How to Achieve Maximum Signal Strength
with Digi Cellular Routers

What tools do I have for determining signal strength?

The best throughput comes from placing the device in an area with the greatest Received Signal Strength Indicator (RSSI). RSSI is a measurement of the Radio Frequency (RF) signal strength between the base station and the mobile device, expressed in dBm. The better the signal strength, the less data retransmission and, therefore, better throughput.

- **How do I read RSSI on the Digi cellular router?**
  RSSI information is available from several sources:
  1. The LEDs on the device give a general indication (1-4 "bars").
  2. Via the Digi device's local user interface:
     - http (Digi web interface > Information > System Info > Mobile)
     - CLI command "display mobile" via telnet, SSH or local serial port connection (via HyperTerminal, TeraTerm or other emulation package) to the Digi cellular router.
  3. Digi Connectware® Manager (Server Platform) can also display the value in dBm via System Information screen.

- **What do the numbers mean?**
  -101 dbm or less (0-1 LED) -> Unacceptable coverage
  -100 dbm to –91 dbm (1-2 LEDs) -> Weak Coverage
  -90 dbm to –81 dbm (2-3 LEDs) -> Moderate coverage
  -80 dbm or greater (4 LEDs) -> Good Coverage

  Pre-install surveys can also be done using a data device such as Blackberry, Treo and even cell phone. Check out this guide from WPS Antennas on how to use a cell phone for a basic site survey: http://www.wpsantennas.info/pdf/testmode/FieldTestModes.pdf.

  These data devices cannot provide a 100% reliable comparison to how a Digi cellular router will behave due to antenna differences, etc. Generally, if the other device works okay, the Digi device should as well. As noted below, special antennas can usually help in areas with marginal signal.

What about placement?

Placement can drastically increase the signal strength of a cellular connection. Often times, just moving the router closer to an exterior window or to another location within the facility can result in optimum reception.

- Another way of increasing throughput is by physically placing the device on the roof of the building (in an environmentally safe enclosure with proper moisture and lightning protection).
  - Simply install the device outside the building and run an RJ-45 Ethernet cable to your switch located in the building.
  - Keep antenna cable away from interferers (AC wiring).

Antenna Options

Once optimum placement is achieved, if signal strength is still not desirable, you can experiment with different antenna options. Assuming you have tried a standard antenna, next consider:

- Check your antenna connection to ensure it is properly attached. If you have the ConnectPort™ WAN VPN product, ensure the internal antenna connectors are also properly connected.
- Cabled antenna (Digi part # - DC-ANT-DBDT) has no dBm gain, but has 8-foot cable and magnetic base for attachment to metal ground plane.
- High gain antenna (Digi part # - DC-ANT-DBHG), which has higher dBm gain and longer antenna.
- Antenna boosters and directional antennas:
  - Companies such as www.wpsantennas.com sell signal enhancing technologies ranging from $100-$1000.
    - Directional antennas are larger and take some time to set up but are typically in the $150 price range. Also verify if the antenna is single- or dual-band. Single-band antennas require matching the signal from the carrier. If you aren't sure which frequency you carrier is using in a particular location, you may contact WPS Antennas for assistance.
    - Powered antenna boosters can be much more expensive, but are often easier to set up.
  - Many cabled antennas require a metal ground plane for maximum performance. The ground plane typically should have a diameter roughly twice the length of the antenna.

Does it help overall throughput to stack the devices at one location?

No, do not stack multiple routers per location. Adding additional routers at the remote location will not increase throughput because the bottleneck becomes the limited EGPRS capable data timeslots allocated at the cell site. All data customers share the same timeslots. If you stack routers, you will simply be competing with yourself for data channels.

NOTE:

Another way of optimizing throughput is by sending non-encrypted data through the device. Application layer encryption or VPN put a heavy toll on bandwidth utilization. For example, IPsec ESP headers and trailers can add 20-30% or more overhead.

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