



MS14 DEVELOPMENT INSTRUCTION

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0.2	Compile instruction update	2013-Oct-14

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1 Introduction

Software and hardware development guide for Dragino MS14.

2 Software Development Guide

2.1 Access MS14

2.1.1 via console

Use the UART module to connect the MS14 as below:



Configure the serial port with below parameters:

Serial: 115200, data: 8bits, Xon/Xoff enable

2.1.2 via SSH

Use SSH to access the LAN port via IP 192.168.255.1

User Name: root

Password: root

2.2 Compile the firmware

Get source code from Github:

```
git clone https://github.com/dragino/dragino2.git dragino2
```

cd into the source directory. Set up build environment,

```
./set_up_build_enviroment.sh ms14
```

Build image:

```
./build_image.sh ms14
```

to build image for ms14

You should be able to get the firmware in bin directory under image directory.

2.3 Upgrade firmware

2.3.1 Upgrade firmware in u-boot

Set up your tftp server with ip 192.168.255.2 and put the firmware on tftp server root

```
//upgrade Kernel  
tftp 0x81000000 openwrt-ar71xx-generic-dragino2-kernel.bin  
erase 0x9f040000 +0x100000;  
cp.b 0x81000000 0x9f040000 $filesize
```

```
//upgrade rootfs  
tftp 0x81000000 openwrt-ar71xx-generic-dragino2-root-squashfs.bin;  
erase 0x9f140000 +0xea0000;  
cp.b 0x81000000 0x9f140000 $filesize
```

2.3.2 Upgrade firmware in OpenWrt

SCP your firmware to the system and then run

```
root@OpenWrt:~# /sbin/sysupgrade openwrt-ar71xx-generic-dragino2-squashfs-sysupgrade.bin
```

2.4 Create your own package

You can create your own package following the instruction in <http://wiki.openwrt.org/doc/devel/packages>.

Place the package in source/package directory. And run:

```
$OPENWRT_PATH/scripts/feeds update
```

```
$OPENWRT_PATH/scripts/feeds install -a -p dragino2
```

To install the package to your openwrt source, remember to use **make menuconfig** in build dir to select the package you have created.

Reference: <http://wiki.openwrt.org/doc/devel/feeds>

2.5 MAC and Unique Key

MAC address:

Each ms14 has been assigned four world-wide unique, continuously MAC address in factory. They are assigned to

wifi: MAC

eth0: MAC + 2

eth1: MAC +3

The [MAC+1] is reserved for some applications which need two mac in wifi radio.

Unique Key:

A 32 bytes random number generated by TRNG is stored in art partition. Address range is 0x100~0x11F.

A 2016 bytes random number generated by CSPRNG is stored in art partition, Address range is 0x0120 ~ 0x090F.

Those keys can be used for serial control purpose. To ready them, below is an example command (assume mtd5 is art partition):

```
#read 16 bytes key from 0x100
```

```
hexdump -v -e '1/1 "%.2x"' -s $((0x100)) -n 16 /dev/mtd5
```

3 Hardware Development Instruction

3.1 Power option

MS14 provide variously power option for developers.

3.1.1 Power Input

<i>Configuration</i>	<i>Power Input</i>	<i>Power Source From</i>
Default(R155 un-populated, R5 un-populated)	9v ~ 15v DC	DC connector
R155 un-populated, R5 populated	9v ~ 15v DC	DC connector, raw_vcc in 2x8 CON
R155 populated, R5 populated	5v DC	DC connector, raw_vcc in 2x8 CON
R155 populated, R5 un-populated	5v DC	DC connector

3.1.2 Power Output

<i>Pins</i>	<i>Power Output</i>	<i>Comment</i>
VDD33 in 2x8 CON	3.3V	
VDD33 in JTAG CON	3.3V	
VDD5_LDO in 2x8 CON	5V	
RAW_VCC in 2x8 CON	= raw power input	Only available when R5 is populated.

3.2 Connectors and Pins

3.2.1 Connector Map

Connector	PIN	Description
2 x 8 ROUTER CON	VDD33	3.3 V power output
	VDD5_LDO	5V power output
	COLD_RESET	COLD_RESET
	GND	GND
	GPIO20	GPIO20, SLIC_FS_IN, I2S_SD
	GPIO19	GPIO19, SLIC_FS_OUT, I2S_WS
	GPIO22	GPIO22, SLIC_DATA_IN, I2S_MICIN
	GPIO21	GPIO21, SLIC_DATA_OUT, I2S_MCK
	GPIO23	GPIO23, SPDIF_OUT
	GPIO18	GPIO18, SLIC_CLK, I2S_CK
	GND	GND
	GPIO24	GPIO24
	UART_RX	UART_RX
	UART_TX	UART_TX
	RAW_VCC	Connect to POWER Input net
	SENSOR_LED	Connect to SENSOR_LED, active LOW
2 x 7 ROUTER CON	POS1 ~ POS12	To Sensor OUT screw terminal. With 5V ESD protect
2 x 5 JTAG CON	GPIO26	GPIO26
	GPIO27	GPIO27
	JTAG_TMS	JTAG_TMS
	JTAG_TCK	JTAG_TCK
	JTAG_TDI	JTAG_TDI
	JTAG_TDO	JTAG_TDO
	GPIO15	GPIO15
	GPIO16	GPIO16

3.2.2 COLD_RESET pin

MS14 has a COLD_RESET pin which can reset itself via hardware. This can be used for hardware watchdog to reset the ms14 in case there is software issue.

The COLD_RESET pin is in the 2x8 connector and active level of this pin is **low**. Since MS14 already has a pull up resistor for this pin. In the daughter board design, developer only needs to connect the IO pins from MCU to this COLD_RESET pin directly and control it via daughter board.

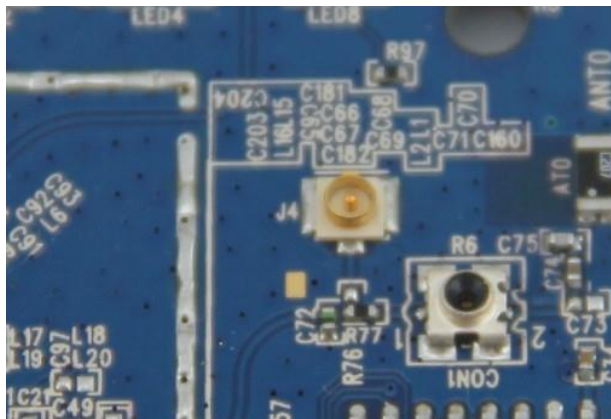
MS14 will enter into reset mode once daughter board send a **low level** to the COLD_RESET pin, it will boot again when the low level signal is removed.

3.3 Antenna and ANT Hole

3.3.1 Antenna

MS14 has two radio paths. They are lead to **ANT0** and **ANT1**. The ANT0 radio is the main antenna for RX and TX. The ANT1 radio is the diversity antenna for RX only.

By default, MS14 is loaded shipped using 2.5 dB chip antenna. It also provides the option to use external antenna for higher gain/ directional requirement.



R76 and R77 are path select resistors for main radio path. To use external antenna for main radio path, developer should remove the 0ohm resistor from R77 and solder it on R76. This will disable ANT0 antenna and enable J4 (i-pex) connector. Then connect the external antenna on J4 and use it.

3.3.2 Antenna Hole



The ms14 enclosure has a removable antenna hole which can be used hold the:

- External Antenna as mentioned above
- Antenna from the daughter board

3.4 Daughter Board Design Clearance

For PCB design clearance, please refer the file ***ms14_components_placement***. It includes all components placement and export in 1:1 ratio. Developer can import it to drawing tool such as Adobe Illustrator to get the exactly dimension to design.

4 Reference

- ✧ Wiki for MS14
http://wiki.dragino.com/index.php?title=Main_Page#Getting_Start_with_Dragino_v2_-_ms14
- ✧ MS14 Reference Documents:
<http://www.dragino.com/downloads/index.php?dir=motherboards/ms14/>
- ✧ SVN Source:
<http://svn.dragino.com/dragino2/>