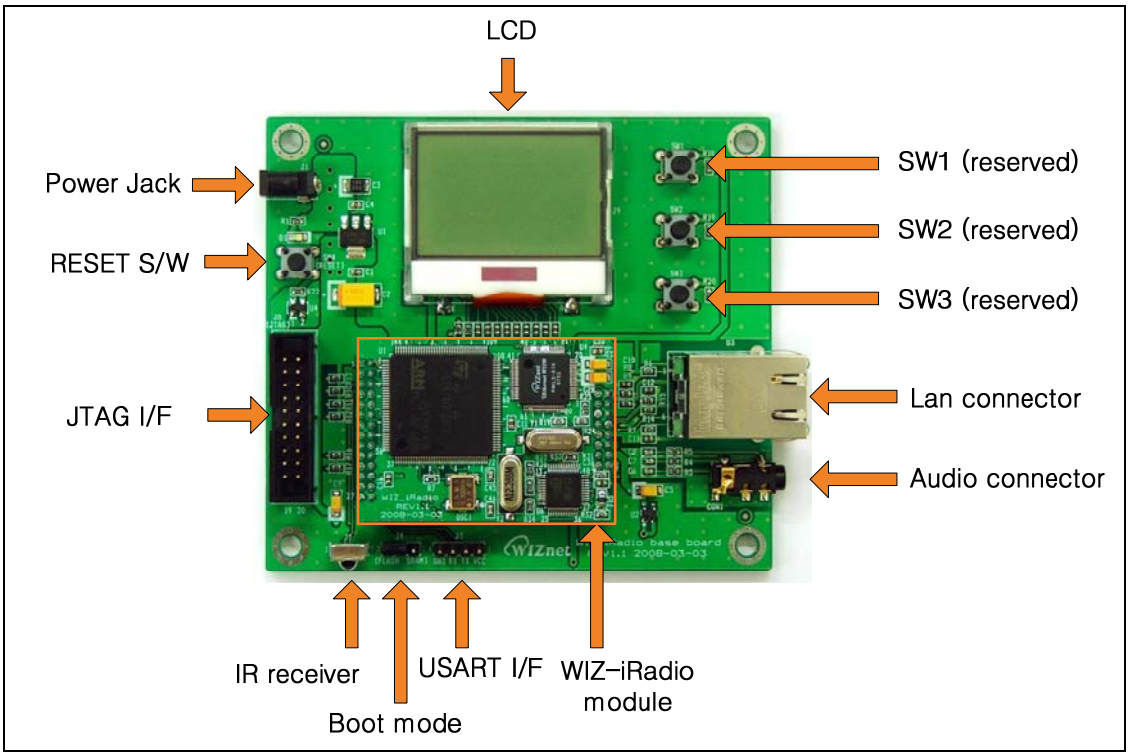


Figure 1. WIZ-iRadio Board Configuration

- Power Jack : DC 5v INPUT(MIN 500mA), diameter(Φ4.2/Φ1.3)
- RESET S/W : Reset Switch. LCD and WIZ-iRadio module will be reset.
- JTAG I/F : JTAG interface of MCU.

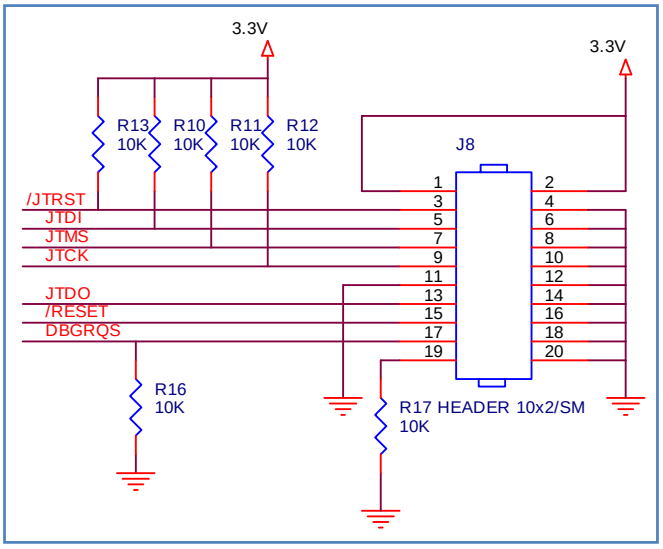


Figure 2. JTAG Interface

- IR receiver : IR receiver module for remote control systems.
  (Carrier Frequency – 40.0kHz)
- Boot mode : JUMPER to select MCU BOOT MODE.

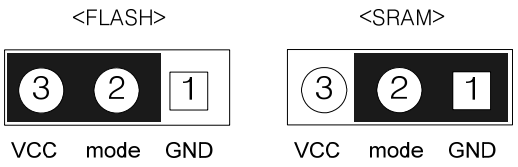


Figure 3. Boot Mode Selection Jumper

- UART I/F : UART Output port for debugging.
- WIZ-iRadio module : The module has 2x14, 2x8 header(2mm pitch) pin to connect to the base board. For details of pin descriptions, refer to chapter 2.2.
- Audio Connector : It uses 3.5Φ stereo phone jack and connects to input of speaker.
- LAN Connector : It is the port to be connected by UTP cable(RJ45). LAN connector contains two indicator LED and transformer.
- SW1, SW2, SW3 : reserved switch
- LCD : 128x64 dot LCD with Blue Backlight

✧ In order to operate WIZ-iRadio, Power adapter, Lan Cable and Audio Cable must be connected.

2.2. Pin Description

The pin description of WIZ-iRadio module is detailed in Figure 4, below.
As shown below, 'J15' is connected to 'J5' of base board, and 'J14' to 'J6' of base board.

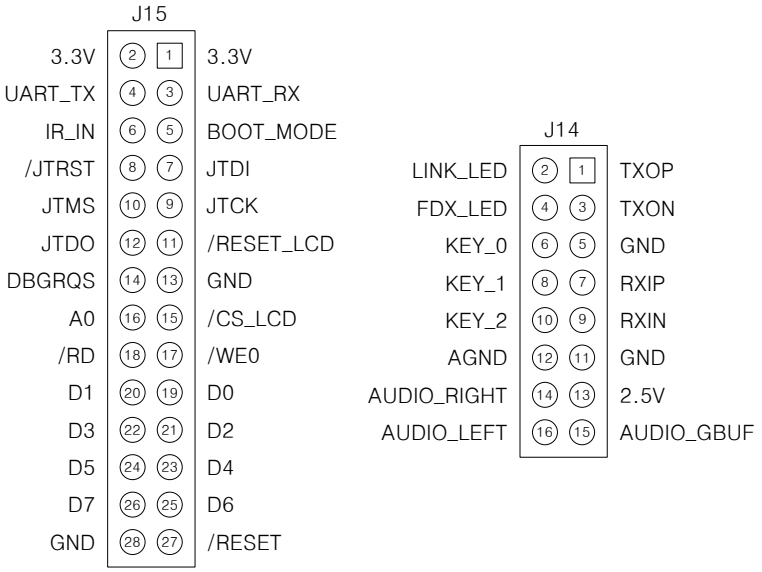


Figure 4. WIZ-iRadio Modue Pin Description

Symbol	Type	Pin No.	Description
3.3V	P	J15:1, J15:2	DC 3.3V power supply
2.5V	P	J14:13	DC 2.5V power supply
GND	P	J15:13, J15:28, J14:11	Ground
AGND	P	J14:12	Analog Ground
UART_RX	I	J15:3	UART receive data input
UART_TX	O	J15:4	UART receive data output
BOOT_MODE	I	J15:5	Boot control input
IR_IN	I	J15:6	IR receiver signal
JTDI	I	J15:7	JTAG data input
/JTRST	I	J15:8	Active low JTAG reset input
JTCK	I	J15:9	JTAG clock input
JTMS	I	J15:10	JTAG mode selection input
/RESET_LCD	O	J15:11	Active low LCD reset signal
JTDO	O	J15:12	JTAG data output
DBGRQS	I	J15:14	Debug mode request input

/CS_LCD	O	J15:15	Active low LCD chip select signal
A0	O	J15:16	Address 0 for LCD Control
/WE0	O	J15:17	Active low write enable output
/RD	O	J15:18	Active low read signal for external memory
D0 - D7	I/O	J15:19 – J15:26	Data bus
/RESET	I	J15:27	Active low reset signal
TXOP	O	J14:1	The differential data is transmitted to the media on the TXOP/TXON signal pair.
TXON	O	J14:3	
RXIP	I	J14:7	The differential data from the media is received on the RXIP/RXIN signal pair.
RXIN	I	J14:9	
LINK_LED	O	J14:2	Active low in link state indicates a good status for 10/100M. It is always ON when the link is OK and it flashes while in a TX or RX state.
FDX_LED	O	J14:4	Active low indicates the status of full-duplex mode.
KEY0 – KEY2	I	J14:6, J14:8, J14:10	Reserved signal
AUDIO_RIGHT	O	J14:14	Audio right channel output
AUDIO_LEFT	O	J14:16	Audio left channel output
AUDIO_GBUF	O	J14:15	Audio ground buffer

Table 3. WIZ-iRadio Module Pin Description

2.3. Dimension

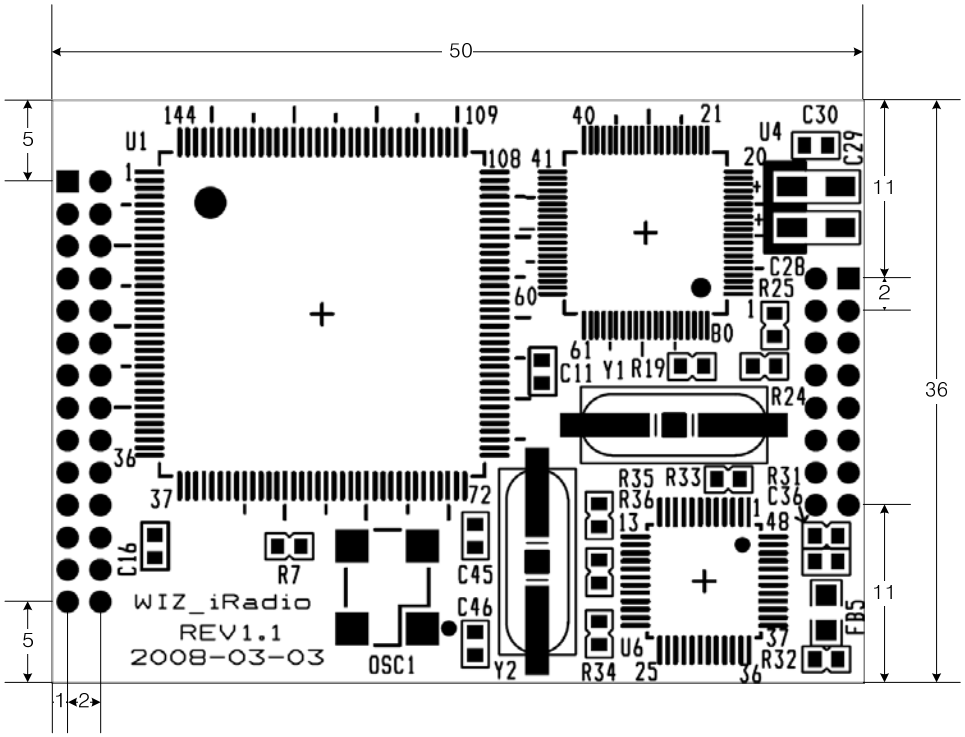


Figure 5. WIZ-iRadio Module Dimension (unit : mm)

2.4. Remote Controller

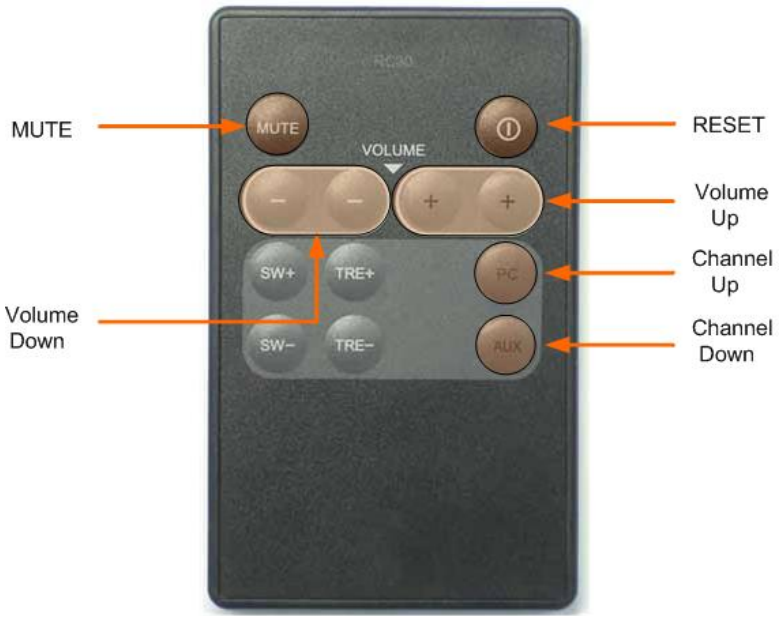


Figure 6. WIZ-iRadio Remote Controller

3. Configuration Tool

3.1. Description

In order to configure the WIZ-iRadio, the Configuration Tool program should be installed and used. Please download Install file from Software CD or WIZnet homepage (www.wiznet.co.kr)

.

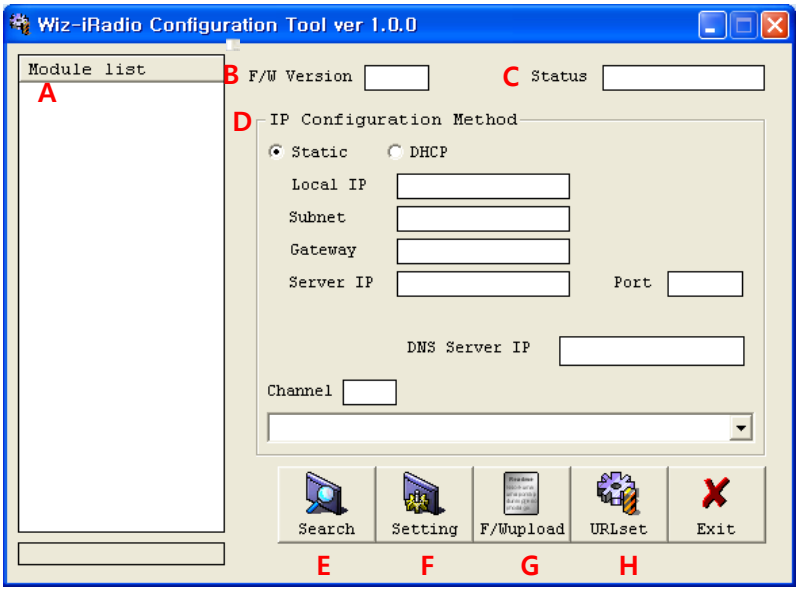


Figure 7. WIZ-iRadio Configuration Tool

A. Module list : The Mac Address of all the modules on same subnet are displayed.

B. F/W version : It shows the firmware version of WIZ-iRadio module.

C. Status : It shows the connection status between module and server.

D. IP Configuration Method : It configures network-related parameters of the module..

- Static
  When using fixed IP,, input local IP, subnet, gateway, and DNS.

- DHCP :
  When module is installed under the dynamic IP environment, select the DHCP. If DHCP is selected, local IP, subnet, gateway and DNS are automatically configured.

- Server IP & Port :
  Server IP and Port can't be manually input. After selecting a channel at the Channel list, it is connected to the selected site through DNS. Server IP and Port are automatically displayed.

- Channel :
  It displays the list saved in the file "Server_list.txt". "Server_list.txt" is created in the folder where Configuration Tool program is installed.

E. Search : It searches for all modules installed on same subnet.

F. Setting : It saves changed configurations.

G. F/W upload : It is for upgrading the firmware.

H. URLset : It saves changed channel information.

3.2. How to Use Configuration Tool - Examples

A. Changing Network Information

- Click "Search" button, and select a module at the "Module list".
- Configure network setting by changing the parameter values, and click "Setting" button.
- The module is reset and operates with changed values.

B. Changing Channel Information

- Select a module at the "Module list".
- Click [URLse] and "Complete" message is displayed.

4. Firmware description

4.1. Firmware Structure

The firmware of WIZ-iRadio is composed of Application and Boot. The role of Boot is for updating through the network. Therefore, JTAG ICE such as MultiICE is not required when developing. In the WIZ-iRadio, STR710FZ2 from STMicroelectronics is used. In the Flash of this MCU, Application and Boot firmware is written according to the memory map (below).

Application	0x40000000 ~ 0x40010000	Internet Radio Function
Boot	0x40030000 ~ 0x40040000	Used for firmware update through network

Table 4. Firmware Structure

4.2. Scat File

According to the memory map, the scat files in each App and Boot folders are written. The scat file in the App folder is as below (please refer to Figure 8).

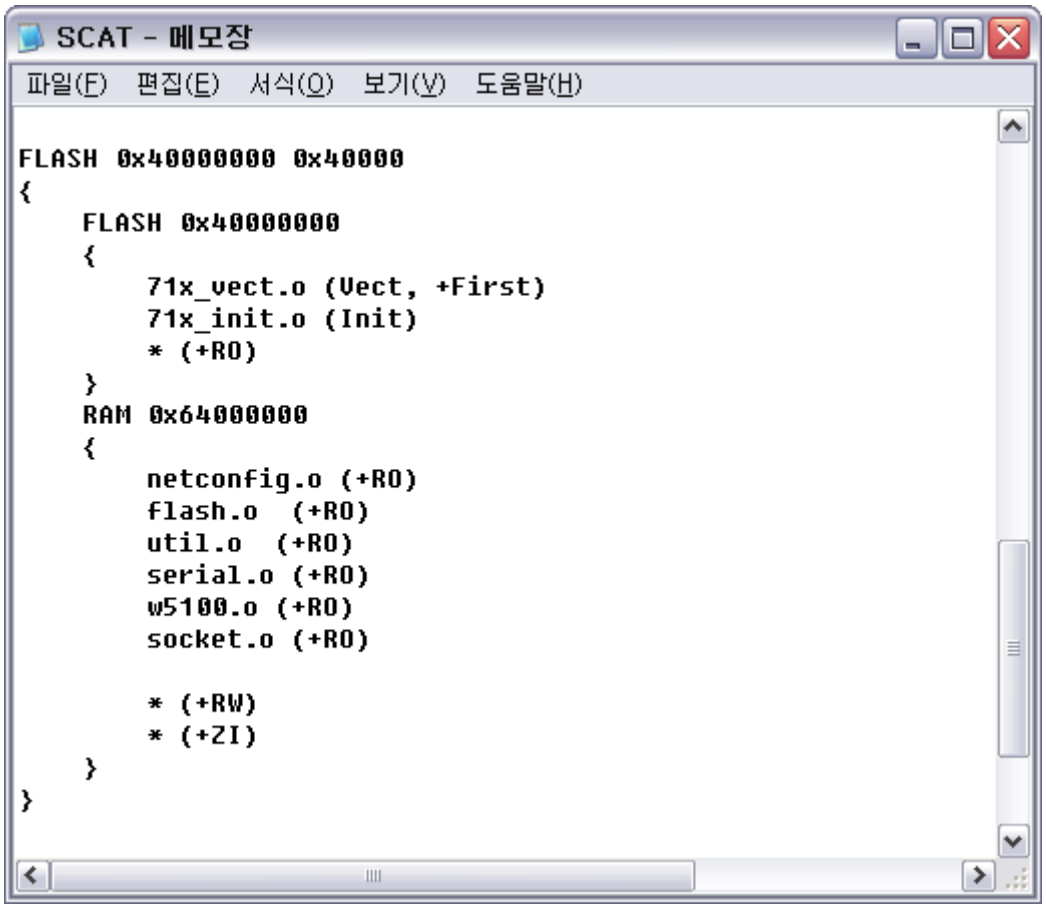


Figure 8. App – Scat

There are RAM_MODE and FLASH. In the case of RAM_MODE, it is used for operating at the internal RAM after writing the F/W and downloading with JTAG device such as MultiICE. The FLASH is used for operating after writing in the flash memory of STR710FZ2. You can select one of them. For the not-used mode, mark it as commentary.

The program starts from 0x400300000 of flash memory at the Boot. The scat file in the Boot folder is as below (please refer to Figure 9).

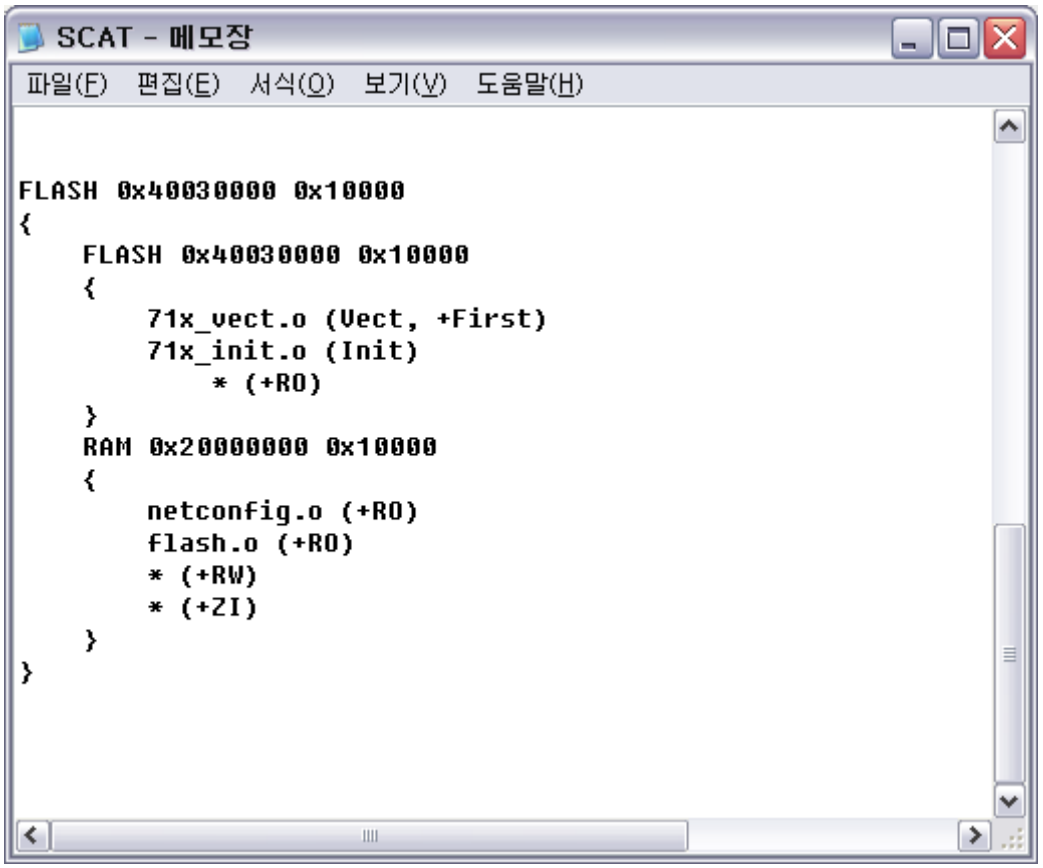


Figure 9. Boot - Scat

4.3. Compile Environment & Process

WIZ-iRadio is developed by using RealView and MultiICE of ARM. If the source file has 'prj' extension, it is the project file of RealView.

-. App : ₩App₩REALVIEW₩network.prj
-. Boot : ₩Boot₩REALVIEW₩network.prj

Execute RealView program and open the project file by selecting the menu "Project➔Open project". If you select "Project➔Project properties...", "Project Properties" window is displayed. In this window, the modified part are shown in blue color.

-. *PROJECT -- Source search

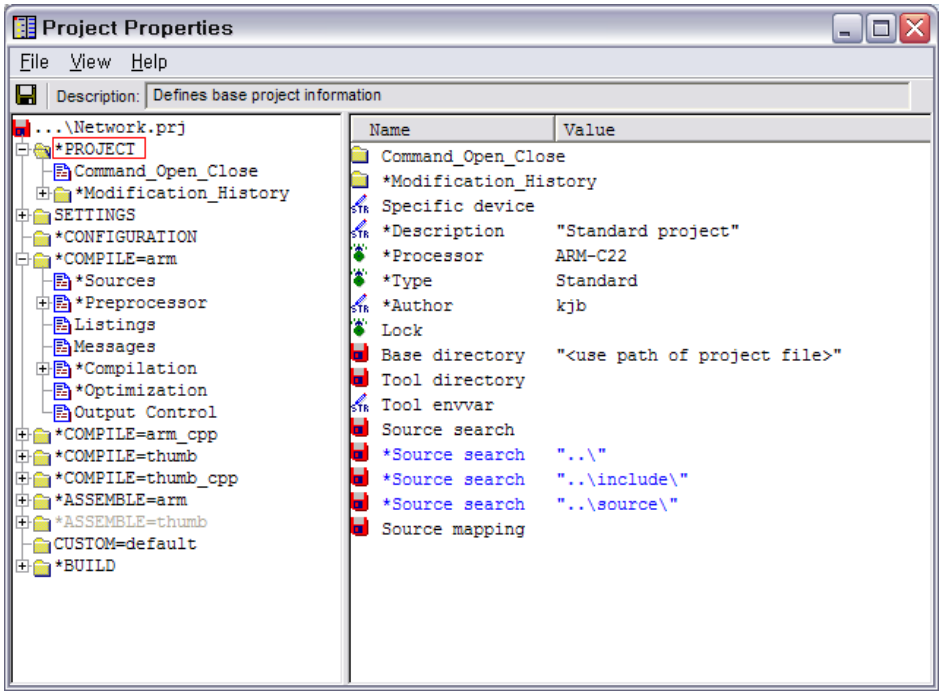


Figure 10. Compile - 1

-. *COMFILE=arm -- *Source

You can add the source here.

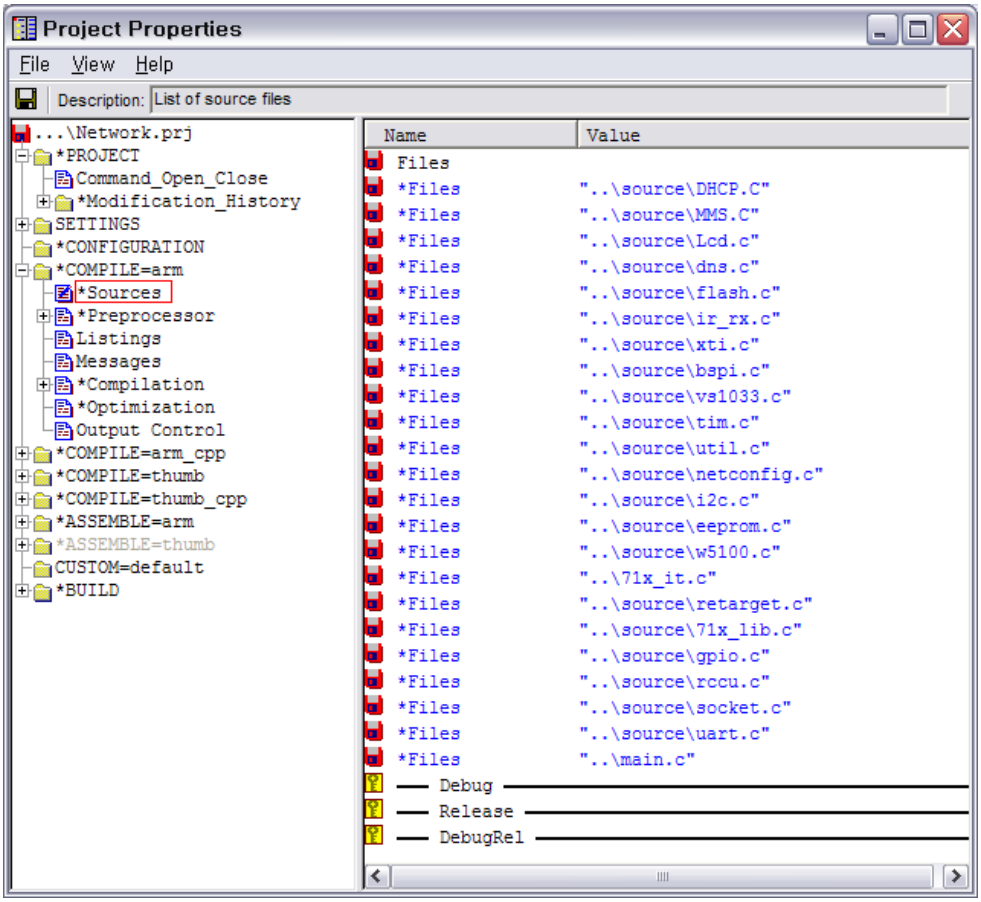


Figure 11. Compile - 2

-. *COMFILE=arm -- *Preprocessor

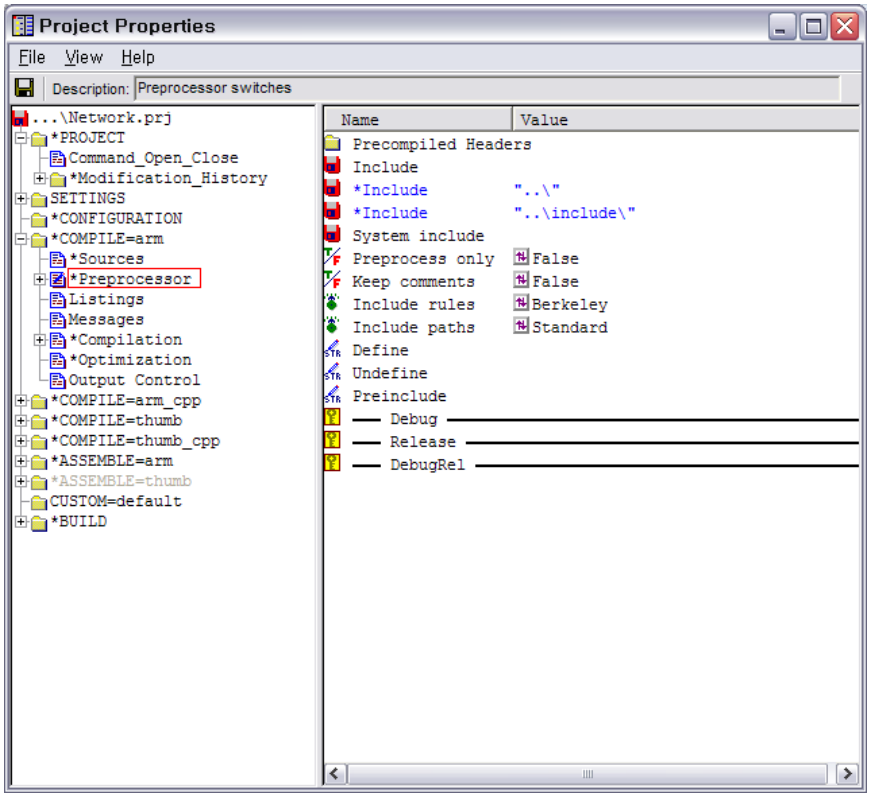


Figure 12. Compile - 3

-. *ASSEMB:E=arm -- *Source

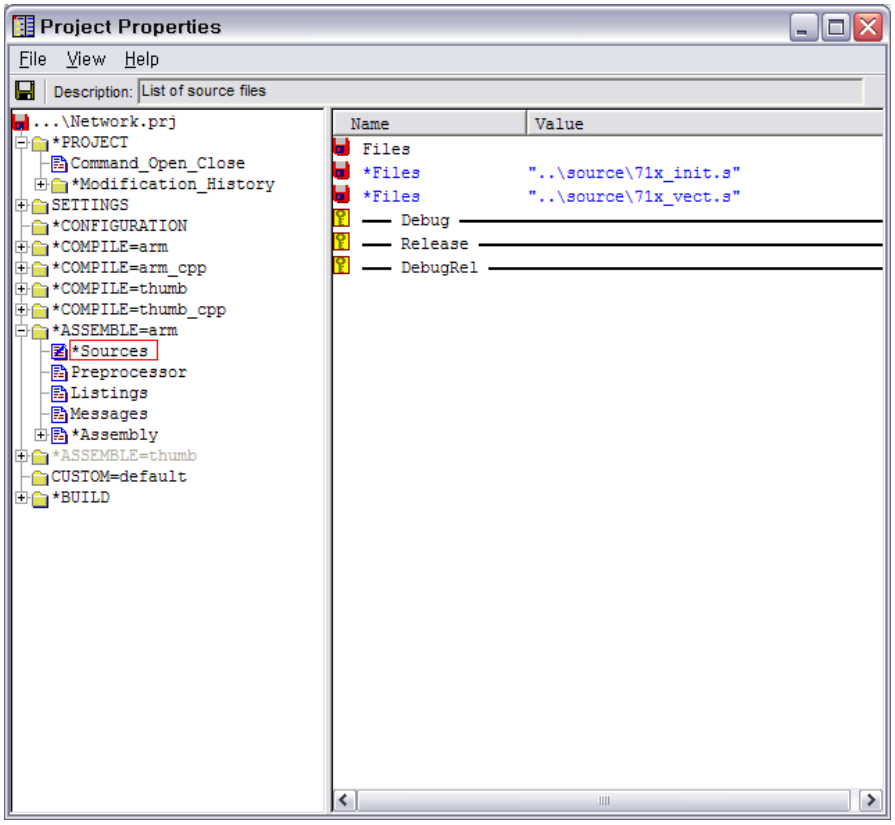


Figure 13. Compile - 4

-. *BUILD -- *Link Advanced

Entry and Scatter files should be specified.

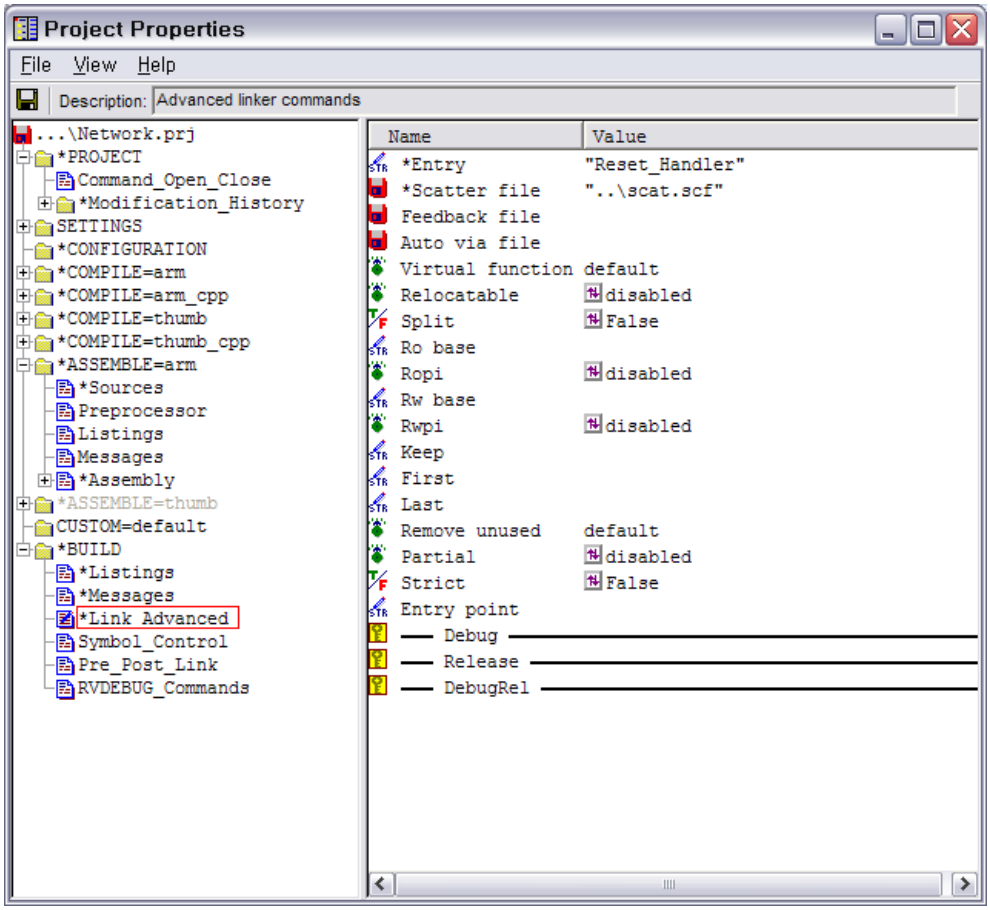


Figure 14. Compile - 5

The compile is processed after Build➔Compile.

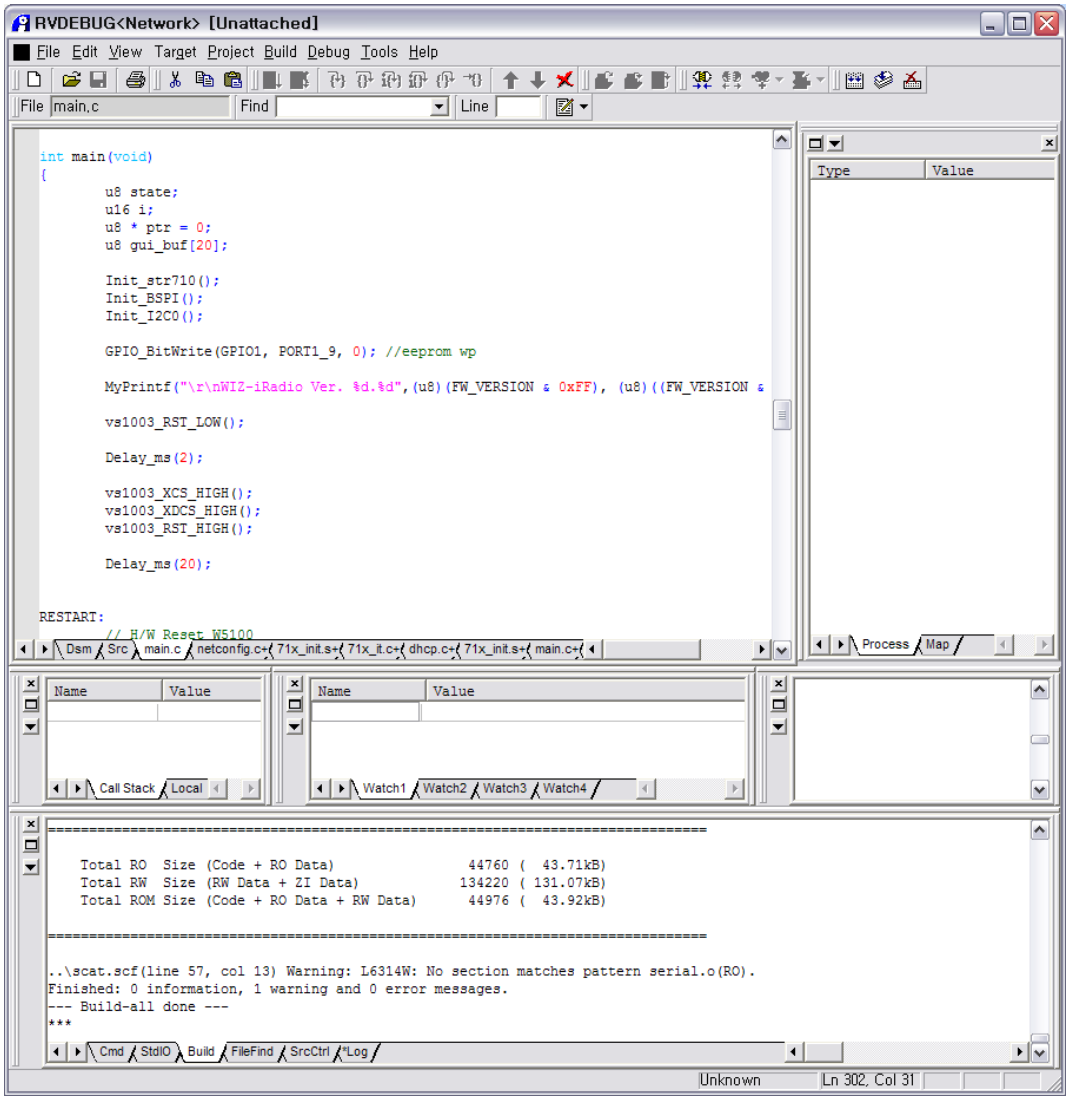
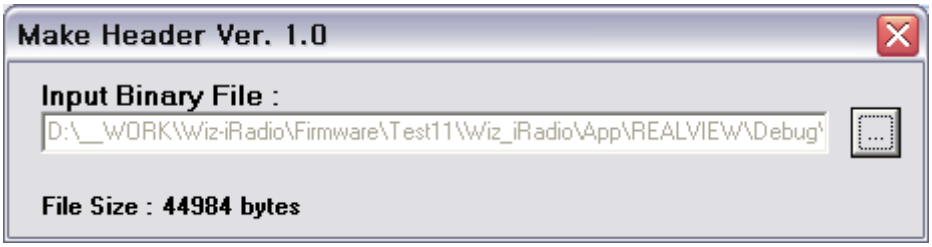


Figure 15. Compile - 6

After finishing compile, "network.axf" file is created in the folder of "REALVIEW₩Debug". In order to change this file to binary format, use 'fromelf'.
You can do it as below. It is created in the file "bin.bat"

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

After changing the file "network.axf" file to "network.bin", if you execute "ROM_Tool.exe" program and input this file, "rom.bin" file is created in the folder of "romfile". The role of "ROM_Tool.exe" is to add the header file to the binary image.



This "rom.bin" file can be updated through network by using Configuration Tool.

4.4. Firmware Operation Process

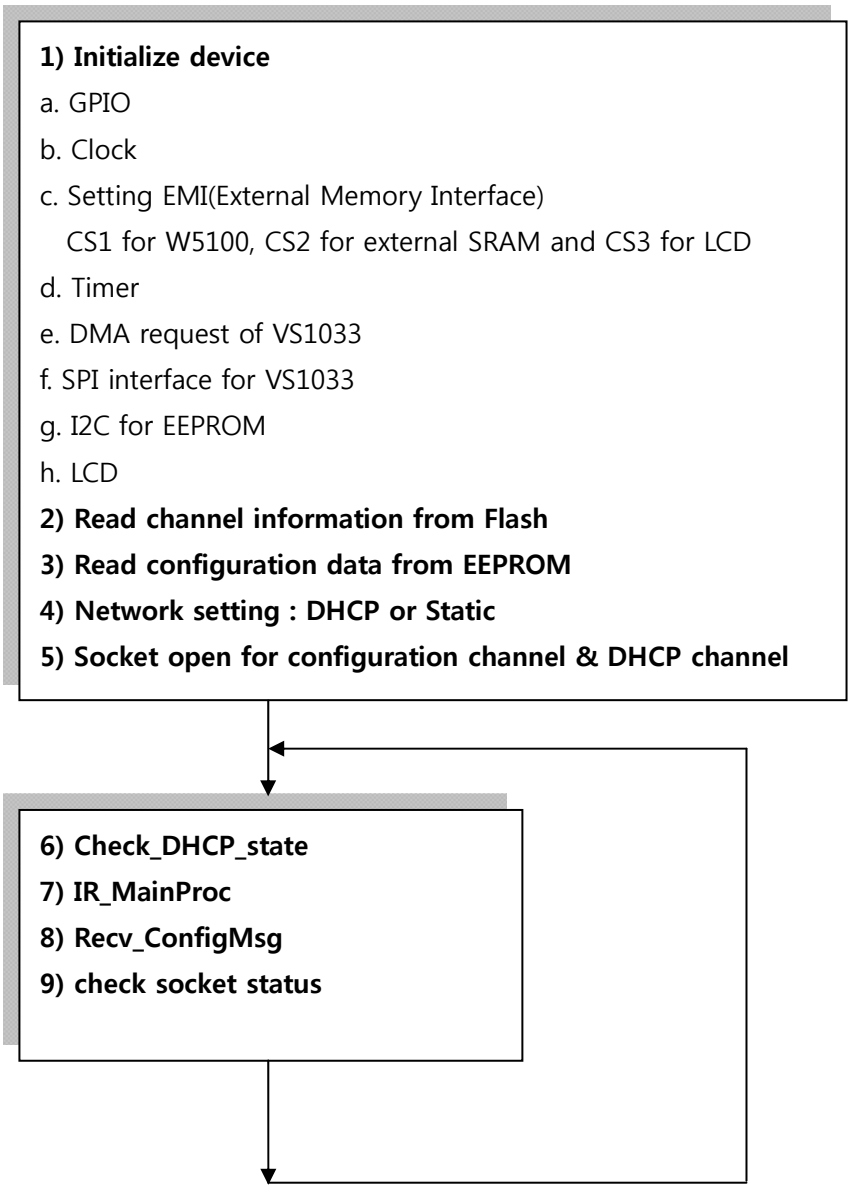


Figure 16. Firmware Operation Process

1) Initialize device

When power is supplied, all devices are initialized.

GPIO is configured and clock is set. In regard to external memory interface, CS1 is connected to W5100, CS2 is to SRAM and CS3 is to LCD. According to this interface, set the 'wait' and 'bus' size.

Timer 0 is used for DHCP request during lease time, and Timer 1 is for operation of IR Remote Controller.

VS1033 chip used for decoding of MP3 and WMA is connected to MCU by SPI. The interrupt should be set.

EEPROM is used for saving MAC address or IP address. As EEPORM is connected to MCU by I2C, I2C should be set.

LCD is connected to the memory BUS. Only RESET of LCD can be controlled by port. As RS of LCD is connected to A0, LCD can be controlled by define as below. When writing command, the RS becomes low, and writing data, the RS becomes High.

```
#define LCDCmdAddress        *((volatile u8 *) 0x66000000)
#define LCDDataAddress       *((volatile u8 *) 0x66000001)
```

2) Read channel information from Flash

The address of Internet radio broadcasting station is saved in the Flash of MCU (0x400C0000). After reading this, it is saved in channel buffer.

3) Read configuration data from EEPROM

The sequence of information saved in EEPROM is as below.

NAME	Byte	Description
EEP_MAC	6	MAC address
EEP_LIP	4	Local IP address
EEP_SN	4	Subnet mask
EEP_GW	5	Gateway
EEP_CUR_CH	2	Current channel number
EEP_DHCP	1	DHCP or static
EEP_VER	2	F/W version
EEP_SIP	4	Server IP address
EEP_SPORT	2	Server Port number
EEP_STATUS	1	Status
EEP_DNSIP	4	DNS server IP address
EEP_D_IP	128	URL of Server

#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_CUR_CH	(EEP_GW + 4)
#define EEP_DHCP	(EEP_CUR_CH + 2)
#define EEP_VER	(EEP_DHCP + 1)
#define EEP_SIP	(EEP_VER + 2)
#define EEP_SPORT	(EEP_SIP + 4)
#define EEP_STATUS	(EEP_SPORT + 2)
#define EEP_DNSIP	(EEP_STATUS + 1)
#define EEP_D_IP	(EEP_DNSIP + 4)

Table 5. Read Configuration Data from EEPROM

4) Network setting : DHCP or Static

If DHCP is configured, the IP address is assigned by DHCP server. Or not, it is initialized with existing IP address.

5) Socket open for configuration channel & DHCP channel

UDP is used for communication with Configuration Tool program of PC. A socket opens for this. When using DHCP, the leased IP address should be updated. For this, a socket opens to transmit DHCP request message through UDP.

W5100 support 4 hardware sockets. Each sockets are used as below.

socket 0 : Streaming (TCP)

socket 1 : Configuration (UDP)

socket 2 : DNS (UDP)

socket 3: DHCP (UDP)

The port for communication with Configuration program is as below.

```
#define REMOTE_SERVER_PORT      49005   // pc
#define REMOTE_CLIENT_PORT      49006   // board
#define REMOTE_UPDATE_PORT      49003   // board
```

The "REMOTE_SERVER_PORT" is the port for PC Configuration program. The

"REMOTE_CLIENT_PORT" is the port for the module, and "REMOTE_UPDATE_PORT" is the port for F/W update.

6) Check_DHCP_state

The steps of '6)~9)' are the flow of continuous operation related to 'while loop'. "Check_DHCP_state". "Check_DHCP_state" is the codes for using leased IP by DHCP requesting at the half of lease time.

7) IR_MainProc

IR_MainProc is the operation code after by receiving the input of IR remote controller. The key value of IR remote controller can be changed by users.

Current Key values are defined as below.

#define KEY_POWER	0x62
#define KEY_MUTE	0x82
#define KEY_VOL_UP1	0x60
#define KEY_VOL_UP2	0xA0
#define KEY_VOL_DN1	0x92
#define KEY_VOL_DN2	0xe2
#define KEY_SW_UP	0xE0
#define KEY_SW_DN	0x3A
#define KEY_TRE_UP	0x90
#define KEY_TRE_DN	0x78
#define KEY_PC	0xC0
#define KEY_AUX	0x40

Table 6. IR Remote Controller Key Value

KEY_POWER : Re-Boot
KEY_MUTE : mute
KEY_VOL_UP1, KEY_VOL_UP2 : volume up
KEY_VOL_DN1, KEY_VOL_DN2 : volume down
KEY_PC: channel up
KEY_AUX: channel down

8) Recv_ConfigMsg

It is the routine to process the packet from Configuration program to change channel or network configuration.

9) check socket status

Most of the function of F/W checks the socket status and performs the related activities. If the address of broadcasting station is of domain name, by using DNS protocol, communication with DNS server is processed to acquire real IP address. After connecting to this IP address, it sends the data to check if the server operates with the method of SHOUTCAST or HTTP. In case of MMS, the address starts with 'mms://'. So, the firmware operates according to MMS method without checking process.

4.5. Server list File

Server list file is used at the Configuration Tool. The server information of this file is saved in the Flash of the module.
The file format is as below..

- Count = 7 ← The total station number
- Name1= station name / It is not required field.
- url1← Address of the Station / The address starts with http:// or "mms://"

If this file is modified, Configuration Tool should be re-started. In order to apply the change. Click "URLset" at the Configuration Tool program.

Figure 17. server_list.txt

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 WIZ200USB 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:

The warranty applies only to products distributed by WIZnet or our official distributors.

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

Contact an authorized distributors or dealer of WIZnet Inc. for obtaining an RMA (Return Merchandise Authorization) request form within the applicable warranty period.

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.

Any service issue, please contact to sales@wiznet.co.kr