Scotnet Wi-Fi & Speed-testing Guide

Section 1 - Wi-Fi

The way in which we use the internet has evolved significantly in recent years. We've moved from sitting at a single shared PC to having multiple devices connected around our homes. As more and more devices go online, the challenges of distributing internet connectivity through our homes and offices increases.

One of the most common support calls we receive relates to poor connectivity when moving away from the router. It is therefore important to understand the challenges and possible solutions:

Scotnet Router

We provide a managed router with all services. It typically has 4 Ethernet (RJ45) cable ports and broadcasts a Wi-Fi service at 2.4Ghz and usually 5Ghz. The router represents our demarcation point for the service. We connect every type of property from caravans to castles, and every building presents its own challenges. We do not offer 'total Wi-Fi' and despite the claims of some providers, such a thing rarely exists without significant additional equipment. We do not guarantee that your Wi-Fi will work around your home for the reasons outlined below. In reality almost all buildings need additional equipment to offer full coverage. Note that Wi-Fi will never be as good as connecting with a cable, even if you are right next to the router. If you can use a cable, then do!

Wi-Fi Penetration

UK Wi-Fi standards are set by the Government at a level which is deemed to be a safe. You cannot simply 'turn up' the power or use different frequencies, as this would not be compliant with Health & Safety rules. All providers must therefore work within the realms of the technology and physics. In simple terms, Wi-Fi signal strength degrades quickly as you move away from the router and/or you pass through solid objects. If you consider the signal at the router to be 10/10, moving a few meters away may drop to 9/10 – and then move through a solid wall and you may be down to 6/10 or worse. By the time you've moved to the other end of your home of office, the signal has become so weak that it's unusable. Stone walls or modern foil-backed wall insulation are particularly bad at blocking the service. Whilst your phone or tablet may show you as still connected to the Wi-Fi, the service will become largely unusable.

Wi-Fi Loading

Most homes and offices now have multiple devices connected. Phones, tablets, TVs, games consoles and computers are all typically connected all of the time. Add in smart appliances like fridges and of course smart speakers, many of us have 20 or more wireless devices fighting over bandwidth and channel capacity. You may also find that when searching for Wi-Fi networks, you can see multiple other homes in your area. These networks are all competing for the available frequency and will have a bearing on your ultimate Wi-Fi performance. Most routers will try to find a 'quiet' channel to use, but in some cases that isn't easy. There is no real solution to this issue, but it useful to understand the problem.

2.4 or 5Ghz?

Most routers are now 'dual band' and offer two different frequencies – 2.4Ghz and 5Ghz. As a rough rule, 5Ghz will offer better performance if you are close to the router. Not all wireless devices support 5Ghz, but if they do and you're in the same room, that's typically the better option. 2.4Ghz has better penetration through walls and over distance – so that's usually the best option as you move away from the router. A new standard called Wi-fi 6 has recently come to market, albeit with a limited number of expensive routers and an even shorter distance capability – so these won't solve most home coverage issues.

Solutions

If you want to use Wi-Fi efficiently around your home, it is likely that you will need some sort of extender or repeater. Here are some of the most common:

- Cat5e/Cat6 cable (Ethernet). This has always been and remains the best way of expanding your service through your property. Ethernet cable can be run up to 100m without losing any signal strength. Plug one end into your router and the other end into your device or into a Wi-Fi access point. This is the best solution where cables can be run discreetly under floors etc. Note – ensure the cable being used is Cat5e or Cat6 with 8 internal coloured cores. 4-core Cat5 cable is limited to 100Mb/s.
- Powerline extenders. These simple devices use your building's mains power infrastructure to carry the connectivity from A to B. They simply plug into 3-pin mains power points and then the 'master' unit plugs into your router on an Ethernet port. The other units (slaves) are plugged in remotely and will then broadcast the Wi-Fi in other rooms. Note however that all devices must be on the same 240v ring main to work. Ask your electrician if you're not sure.
- Wireless mesh. Some companies offer a 'mesh' solution which picks up and amplifies the Wi-Fi service through a building. This usually suits more open-plan buildings like offices as each repeater still needs cabling, so may not be an easy retrofit solution.

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Section 2 - Speed-testing

Running a speed-test can be a useful tool in helping to diagnose or confirm a potential issue. We receive calls from customers advising that their speed-test is showing a speed which doesn't align with their package. Whilst this may indicate a fault, the challenge for broadband suppliers is that 99% of speed-tests are not accurate!

How speed-testing works

In simple terms, a speed-test works by sending & receiving a set amount of data and recording how long it takes to complete the transmission. That then produces a speed quoted in Mb/s (mega bits per second).

Issues with speed-testing

Whilst the theory behind a speed-test is simple, the reality is that there are lots of factors which can compromise the accuracy of a test – and ultimately suggest a problem with your broadband service which may not be correct. Here are some of the main issues to consider:

- Wi-Fi. Running a test across Wi-Fi will never provide an accurate result because the speed of service is always lower than it would be using a cable directly to the router. As outlined in the Wi-Fi page, moving away from the router will get progressively slower, and further compromise the test.
- Other network traffic. A speed-test works by transferring a set amount of data and measuring the time taken. If your network has any other traffic running at the same time, this will reduce the speed of the test's transfer time. Most properties have lots of devices connected all of the time – many of which are transferring data in the background without your knowledge. Watch the activity light on your router and you'll see it flashing away 24x7, even when nobody *appears* to be online.
- Speed-test sites. There are lots of websites offering speed-tests, but many of them are far from accurate. Even the biggest sites like Speedtest.net are actually a network of hundreds of servers being operated by third-parties like ISPs. There is no guarantee that the server you connect to isn't congested, or has sufficient bandwidth. This is especially true with our full-fibre services where running an accurate speed-test at 900Mb/s is next to impossible for most speed-testers as they don't have the capacity to send/receive the data that quickly.
- Your Device. Modern PCs etc are made to last and many people are using devices made 5-10 years ago. That's great for your wallet, but older machines often have limited processor capacity and/or are groaning with years' worth of clutter which slows them down and can prevent you from running a test which is accurate.

Running a test from a phone or tablet, regardless how new is unlikely to provide an accurate test.

How to run an accurate speed-test

Running a test which is totally accurate is largely impossible in reality. There are some good practice steps you can take however to provide some indicative tests - especially when run as part of a set of tests over a period of time.

1. Always run a speed-test when connected via cable to your router. A wireless test will not be accurate and our support desk will ask you to re-run the tests with a cable.
2. Disable other network traffic. Not always easy, but if you can switch off the Wi-Fi and unplug any other machines from the router, that will eliminate the bulk of other traffic. Ensure the machine running the test isn't carrying out any other background tasks like software updates, streaming radio, calling for e-mail etc.
3. Use the best PC/laptop you've got. If possible, use a machine which is reasonably new and doesn't have any known performance/software problems. A modern fast machine will perform better than an old one in general.
4. Run the tests at different times of day. Try to run 5 tests through the day and compare the results – this may help to identify a pattern and resolve any possible fault.

Scotnet operate a speed-test server on the Ookla platform. Visit www.speedtest.net and change the selected server to Scotnet.co.uk.

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