

**Linking Two Buildings using the EnGenius 8610
5.8GHz Outdoor Bridging units,
Vr 1.0**

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1 Introduction

The purpose of this document is to show a quick setup guide for creating a wireless network link between buildings using the EnGenius outdoor 5.8GHz 8610 bridging units. For the purpose of this document a network can be just a single remote computer or a collection of networked computers.

If you want to read up on some of the technical aspects behind wireless links covering aspects such as signal losses, line-of-site, effective range etc.. then you are advised to peruse some of our other technical articles:

<http://www.solwise.co.uk/networkingwireless.htm>

<http://www.solwise.co.uk/los.htm>

<http://www.solwiseforum.co.uk/downloads/files/intheuk5ghz.pdf>

1.1 5GHz Legalities

In the UK , there are two main types of radio devices that use the 5GHz frequency bands. The most common are those devices that conform to the 11a standard. These are licence free bands which can only be used by devices which are part of a mobile network i.e. you cannot use these bands for bridging between stationary points.

The bands in question for UK 802.11a equipment are 5150-5350 MHz (Band A), 5470-5725 MHz (Band B). The higher band, 5725-5850 MHz (Band C), is a licensed band to be used for the Installation of Fixed Wireless Access (FWA) services between stationary points. Bands A and B have been granted licence exempt status for use by public and private users for mobile/nomadic Wireless Local Area Networks (WLAN).

Please note that this differs from the 802.11a bands used in the USA. In the USA 11a equipment also uses the range 5.725GHz to 5.825GHz (Band C). However, the permitted power levels for use in the USA are much lower than the UK: The “low” band, 5.15 – 5.25 GHz, has a maximum of 50 mW (UK 200mW). The “middle” band is 5.25 – 5.35 GHz, with a maximum of 250 mW (UK 1W). The “high” band is 5.725 – 5.825 GHz, with a maximum of 1 W (UK 4W but licensed). For both these reasons (frequency range and power) it is NOT advisable to use 5GHz radio device imported from or destined for the US market.

The operational requirements for equipment operating in the 5GHz bands are stipulated in Interface Requirement IR 2006. It contains the following conditions:

Band A (5150-5350MHz)	Band B (5470-5725 MHz)
All devices must comply with ERC Decision 99(23) and IR 2006 (including Transmit Power Control (TPC) and Dynamic Frequency Selection (DFS)).	All devices must comply with ERC Decision 99(23) and IR 2006 (including Transmit Power Control (TPC) and Dynamic Frequency Selection (DFS)).
All devices must be part of a mobile/ nomadic network	All devices must be part of a mobile/ nomadic network
Max EIRP 200mW	Max EIRP 1W
Indoor use only.	Indoor and outdoor use permitted.
Band C (5725-5850MHz)	
All devices must comply with IR 2007.	
Max EIRP 4W with a PSD not exceeding 23dBm/MHz	
Transmit Power Control (TPC) and Dynamic Frequency Selection (DFS) are mandatory	
Fixed Service Operations only	

Aside: In the EU and UK, the bands for 11a devices are A and B. Band C frequencies are used for licensed site bridging. Just to confuse things a bit more, the frequency range for Band C (5.725-5.850Ghz) is also used for 11a devices in the US. This means that 11a equipment which is designed for the US market (and this can be both radio devices and antenna) will be using the wrong frequencies. US equipment will be set to use the frequencies which, in the UK, are allocated for licensed Band C equipment so take care with grey market equipment! Is also means there is a

temptation to use equipment designed for the US market for Band C bridging in the UK. However this equipment will not conform to IR2007 (a UK only thing) and it's use is illegal!

Back to 11a. To use Band A and Band B equipment must conform to ERC Decision 99(23) and IR 2006 which include two key operational requirements i.e. Transmit Power Control (TPC) and Dynamic Frequency Selection (DFS). These are covered by the IEEE 802.11h standard.

1.2 The Channels

These are the channels used in the 5GHz Band C ranges:

Channel	Frequency/GHz	Maximum EIRP
149	5.745	4W
153	5765	
157	5785	
161	5805	

2 Design Considerations

2.1 The Product

The EnGenius 8610 bridging units are self contained, waterproof, outdoor 5.7-5.8GHz radio units which include a directional antenna system (though there is also a version where you can add your own antenna), high power/high sensitivity radio unit, PoE (Power over Ethernet – so you can deliver the power up the LAN cable) and fixing brackets (suitable for wall or pole mount). In fact everything you should need to setup an external wireless bridge – the only thing you'll need to add is some network cable!



There are two models in the outdoor 8610 range:

NOC-8610EXT

No antenna included, ReSMA Socket connector



NOC-8610PLUS

includes 16dB panel antenna

n.b. If you are considering using the 8610EXT then you need to ensure that the maximum EIRP doesn't exceed the legal 4W limit. So, the maximum power output of the 8610 radio unit is 20dBm. Maximum legal EIRP is 36dBm. If we assume that we are going to lose about 3dB in the antenna cable then that means we are limited to an antenna of about

19-20dB gain. If you use an antenna higher than this then you run the risk of exceeding the legal limits for Band C radio.

Before installing your radio link you need to plan where to mount the units. To this end you need to place the bridging units where the antenna have a clear line of site between each other – WiFi don't like things in the way, e.g. brick walls, metal buildings, caravans etc... In fact they are also not very keen on thick vegetation.

You also need to decide on which model to use i.e. EXT, 16dB version. For simple point-to-point links (one building to one building) then you should be using the 16dB directional unit. For speeds up to 54meg (wireless link speed which, of course, bears no relationship to the REAL transfer speed ☺), at distances in the range to about one Km then the 16dB unit should be fine. However, if you are willing to accept a drop in performance (e.g. 6meg) then distances in excess of 10Kms are possible (assuming you can get clear line of site over such a distance!).

If you are feeling keen, then our other wireless articles contain details of the calculations necessary to correctly determine what speeds you should be able to attain of what distance with what model (see <http://www.solwise.co.uk/los.htm>).

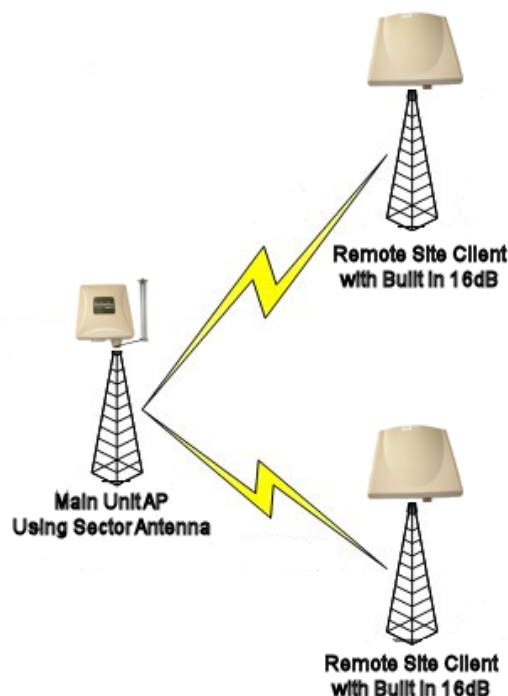
If you are trying to setup a multi-point link, where you have a single source but need to link to multiple other units then, for the main source location you will probably need to use the 8610EXT unit. This will require you to use either an omni antenna (for 360 degree coverage) or a sector antenna (where you only need to send the signal over a specific angle of coverage e.g. 90 degrees or 120 degrees or 180 degrees). For a range of outdoor antenna see our web site at:

<http://www.solwise.co.uk/wireless-outdoorantenna-58.htm>

Remember you need to choose antenna suitable for Band C region and also remember to stick to the IR2007 4W EIRP limit ;-)

2.2 Link Basics

The type of wireless link it's recommended we use is called an 'infrastructure' wireless network. In this type of wireless link one end of the link is setup as an Access Point (AP) and the other is configured as a Bridge Client (BC). For a basic two building connection then you will have one end as the AP and the other the BC – it doesn't really matter too much which end is which but, convention has it that the end that is supplying the service (e.g. the internet if the purpose is to share the internet connection of one site) is normally the one configured as an AP. You can only have one AP but you can have multiple BC's so, for example, you might have an internet connection or even a LAN based server at a main building (the AP end) which you want to share with multiple other buildings (using BC's).

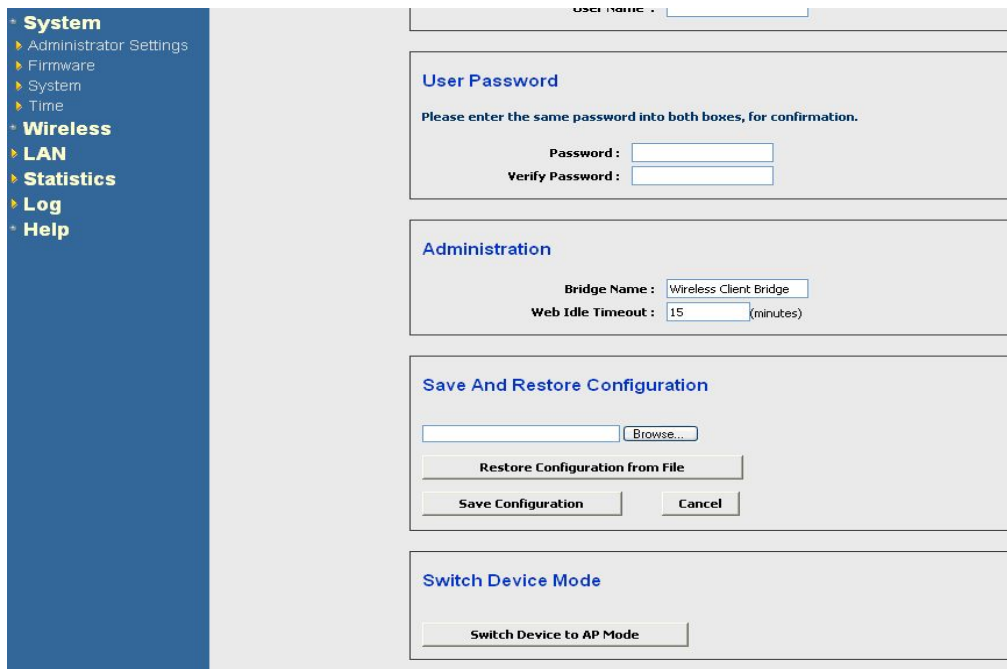


3 Configuring the 8610 units

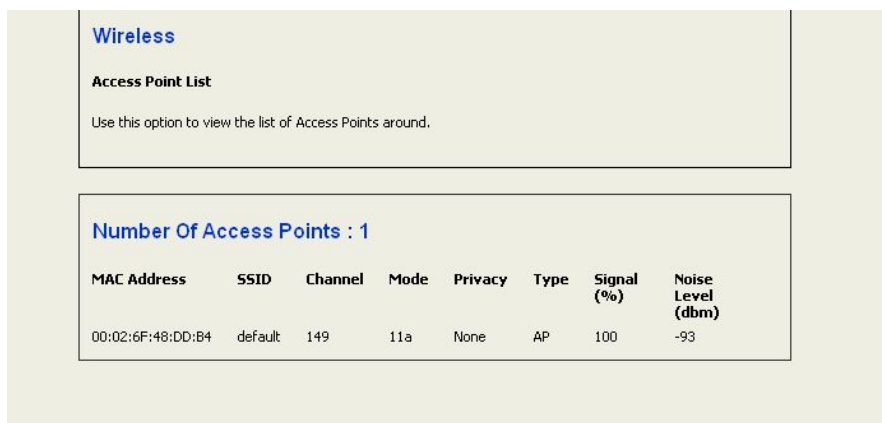
3.1 Basic Configuration

Configuration of the 8610 is very, very easy! Because IR2007 demands auto-channel and auto-power operation they you don't need to worry about those settings at all. All you need to do is set one end as AP and the other as Bridge Client.

By default the default settings of the 8610 are as client mode on address 192.168.1.1... Log in to the first unit via your web browser on 192.168.1.1 (there is no username or password required). In the system menu click on Administrator Settings, at the bottom of page click on "Switch device to AP mode", click on OK to confirm. This will change the IP address to 192.168.1.2.



Now log in to the web interface on the second (Bridging) unit. Leave the second unit set on it's default settings as a client. Click on wireless.



You should see it is connected to the unit you just set as AP and you should now be able to link allowing network traffic to flow between the two sites. That's it!! You can now set up extras like security etc; done!