



networks@work

HARDWARE MANUAL



COMPEX SYSTEMS

WP188 BareBoard
WP188 BareBoard
WP188 BareBoard
WP188 BareBoard
WP188 BareBoard

Table of Contents

<u>REVISION HISTORY.....</u>	<u>2</u>
<u>KEY FEATURES OF WP188 BOARD</u>	<u>5</u>
<u>WP188 MAIN BOARD OVERVIEW.....</u>	<u>6</u>
<i>GPIO Bit Mapping</i>	<i>8</i>
<i>LED Mapping.....</i>	<i>9</i>
<i>Interface Connectors.....</i>	<i>10</i>
<i>Serial Port Header</i>	<i>11</i>
<i>Ethernet Connectors</i>	<i>14</i>
<i>Update to OpenWRT Firmware</i>	<i>16</i>
<i>Porting RedBoot/SnapGear over to WP188.....</i>	<i>17</i>
<i>Changing Loader from Compex to RedBoot.....</i>	<i>17</i>
<i>Porting Own Firmware Over to WP188.....</i>	<i>20</i>
<i>Drivers to Support the boards.....</i>	<i>20</i>
<i>Generating a firmware compatible with Compex Loader.....</i>	<i>20</i>

REVISION HISTORY

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 WP188	Serial Converter can be used to debug the Open-WRT firmware.
Port Own Firmware Over to WP188	Serial Converter can be used to debug the Serial Output messages.
Port Own Firmware and Loader Over to WP188	Serial Converter can be used to debug the Serial Output messages. JTAG Programmer can be used to load in your loader.

KEY FEATURES OF WP188 BOARD

GENERAL INFORMATION

PROCESSOR	Intel XScale IXP425Processor Operating at 533MHz
MEMORY	128MB SDRAM (Up to 256MB max.)
FLASH	16MB FLASH (Up to 32MB max.)
PHYSICAL PORTS	4 x Type III Mini-PCI Slots (Default is 2 X 9.2mm miniPCI slots on top and 2 X 6mm miniPCI slots on bottom. 1 X 10/100 Base-TX Ethernet Ports (with Auto MDI/MDIX) (max. 2 x 10/100 Base-TX Ethernet Ports)
DEBUG INTERFACE	Serial (TTL) / JTAG (ARM-standard 20 pin) Optional JTAG Programmer** available Optional Serial Converter*** available
OPERATING TEMPERATURE	-20°C to 55°C
OTHER FEATURES	Push-button Reset Watch-Dog Timer Real Time Clock (RTC) SD Card Slot Reset Switch Button Surge Arrestors (On Both Ethernet Ports) Temperature Sensor Heater Control Mosfet Heater Element ¹ On CPU (Optional) – 2W Ceremic Type pasted on top of CPU.
LED INDICATORS	8 LEDs total: • Power, Diagnostic, WLAN 0-3, ETH 0-1
DIMENSIONS	180mm x 126mm x 2mm
MINIPCI SUPPORT	Supports up to 2 X 26dBm miniPCIs, and 2 X 20dBm miniPCIs in WPM or WPMA Enclosure Supports up to 4 X 26dBm miniPCIs in a non-enclosed free air enclosure
ENCLOSURE	Directly mountable into Compex's recommended WPM or WPMA Enclosure, without the need for separate mounting plates.

INFORMATION ON POWER

POWER OVER ETHERNET	IEEE 802.3af Standard PoE Compatible (High Power)**** Compex PoE Plus Compatible PoE supported on default Ethernet Port only High-power passive PoE input voltage (range 24-48V) with 1500V _{RMS} electrical isolation.
TYPICAL OPERATING POWER	5 W (Without MiniPCI , Board Only)
DC SUPPLY	24V - 48V DC Supply
MINIPCI SLOTS	1. 20W total continuous power at 3.3V. 2. All 4 slots can accomodate standard size Wi-Fi Cards 3. Can support up to 1.6A at 3.3V per slot

* Specifications are subjected to change without notice

** JTAG Programmer available to reprogram the flash in case of loader corruption.

*** Serial Converter available to change the TTL signals on board to RS232 signals for debugging

**** Requires a 25W IEEE 802.3af Standard PoE Compatible for 4 MiniPCI's to function properly

¹ Heater Element: When apply power to board, it is automatically turned on. Firmware will turn it off after it is successfully loaded and running.

WP188 MAIN BOARD OVERVIEW

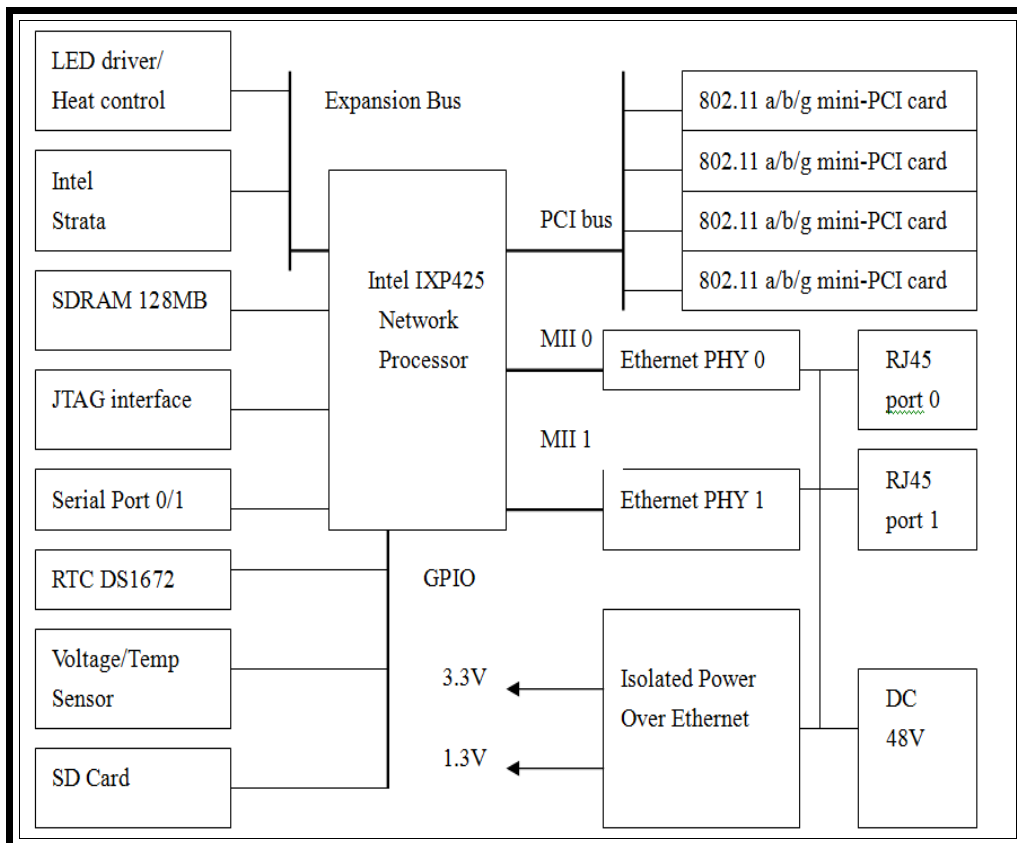


Figure 1

Memory	
SDRAM	Two bank, PC-133 compatible (soldered on board) (Up to 256MB)
Flash	Two bank, Intel J3D StrataFlash (soldered on board) (Up to 32MB)
SD	SPI bus mode, not hot pluggable

Memory Map

The IXP425 network processor implements a single address map that is used for all internal memory and register space. The complete address space consists of 2^{23} Byte addressable locations.

Expansion Bus	Description	Base
CS0	Flash U14 chip select	Base + 0x000 0000 to 0x080 0000
CS1	Flash U34 chip select	Base + 0x100 0000 to 0x180 0000
CS2	none	
CS3	none	
CS4	none	
CS5	LED control CS	Base + 0x500 0000
CS6	None	
CS7	none	

GPIO Bit Mapping

The following is the GPIO Bit mapping specific to the Complex WP188.

GPIO Bit	Description
0	Software Push Button
1	Temperature Sensor/SD card Data Output(SPI mode)
2	SD card Data Input(SPI mode)
3	I2C SCL
4	I2C SDA
5	Temperature Sensor Chip Select
6	SD card Chip Select(SPI mode)
7	DS2438 Data Output
8	PCI INT D
9	PCI INT C
10	PCI INT B
11	PCI INT A
12	CPCI_RST_N
13	Temperature Sensor/SD card Clock (SPI mode)
14	PCI CLOCK
15	Ext Bus Clock

LED Mapping

The following is the LED mapping specific to the Complex WP188.

LED	Description
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
D10	WLAN C LED. Memory Space: 0x55000000 Chip CS: ixp_CS5. Bit 2
D11	WLAN D LED. Memory Space: 0x55000000 Chip CS: ixp_CS5. Bit 3
D12	DIAG LED. Memory Space: 0x55000000 Chip CS: ixp_CS5. Bit 4
D20	Power LED
DS1	Software control bi-color: Memory Space: 0x55000000 Green Chip CS: ixp_CS5. Bit 6 Red Chip CS: ixp_CS5. Bit 7
DS21	Lan port 0: 10 M Indicator
DS22	Lan port 0: 100M Indicator
DS23	Lan port 1: 10 M Indicator
DS24	Lan port 1: 100 M Indicator

Interface Connectors

The Complex WP188 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.

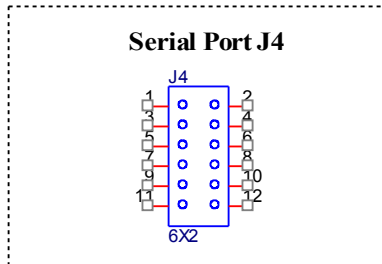
Connector	Function
J1	CPLD programming Port (CPLD is not on the interface anymore)
J4	COM1 Serial Port Header
J6	JTAG Port Header
J7	POE Ethernet Port
J8	Second Ethernet Port

Serial Port Header

The Compex WP188 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.

<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>
1	3.3V	2	3.3V
3	TXD0	4	TXD1
5	RXD0	6	RXD1
7	GND	8	GND
9	CTS0	10	CTS1
11	RTS0	12	RTS1

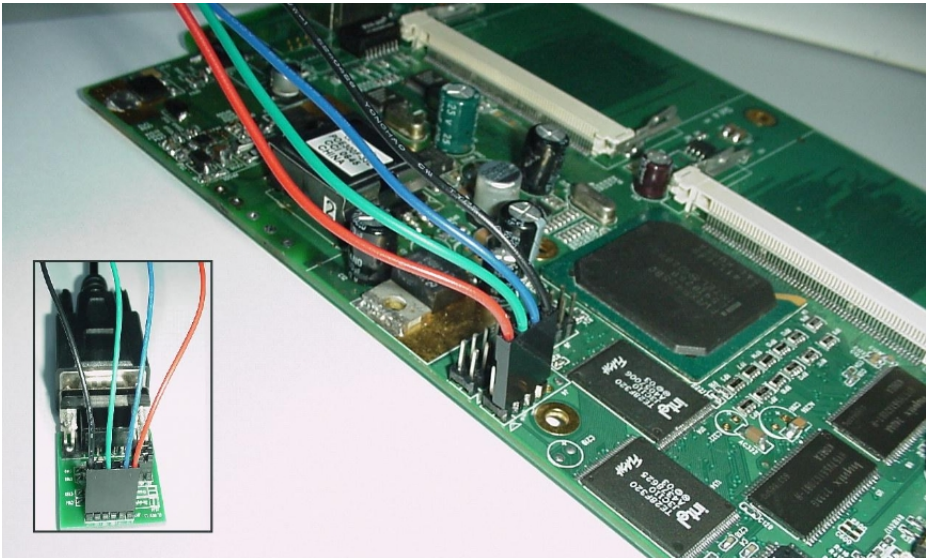
Note: Our Serial port Implementation requires an external high-impedance serial port not usually available with the serial ports of the notebooks/computers. You will need a Serial Converter available in the market. For our customers' convenience, it is available from Compex, bundled together with the Compex WP188 Development Kit.



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



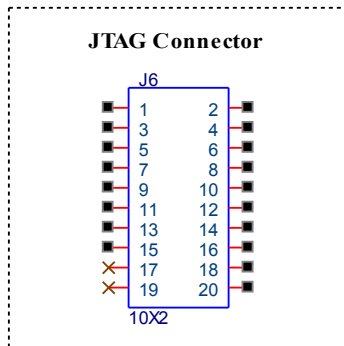
JTAG Port Header

The primary purpose of the Compex WP188 Bareboard JTAG Port Header is to facilitate program download into Flash memory.

Pin	Signal	Pin	Signal
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 WP188 Bareboard. It is bundled with Compex WP188 Development Kit. This JTAG programmer is able to download file onto the Flash, and thus recover a corrupted loader.



Ethernet Connectors

The Compex WP188 Bareboard contains by default one 10/100 Base-TX Ethernet port (J7). Maximum can have two Ethernet Ports. Both Ethernet ports are vertical type 8-pin RJ45 connectors. Only J7 support Active/Passive Power-Over-Ethernet.

Ethernet Connectors signaling is shown below.

<u>Pin</u>	<u>Signal</u>
1	TX+
2	TX-
3	RX+
4	PoE (+ve)
5	PoE (+ve)
6	RX-
7	PoE (-ve)
8	PoE (-ve)

Ethernet Connector J7

OPERATING SYSTEM SUPPORT ON WP188

This section provide you with the summary on the supported loader bios and supported Operating System that supported by Compex's WP188

<i>Loader/ Bios</i>	<i>Operating System</i>	<i>Version tested</i>
Compex	Compex Firmware	All versions
Compex / RedBoot	Open WRT	Kamikaze r7502
Redboot	SnapGear	

Update to OpenWRT Firmware

Make sure that you are using:

1. WP188 board has Compex loader V2.4x or higher.
2. Ensure to PC connecting to WP188 board is configured with IP address 192.168.168.xxx (where xxx is any number 2 to 254).
Test ping from PC to WP188 board,
==> Ping 192.168.168.1 .
3. Set WP188 to firmware upgrade mode.
==> (By Press and hold the Reset button and power up board).

-Start-

Download and execute installation file from DOS Command prompt to upload OpenWRT firmware from this link,

http://compex.com.sg/home/OEM/Open_wrt.htm

Alternatively, to execute step manually, follow the steps below.

- Go to the Console (CMD/DOS and same folder)

1. TFTP -i 192.168.168.1 put openwrt-compex-wp18-8m.bin
2. Do not turn off the device when you see the "transfer successful" message what until the DIAG LED is blinking.
3. Finish and reboot the device.
4. To test whether you are successful to convert OpenWRT,
Please do followings command in DOS
> telnet 192.168.1.1

- a. The OpenWRT picture will be appear if firmware upload is successful.
- b. IF NOT, turn off the device and start from step No.1 again.
Double check to make sure no step is missed and/or any error message displayed. Feedback the step and error message as seen to support to troubleshoot the problem.

- End -

Porting RedBoot/SnapGear over to WP188

* 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.bin (RedBoot Loader)
 3. Fis.ttl
 4. fconfig.ttl

Changing Loader from Complex to RedBoot

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....

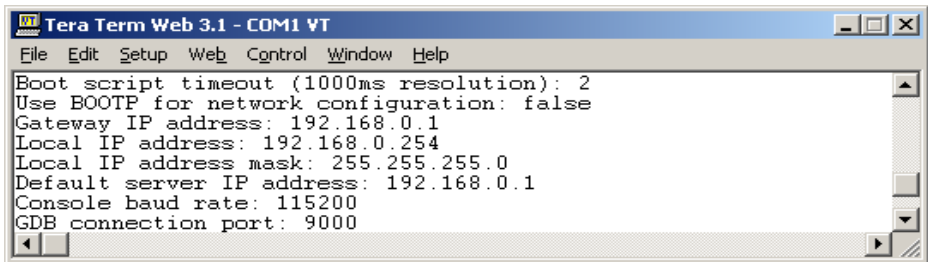
- 3) Run " tftp -i 192.168.168.1 put redboot.bin "
- 4) Wait 10 Sec then Power down the AP.
- 5) Connect the front Serial port using a cross cable.
- 6) Run the TeraTerm program ttermpro.exe
Select the correct COM port (Setup->General) and baud rate (Setup->Serial Port->Baud rate->115200)
- 9) Power 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"
- Until you see " RedBoot> " then
- Run control ==> macro ==> "fconfig.ttl"
- Until you see " RedBoot> " then restart

Look at teraterm The IP should appear like show below.

That's mean you already successful 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.

-End

Update to Redboot loader completed.

If you plan to loader Snapgear firmware go to next step below.

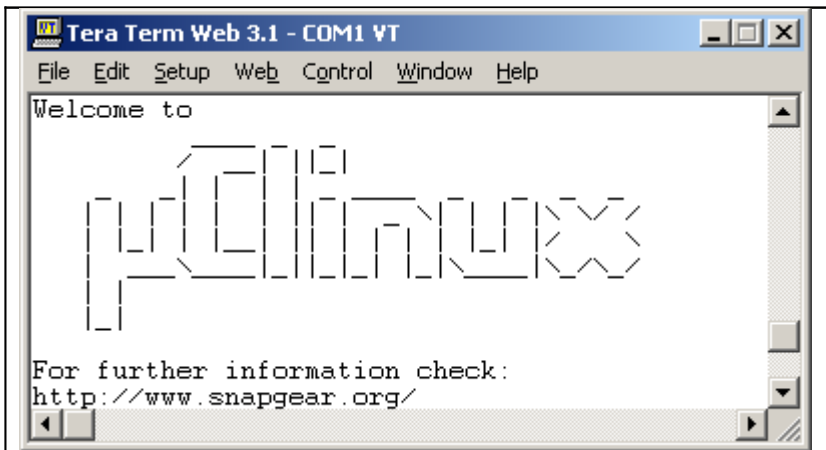
Flashing/Update Snapgear to device

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 until you see " RedBoot> " then reboot
5. Wait awhile until you able to see the picture below. This mean you are successful.



6. FINISH. The device is loaded with RedBoot and SnapGear.

-End-

- * Note: Newer updated download available from the web site the procedure may be different.
Please follow the procedure provided in that download file instead.

Porting Own Firmware Over to WP188

To port over your own firmware over to WP188, 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, WP188 board or WP188 are 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 and WP188. 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.