

# User Manual:

## Serial to Wi-Fi Evaluation Kit

### INTRODUCTION

THE GAINSPAN GS1011MXX EVALUATION KIT offers a quick and easy way to evaluate the GainSpan GS1011M ultra-low-power wireless module and embedded platform software for Wi-Fi® networks based on the GS1011 SOC ultra-low-power Wi-Fi System-On-Chip.

The default firmware pre-loaded on the Evaluation kit is the serial to Wi-Fi application. The GS1011M can be used as transparent bridge to carry serial (UART) traffic over an 802.11 wireless link. The quick start guide provides the steps required to construct the serial to Wi-Fi bridge.



### GAINSPAN EVALUATION KIT COMPONENTS

The GS-SOC Evaluation Kit includes the following items:

- ▶ ***GS1011M based Evaluation Board (GS1011MxP-EVB or GS1011MEE-DB)***
- ▶ ***Power Source (Battery or 3.3V DC adapter)***
- ▶ ***Serial Cable (USB to UART or DB9)***
- ▶ ***Standard Wi-Fi ® Wireless Access Point.***
- ▶ ***GainSpan USB Flash Drive, which includes:***
  - ***Product Documentation including***
  - ***Evalkit\_Setup.exe***
  - ***Java Environment Installer***
  - ***SW Utilities (Wireshark, TeraTerm and Sim Term terminal software)***
- ▶ ***This Manual***

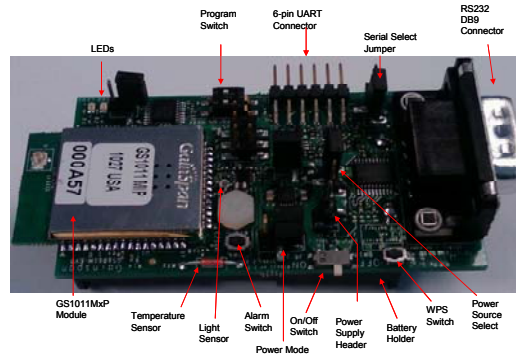
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## EVALUATION BOARD DETAILS

This section describes the various interfaces and jumper settings for the GS1011MxP-EVB board.



Feature	Description
<b>RF Module</b>	GS1011MIP – Internal PA and PCB antenna or GS1011MEP – External PA and PCB antenna
<b>RF Output Power (Typical)</b>	9 dBm with GS1011MIP 18 dBm with GS1011MEP
<b>Antenna Type</b>	On-board PCB Trace (GS1011MxP)
<b>I/O Port (J1 or J2)</b>	J1: 6-pin serial UART ( 3.3V TTL) or J2: RS232 DB9 Connector
<b>LED</b>	2 LED's to indicate state
<b>WPS Switch (SW2)</b>	Push button for Wi-Fi Protected Setup
<b>Alarm Switch (SW4)</b>	Push button for Alarm and configuration
<b>Program Switch (SW3)</b>	RUN: Normal Operation (default) PROGRAM: For programming the GS1011M module:
<b>On/Off Switch (SW1)</b>	Power on/off switch
<b>Serial Select Jumper ( J4)</b>	1-2 : RS232 Interface (DB9) 2-3: 6-pin UART (default)
<b>Sensors</b>	Temperature and Light
<b>Power Source Select (J9)</b>	1-2: Ext Lab DC power supply 2-3: Battery (default)
<b>Battery</b>	Two 1.5V AA Battery (Alkaline or Lithium) Lithium is recommended for longer battery life
<b>Power Mode (J8)</b>	1-2: Always On (Power is always on) 2-3: Standby Mode (Power is turned off to the board during standby state) - default
<b>Power Measurement Jumper (J8)</b>	Jumper to facilitate measurement of current consumption for module
<b>Power Supply Header</b>	Jumper posts for connecting Lab DC power supply
<b>Power Source Range</b>	2.7V to 3.6V

## INSTALLATION STEPS FOR EVALUATION KIT SOFTWARE

The USB key in the evaluation kit contains multiple SW components that can be installed for evaluating the various applications on the evaluation board.

System Requirements: PC with Windows XP Service Pack 2 or Windows Vista, with at least one Ethernet port, and a PC with a serial or USB port. (A single PC can provide both the serial and Ethernet connections, if desired.)

### Install Java Runtime Environment

If you have Java Runtime Environment (JRE) Version 6 Update 14 or later, you should be able to run the GSDemo GUI application that are installed as part of the Eval kit installation. If not, you can download the current version of JRE from

<http://www.java.com/en/download/manual.jsp>

or run `jre-6uXY-windows-i586-p-s.exe` from the USB flash drive received with your Evaluation Kit, where XY may vary depending on the update provided.

### Install Serial Terminal Software

Install the Tera Term serial terminal software (`teraterm_utf8-4.58.exe`). If you already have tera term or use a different terminal software, then you can skip this step.

### Evaluation Kit Software Installation

Installs the Serial to Wi-Fi application binaries, GSDemo GUI for the temperature and light sensor application and drivers required for serial configuration.

Run `evalkit_setup.exe` from the USB flash drive. This starts the *InstallShield Wizard*. Perform a “Typical” installation, using all default settings. This creates and populates the `C:\GainSpan\EvalKit\X.X.X` directory.

Note: Directory names and organization may differ slightly from one release to another; If you have already installed earlier versions of GainSpan software, the most recent release will be added in a separate folder.

Copy `Sim_terminal.exe` from the USB key to the EvalKit directory created in this step. The sim terminal is a serial terminal with --- TCP/UDP client available from GainSpan. Note that *Simple Terminal* requires the .NET framework, 2.0 or above; You can download that .net framework from <http://www.microsoft.com/downloads/en/default.aspx>

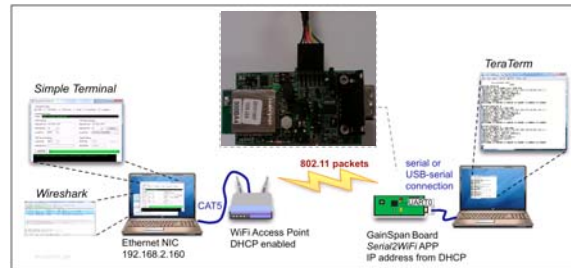
### USB/UART Cable Driver Installation

Note: If using RS232 (DB9) cable, then this step can be skipped

If USB to UART cable provided with the kit is used, then install the driver for this cable from `C:\GainSpan\S2wEvalKit\1_1_2\drivers\usb_uart` directory that was created previous step. The file is labeled CDM 2.02.04.

## SERIAL TO WI-FI SETUP AND START UP INSTRUCTIONS

Below are the steps required to run the serial to Wi-Fi application.



1. Once the software installation is completed, power the Wi-Fi Access Point (AP). The access point have been pre-configured with the following parameters:
  - a. SSID = "GainSpanDemo
  - b. Channel = 6
  - c. DHCP = Enabled
  - d. Security = Open
  - e. IP Address = 192.168.3.1

Note: If user wants to use a different AP than the one provided with the kit, user can use any standard Wi-Fi (802.11 b/g/n) AP, they should just ensure that the AP settings match the parameters above.

2. Plug the serial cable provided directly into a serial communications port of the PC if one is available, or into a USB-to-serial converter. Since USB converters can enumerate to any one of a number of COM ports, it is necessary to find the COM port of the serial port or USB converter being used to communicate with the board. Open the Device Manager (Figure 1): Start → Settings → Control Panel → System → Hardware → Device Manager. The USB Serial Port is listed under Ports (COM & LPT), as shown below.

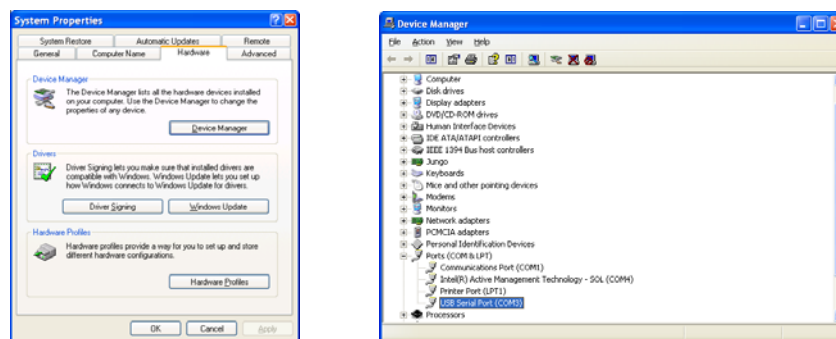
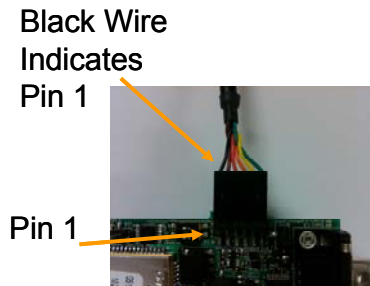
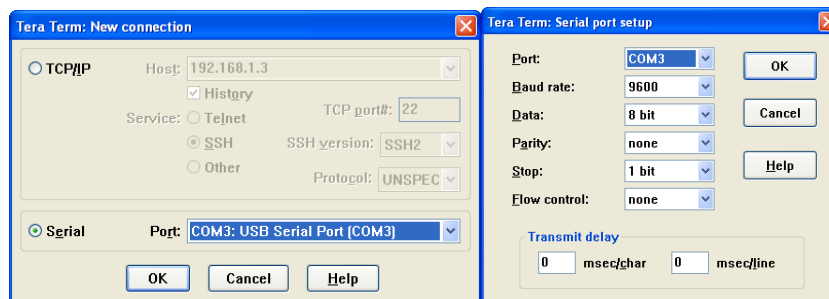


Figure 1: System Properties pane with Device Manager Button

2. Connect the Serial Cable provided with the kit to either the 6-pin UART connector as shown below or to the DB9 connector depending on the type of cable that is being used.



3. Launch the Tera-Term Application. Select serial port connection, and select the serial port identified in step 2. Set the port settings as shown below.



4. Install the batteries provided with the kit into the battery holder.

NOTE: Make sure the power switch (SW1) is in the OFF position. Make sure that the battery's positive (+) terminal aligns with the battery holder's positive (+) terminal indicator before insertion. Improper placement of the battery may damage the evaluation board.



5. Power on the Evaluation board by switching the power switch SW1 to the "ON" position. Tera-Term will display "Serial to WiFi App" for an internal PA board (GS1011MIP-EVB) or "Serial to WiFi App-Ext. PA" for an external PA board (GS1011MEP-EVB or GS1011MEE-DB).
6. By default the board will not have a network setup. To look at the network stat type "at+nstat=?" In the tera-term window. To look for available wireless networks and associate with one, below are the steps
  - a. To scan for available Wi-Fi access points, type "at+ws" on the Tera-Term screen

- b. To associate with the GainSpanDemo AP, first enable DHCP client, by typing “at+ndhcp=1” and then type “at+wa=GainSpanDemo”. The evaluation board will receive an IP address from the Access Point DHCP server.
- c. Type at+nstat=? To show the current status of the network connection.

```

COM3:9600baud - Tera Term VT
File Edit Setup Control Window Help

Serial2WiFi APP-Ext.PA
at+nstat=?
MAC=00:1d:c9:00:0a:e3
MSTATE=NOT CONNECTED MODE=NONE
BSSID=00:00:00:00:00:00 SSID="" CHANNEL=NONE SECURITY=NONE
RSSI=0
IP addr=0.0.0.0 SubNet=0.0.0.0 Gateway=0.0.0.0
DNS1=0.0.0.0 DNS2=0.0.0.0
Rx Count=0 Tx Count=0
OK

at+ws
Channel Type RSSI Security
b0:e7:54:69:34:d9, 2WIRE400 , 01, INFRA , -64 , WPA-PERSONAL
00:1d:7e:fc:88:00, Linksys , 01, INFRA , -75 , NONE
00:1c:f0:f2:0c:ca, hrentwood , 03, INFRA , -73 , WEP
34:ef:44:74:84:d1, 2WIRE277 , 11, INFRA , -79 , WPA-PERSONAL
00:22:3f:80:3a:fc, GainSpanDemo , 11, INFRA , -25 , NONE
No. of AP Found:5
OK

at+ndhcp=1
OK
at+wa=GainSpanDemo
IP SubNet Gateway
192.168.3.52: 255.255.255.0: 192.168.3.1
OK
at+nstat=?
MAC=00:1d:c9:00:0a:e3
MSTATE=CONNECTED MODE=AP
BSSID=00:22:3f:80:3a:fc SSID="GainSpanDemo" CHANNEL=11 SECURITY=NONE
RSSI=-25
IP addr=192.168.3.52 SubNet=255.255.255.0 Gateway=192.168.3.1
DNS1=192.168.3.1 DNS2=0.0.0.0
Rx Count=9 Tx Count=200
OK
    
```

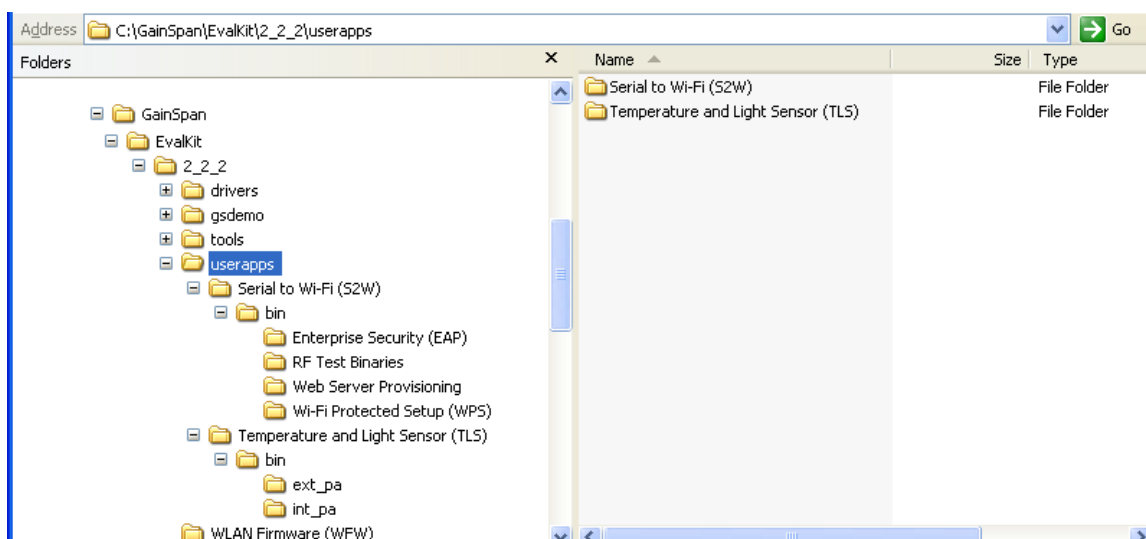
7. Type “AT?” This will list all the supported AT command set so you can develop your application using either HOST MCU through the serial interface or HOST PC using the Serial Terminal Application. See the Serial to Wi-Fi Adapter guide and command reference guide for details on all the AT command set and a quick list of AT commands respectively.

```

COM3:9600baud - Tera Term VT
File Edit Setup Control Window Help

Serial2WiFi APP
at?
ATE<0|1> Disable/enable echo
ATV<0|1> Disable/enable verbose responses
ATU<0|1> Configure serial port
ATB<rate>,<bitsperchar>,<parity>,<stopbits>
AT&K<0|1> Disable/enable software flow control
AT&R<0|1> Disable/enable hardware flow control
AT&W<0|1> Save Settings to profile 0/1
ATZ<0|1> Load Settings from profile 0/1
AT&Y<0|1> Set default power on profile to profile 0/1
AT&U Output current configuration
AT&F Reset to factory defaults
AT+WM=<0|1> Set mode to Infrastructure (0) or ad-hoc (1)
AT+WS[=<SSID>[,<BSSID>[,<Ch>[,<ScanTime>]] Perform wireless scan
AT+WA=<SSID>[,<BSSID>[,<Ch>]] Associate to network or form ad-hoc network
AT+WD or ATH Disassociate from current network
AT+WRSSI=? Query the current RSSI value
AT+WRATE=? Query the current WiFi rate used
AT+WEPn=<key> Set WEP key (10 or 26 hex digits) with index n (1-4)
AT+WEPn=passphrase Set WPA passphrase (8 - 63 chars)
AT+WAUTH=<authmode> Set authmode (1->open,2->shared)
AT+WRETRY=n Set the wireless retry count
AT+WRXACTIU=<0|1> Enable/disable the radio
AT+WRXPS=<0|1> Enable/disable 802.11 power save
AT+WP=<power> Set the transmit power
AT+WSTATUS Display current Wireless Status
AT+NMAC=<?>/<mac> Get/Set MAC address and store in flash
AT+NMAC2=<?>/<mac> Get/Set MAC address and store in RTC
AT+NDHCP=<0|1> Disable/Enable DHCP
AT+NSET=<IP>,<NetMask>,<Gateway> Configure network address
AT+NCTCP=<IP>,<Port> Open TCP client
AT+NGUDP=<IP>,<RemotePort>,[<LocalPort>] Open UDP client
AT+NSTCP=<Port> Open TCP server on Port
AT+NSUDP=<Port> Open UDP server on Port
    
```

The evaluation kit installer loads various software components including the WLAN firmware and user application binaries for evaluation. The two main types of application binaries installed are Serial to Wi-Fi and Temperature and Light Sensor Application. The directory structure looks like the figure below.



The Serial to Wi-Fi Application contains multiple example applications. Below is a list of the binaries and a short description for each

Directory	Description
Web Server Provisioning	Application with AT command to support embedded WebServer and Web pages for provisioning. This is the default binary loaded on all the evaluation boards. The directory also contains binaries for testing firmware update. (See App Note 39 for Web provisioning steps)
Wi-Fi Protected Setup (WPS)	Application with support for AT command to evaluate Wi-Fi Protected Setup. (See App Note 39 for WPS steps)
RF Test Binaries	Application with support for AT command to do RF testing i.e configuring radio for FCC modes like continuous transmission
Enterprise Security (EAP)	Application with support for AT commands for Enterprise EAP types – EAP-TLS, EAP-TTLS, EAP-FAST

The Temperature and light sensor application (TLS) is not a serial to Wi-Fi application, but a different reference application that utilizes the GEPS API's to develop a sensor device. It uses SNMP for configuration and communicates with the GSDemo PC GUI application that is installed by the kit. The TLS di-



rectory includes binaries for two types of modules. For details on how to setup and run the TLS application see the Temperature and Light Sensor and GSDemo User Manual.

Directory	Description
Ext_pa	TLS application binaries for supporting External PA Module. If board contains a GS1011MEP or GS1011MEE module, then download this binary set into the module
Int_pa	TLS application binaries for supporting Internal PA Module. If board contains a GS1011MIP module, then download this binary set into the module

- ▶ “GS1011M Evaluation Start Up Guide GS1011-EVK-SG
- ▶ Serial to Wi-Fi Bridge Application Note – AN-025 (For UDP/TCP data transfer)
- ▶ Provisioning in Serial to Wi-Fi using Web and WPS Application Note –AN039
- ▶ “Serial to Wi-Fi Adapter Application Programming Guide”, GS-S2WF-APG
- ▶ “Serial to Wi-Fi Command Reference” GS-S2WF-CR
- ▶ Temperature Light Sensor and GSDemo User Manual





## REGULATORY NOTES

### *Federal Communication Commission Interference Statement*

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: To assure continued compliance, (example - use only shielded interface cables when connecting to computer or peripheral devices). Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

### IMPORTANT NOTE:

#### FCC & IC Radiation Exposure Statement:

This equipment complies with FCC & IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This device is intended only for OEM integrators under the following conditions:

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 conditions above are met, further transmitter test will not be required. However, the

OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

IMPORTANT NOTE: In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC & IC authorizations are no longer considered valid and the FCC & IC IDs cannot be used on the final product. In these circumstances, the OEM

integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining separate FCC & IC authorizations.

#### End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users (for example access points, routers, wireless ADSL modems, and similar equipment). The final end product must be labeled in a visible area with the following: “Contains FCCID: XXXXXXXX & IC: XXXXXXXX”.

#### *IC Certification — Canada*

The labeling requirements for Industry Canada are similar to those of the FCC. A visible label on the outside of the final product must display the IC labeling. The user is responsible for the end product to comply with IC ICES-003 (Unintentional radiators)

#### Manual Information That Must be Included

The user’s manual for end users must include the following information in a prominent location.

#### IMPORTANT NOTE:

To comply with FCC & IC RF exposure compliance requirements, the antenna used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

#### Other notes:

GainSpan modules have been built or under development for near body exposure applications. The 20cm statement is a standard note because absorption rate testing (commonly known as SAR or Specific absorption rate) is not modularly transferable for FCC/IC. Thus, if a radio is being used against the body, the end user is still responsible to test for regulatory near body exposure testing (for USA, please refer to the following):

- FCC Part 1.1037
- FCC Part 2.1091 Mobile Devices
- FCC Part 2.1093 Portable Devices
- FCC Part 15.247 (b) (4)

## LIMITATIONS

THIS DEVICE AND ASSOCIATED SOFTWARE ARE NOT DESIGNED, MANUFACTURED OR INTENDED FOR USE OR RESALE FOR THE OPERATION OF APPLICATION IN A HAZARDOUS ENVIRONMENT, OR REQUIRING FAIL-SAFE PERFORMANCE, OR IN WHICH THE FAILURE OF PRODUCTS COULD LEAD DIRECTLY TO DEATH, PERSONAL INJURY, OR SEVERE PHYSICAL OR ENVIRONMENTAL DAMAGE (COLLECTIVELY, "HIGH RISK APPLICATIONS"). YOU AGREE AND ACKNOWLEDGE THAT YOU HAVE NO LICENSE TO, AND SHALL NOT (AND SHALL NOT ALLOW A THIRD PARTY TO) USE THE TECHNOLOGY IN ANY HIGH RISK APPLICATIONS, AND LICENSOR SPECIFICALLY DISCLAIMS ANY WARRANTY REGARDING, AND ANY LIABILITY ARISING OUT OF, HIGH RISK APPLICATIONS.

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Version	Date	Remarks
0.9	Aug 10	Initial Release

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