



networks@work

# HARDWARE MANUAL



COMPEX SYSTEMS

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**WP18 BareBoard**  
WP18 BareBoard  
WP18 BareBoard  
WP18 BareBoard

Revision: 1.5



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## REVISION HISTORY

Revision	Information / Changes
Rev 1.1	First release for WP18 BareBoard
Rev 1.2	<ol style="list-style-type: none"><li>1. Added Support for Open-WRT</li><li>2. Added Reasons for using Development Kit</li></ol>
Rev 1.3	<ol style="list-style-type: none"><li>1. Added "How to Port Your Own Firmware over to WP18"</li><li>2. Added "LED Mapping"</li><li>3. Added Picture of how Serial Converter is used on WP18.</li></ol>
Rev 1.4	<ol style="list-style-type: none"><li>1. Added "How to Port OpenWRT Firmware over to WP18"</li><li>2. Added "How to Port Redboot Loader over to WP18"</li><li>3. Added "How to Port SnapGear Firmware over to WP18"</li></ol>
Rev 1.5	<ol style="list-style-type: none"><li>1. Changed the Ethernet Support of PoE</li></ol>

## REASONS USING DEVELOPMENT KIT

The Development Kit is especially useful for customers who are developing their firmware. Below are the reasons how we have made it more user-friendly for you.

PURPOSE	WHY IS DEVELOPMENT KIT USEFUL?
Develop Redboot/Snapgear OR Open-WRT on WP18	Serial Converter can be used to debug the Open-WRT firmware.
Port Own Firmware Over to WP18	Serial Converter can be used to debug the Serial Output messages.
Port Own Firmware and Loader Over to WP18	Serial Converter can be used to debug the Serial Output messages. JTAG Programmer can be used to load in your loader.

## Ordering Options - Standard Configurations\*

ORDER CODE	CONTENTS
P-S4 OEMWP181A  P-S4 OEMWP186A (For RoHS)	<ul style="list-style-type: none"> <li>• WP18 IXP422 (266MHz CPU) Bare-board (Pre-loaded with CompeX Firmware)</li> <li>• Bareboard embedded with 32MB SDRAM / 4MB Flash</li> </ul>
P-S4 OEMWP183B  P-S4 OEMWP186B (For RoHS)	<ul style="list-style-type: none"> <li>• WP18 IXP425 (533MHz CPU) Bare-board (Pre-loaded with CompeX Firmware)</li> <li>• Bareboard embedded with 64MB SDRAM / 8MB Flash</li> </ul>
WP18 3B DEV KIT  WP18 6B DEV KIT (For RoHS on WP18 Bareboard)	<ul style="list-style-type: none"> <li>• WP18 IXP425 (533MHz CPU) Bare-board (Pre-loaded with CompeX Firmware)</li> <li>• Bareboard embedded with 64MB SDRAM/8MB Flash</li> <li>• Wireless G mini-PCI (CompeX WLM54G)</li> <li>• Wireless AG mini-PCI (CompeX WLM54AG)</li> <li>• PoE+ Injector (CompeX PoE+1A4815)</li> <li>• JTAG Programmer (Cable from PC to JTAG Programmer included)</li> <li>• Serial Converter (Cable from PC to Serial Converter included)</li> <li>• 5V DC Adapter</li> </ul>

\* Configurations are subjected to change without notice

## PORTING OpenWRT FIRMWARE OVER TO WP18

Make sure that you are using:

1. You are using WP18 model loaded with Compex loader V2.4 or above.
2. Please ensure that you are able to  
==> Ping 192.168.168.1
3. You are in the firmware upgrade mode  
==> (By Press and hold the Reset button and plug-in the power adaptor).

-Start-

Open the folder that contain OpenWRT files that available via  
[http://compex.com.sg/home/OEM/Open\\_wrt.htm](http://compex.com.sg/home/OEM/Open_wrt.htm)

Then follow the steps below.

- Go to the Console (CMD/DOS)

1. Write OpenWrt image (kernel) to flash
  - > tftp -i 192.168.168.1 put flashwrt-kernel.cmd
  - > tftp -i 192.168.168.1 put openwrt-ixp4xx-2.6-zlimage
2. Write OpenWrt image (rootfs) to flash
  - > tftp -i 192.168.168.1 put flashwrt-jffs.cmd
  - > tftp -i 192.168.168.1 put openwrt-ixp4xx-2.6-jffs2-128k.img
3. Change the partition table to load OpenWrt image format
  - > tftp -i 192.168.168.1 put partwrt.cmd
4. Create a RedBoot style fconfig area
  - > tftp -i 192.168.168.1 put fconfig-crt.cmd
5. Write a RedBoot style fis area
  - > tftp -i 192.168.168.1 put flashwrt-fis.cmd

```
> tftp -i 192.168.168.1 put fis.bin
```

6. Finish and Reboot the AP.

7. To test whether you are successful, in converting to Open-WRT,  
Please do followings command in DOS  
> telnet 192.168.1.1

- a. The OpenWRT picture will be appear if you are successful.
- b. If not turn of the device and start from step No.1.

- END -

## Automatic Converter

Automatic converter is a file that being created to upload the OpenWRT, it's made to eliminate the sequence error and typing error that always happened in the process.

1. Run "Autoconvert.bat" from the OpenWRT code.
2. Follow the steps and the command show in the Console (CMD/DOS form).
3. It takes up to 2 minute for entire Process.
4. To test whether you are successful in converting to Open-WRT,  
Please do the followings command in DOS  
> telnet 192.168.1.1

- a. The OpenWRT picture will be appear if you are successful.
- b. If not turn of the device and start from step No.1.

- END -

## PORTING RedBoot/SnapGear FIRMWARE OVER TO WP18

Note:

1. Use latest loader (Go to "Update Loader" If You use older Loader)
2. Use latest firmware, Must use latest loader otherwise you must update you loader before update you firmware.(Go to "update Firmware" Step if your loader is not later one.)
3. Prepare Tera team, ethernet cable, Serial cross cable and serial converter.
4. File needed for changing the loader.
  1. upbios.tst
  2. redboot-romram.bin (RedBoot Loader)
  3. Fis.ttl
  4. fconfig.ttl

### CHANGING LOADER from Compex Loader to RedBoot Loader

Plug in the serial converter cable and ether net is conncted and able to ping 192.168.168.1

1. Got to the loader mode By Press and Hold the "RESET" button and plug in the adapter cable (Diag led will blink).

2) Run " tftp -i 192.168.168.1 put upbios.tst "

Wait for 3 seconds....

3) Run " tftp -i 192.168.168.1 put redboot-romram.bin "

4) Wait 10 Sec then Power down the AP.

5) Connect the front Serial port using a cross cable.

6) Run the TeraTerm program ttermpro.exe

Select the correct COM port (Setup->General) and baud rate (Setup->Serial Port->Baud rate->115200)

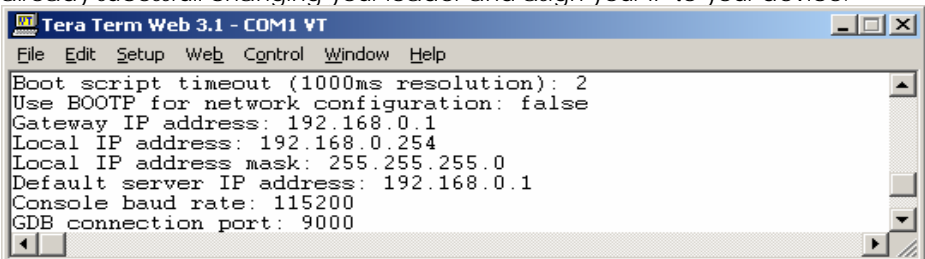
9) Power up the AP.

The RedBoot screen should show up on the Terra term's Screen

10) Run the script fis.ttl to initialize the flash image system,

- From terraTerm ==> Control ->Macro and then select "fis.ttl"
- Untill you see " RedBoot> "
  
- then run control ==> macro ==> "fconfig.ttl"
- Untill you see " RedBoot> " then restart

11. Look at teraterm The IP should appear like show below. That's mean you already sucessfull changing your loader and assign your IP to your device.



```

Tera Term Web 3.1 - COM1 VT
File Edit Setup Web Control Window Help
Boot script timeout (1000ms resolution): 2
Use BOOTP for network configuration: false
Gateway IP address: 192.168.0.1
Local IP address: 192.168.0.254
Local IP address mask: 255.255.255.0
Default server IP address: 192.168.0.1
Console baud rate: 115200
GDB connection port: 9000
  
```

11) Check that there is no flash error time out, and the Mac addresses are correct.

12 The loader has changed, then turns off your device and prepare for the SnapGear.

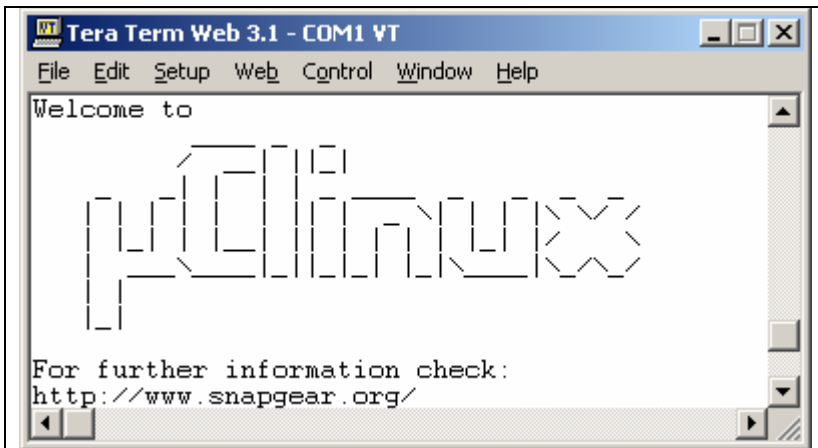
## Flashing/Update Snapgear into device

Prepare

1. Snapgear.ttl (no.1 and 2 will be in tftpboot folder)
2. fconfig.ttl ( this is the snapgear ttl not the one we use for loader )
3. Tftp32
4. Put all together in same folder
5. Set PC IP TO 192.168.0.1

Start

1. Open Tftp32 and teraterm (Remember Keep the Tftp32 Open for the whole process)
2. From teraterm Choose Control ==> Macro ==> Snapgear.ttl (this will take long process and choose "YES" is any option being ask.)
3. After you see " Redboot> " then again choose Control ==> Macro ==> fconfig.ttl "
4. Wait untill you see " RedBoot> " then reboot
5. Wait awhile untill you able to see the picture below. This mean you are succesfull.



6. FINISH. The device already runing with RedBoot n SnapGear.

- END -

## PORTING OWN FIRMWARE OVER TO WP18

To port over your own firmware over to WP18, you will need to have the drivers to support the boards and also some image generating tool to help to generate the header for your firmware to be ported over to our platform. This process is appropriate for customers using Complex Loader.

### Drivers to Support the boards

1. Go to Open-WRT website (<http://openwrt.org/>)
2. Click "Development" to arrive at <https://dev.openwrt.org/>. The documentation to download the drivers needed for WP54 6E board or WP18 board is all there.
3. On the Linux platform, use "svn co <https://svn.openwrt.org/openwrt/trunk/>"
4. After "make menuconfig", change the target to ADM5120 for WP54 and Intel XScale IXP4XX for WP18. You will get a kernel and a root file system that can work with our board.
5. Port your firmware over to the root file system.

### Generating a firmware compatible with Complex Loader

1. Go to the URL "<https://dev.openwrt.org/browser/trunk/tools/firmware-utils/src/mkmylofw.c>"
2. Follow the instructions to generate a firmware compatible with Complex Loader.

## CONFIGURATION AND INSTALLATION

The following is the GPIO Bit mapping specific to the Complex WP18.

### GPIO Bit Mapping

The Complex WP18 GPIO bit mapping is shown below.

GPIO Bit	Description
0	Software Push Button
1	CPLD
2	CPLD
3	Uart DCD (not used)
4	Uart RI (not used)
5	Uart DSR (not used)
6	Uart DTR (not used)
7	Software reset
8	Not used
9	Not used
10	PCI INT B
11	PCI INT A
12	CPCI_RST_N
13	CPLD
14	PCI CLOCK
15	Ext Bus Clock

## LED Mapping

The following is the LED mapping specific to the Complex WP18.

LED	Description
DS1	LAN Port 0 LED. Green:100M Yellow: 10M
DS2	LAN Port 1 LED. Green:100M Yellow: 10M
DS3	LAN Port 2 LED. Green:100M Yellow: 10M
DS4	LAN Port 3 LED. Green:100M Yellow: 10M
DS5	WAN Port LED. Green:100M Yellow: 10M
D8	WLAN A LED. Memory Space: 0x55000000 Chip CS: ixp_CS5. Bit 0
D9	WLAN B LED. Memory Space: 0x55000000 Chip CS: ixp_CS5. Bit 1
D20	Power LED
D21	DIAG LED. Memory Space: 0x55000000 Chip CS: ixp_CS5. Bit 4

## Interface Connectors

The Complex WP18 Bareboard interface connector pin assignments and signal descriptions are included in the following sections. The connectors are listed in the section below and the connector locations are shown in the following diagrams.

<u>Connector</u>	<u>Function</u>
J1	Power Jack DC 5V
J2	Xilinx Port
J4	COM1 Serial Port Header
J6	JTAG Port Header
JP01	POE power and Power Jack selection
TP3	Four LAN port Ethernet connector
U12	One WAN port Ethernet connector
P5	9 pin Serial port

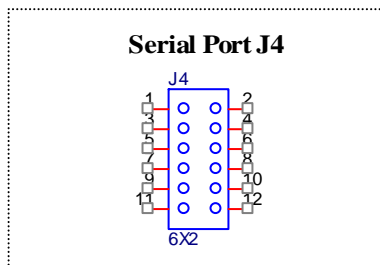
## Serial Port Header

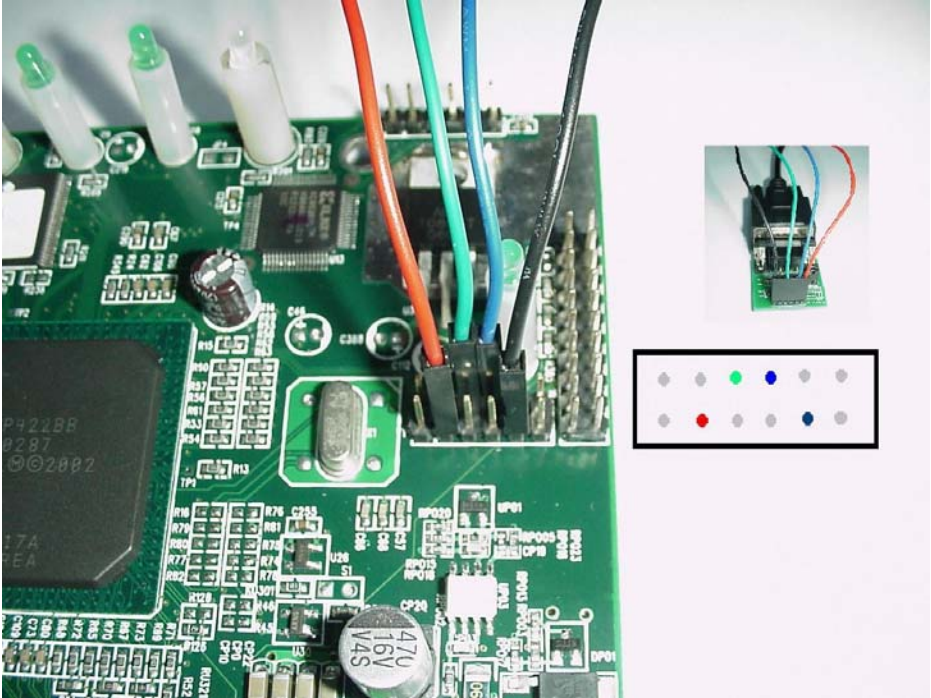
The Compex WP18 Bareboard Serial Port (J4) Header signaling is shown in the following table. This serial port uses TTL signals, and therefore you have to use serial converter using MAX-232 IC (or other IC in the market that convert TTL signals to RS232 signals) in order to use it with the PC.

Please take note that Compex Redboot/Snapgear does not run from this Serial Port. Compex RedBoot/Snapgear runs from the 9 Pin Serial Port (P5). Open-WRT is able to run from this port.

<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>
1	5V	2	3.3V
3	5V	4	3.3V
5	Not used	6	TXD
7	Not used	8	RXD
9	GND	10	RTS
11	GND	12	CTS

**Note:** Our Serial port Implementation requires an external high-impedance serial port not usually available with the serial ports of the notebooks/computers. You will need a Serial Converter available in the market. For our customers' convenience, it is available from Compex, bundled together with the Compex WP18 RedBoot/Snapgear Development Kit.





## 9 Pin Serial Port

The 9 Pin Serial Port (P5) is used to run the RedBoot/Snapgear from Complex. It uses a Cross Cable.

## Serial Console Settings

The serial console settings used together with the serial ports (J4 and P5) is given below.

Baud Rate	115200
Data	8 Bit
Parity	None
Stop	1 Bit
Flow Control	None

## JTAG Port Header

The primary purpose of the Compex WP18 Bareboard JTAG Port Header is to facilitate program download into Flash memory.

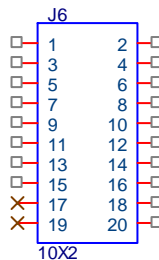
<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>
1	3.3V	2	3.3V
3	TRST_N	4	GND
5	TDI	6	GND
7	TMS	8	GND
9	TCK	10	GND
11	GND	12	GND
13	TDO	14	GND
15	SRST_N	16	GND
17	Empty	18	GND
19	Empty	20	GND

### Note:

Compex has a JTAG Programmer compatible with WP18 Bareboard. It is bundled with Compex WP18 Development Kit. This JTAG programmer is able to download file onto the Flash, and thus recover a corrupted loader.



### JTAG Connector



## Ethernet Connectors

The Compex WP18 Bareboard contains 4 X 10/100 Base-TX Lan Ports and 1 X 10/100 Base-Tx Wan Port. All Ethernet Channels are available through standard 8-pin RJ45 connectors. Only the TP3(1<sup>st</sup> port) support PoE, which means only 1 Ethernet port support PoE.

Ethernet Connectors signaling is shown below.

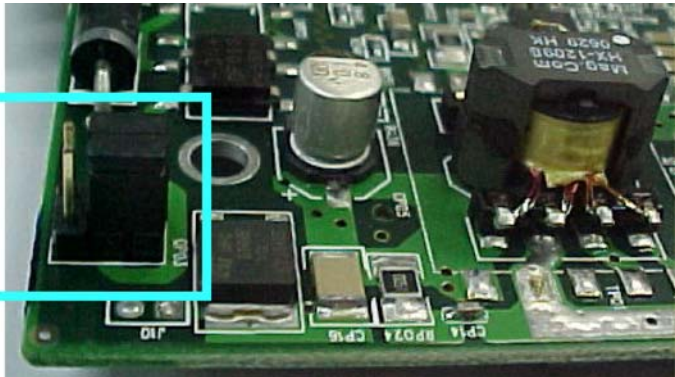
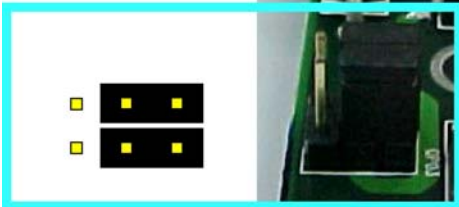
<u>Pin</u>	<u>Signal</u>
1	TX+
2	TX-
3	RX+
4	PoE+V
5	PoE+V
6	RX-
7	GND
8	GND

Ethernet Connector (1<sup>st</sup> Port of TP3)

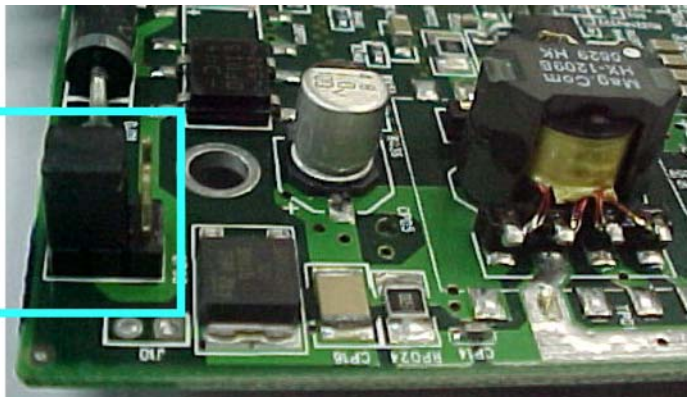
## Power Jumper Connector

Complex WP18 Bareboard supports both Active PoE and DC Jack. To support either Active PoE or DC Jack, please set the jumpers on JP01 as shown below:

Active PoE  
Jumper Selection



DC Jack  
Jumper Selection



## Additional Notes

1. A Software Development Kit for porting over your source codes is available. Please contact a Complex salesperson for details.

## Additional Notes (For RedBoot/Snapgear)

1. Default IP address for WP18 Bareboard 192.168.0.254
2. Default Server IP address is 192.168.0.1
3. MAC Address is default.  
We are in the process of making the RedBoot/Snapgear a Complex MAC address. (For RedBoot/Snapgear)
4. RedBoot boards come preloaded with the RedBoot Loader and Snapgear.

## Additional Notes (For Open-WRT)

1. Our Open-WRT is based on the current development branch, Kamikaze.
2. Please download Open-WRT Source Codes from [http://complex.com.sg/home/OEM/Open\\_wrt.htm](http://complex.com.sg/home/OEM/Open_wrt.htm)
3. The Open-WRT is based on Linux 2.6. The Open-WRT will run off the Complex loader originally on the board.
4. Default IP address for  
LAN Port: 192.168.1.1  
Wan Ports is: 192.168.0.2
5. MAC Address is Complex MAC Address (00-80-48-XX-XX-XX).
6. For uploading Open-WRT Source Code, Please refer to the "Read ME WP18.txt" in
  - a. ../WP18(Open-WRT)/WP18 4MB/ For 4MB flash or
  - b. ../WP18(Open-WRT)/WP18 8MB/ For 8 MB flash.

## 7. Flash Memory Map:

Offset:

0x00000000	Compex Loader
0x00080000	Linux Kernel
0x00300000	JFFS, Root FS
0x003E0000(4MB) 0x007E0000(8MB)	Redboot fis, Redboot config

## 8. Is there any space available for the JFFS partition?

The JFFS partition is fixed. It is between (0x003000000 - 0x003E0000(4 Or 007E0000(8MB))

## 9. What can be the maximum size for TRX?

The maximum size for TRX is (0x3F0000 – 0x50000) = 3801088 bytes. If the TRX reaches maximum size, there is no JFFS partition

## 10. What is the use of the JFFS partition? Can we store configuration files if there is no JFFS partition?

Our current Open-WRT stores configuration files in writable JFFS partition. Configuration cannot be saved if there is no JFFS partition, although it can still run using default configurations.

## 11. Please do note that ONLY when Compex Loader is V2.40 and above, then it can support the use of Open-WRT.