The basic of Cellular signal strength

A cell phone and or cell data device is a radio. Radio’s operate on signal strength and signal quality, these are both measured in decibels (dBm)

Decibels are expressed as a negative number, like -70 dBm. The closer the number is to 0, the stronger the signal. For example, -70 dBm is a stronger signal than -90 dBm.

**A: Signal Strength**

1. Influences connection to the cellular tower.
2. Represented by RSSI “Received Signal Strength Indicator”, measured in -dBm. 
3. RSSI (3G, CDMA/UMTS/EV-DO), is a negative dBm value. Values closer to 0 are stronger signals.

Signal Strength can run from -51dBm to -113dBm. Values closer to -51dBm are stronger. A signal beyond -98dBm is not considered strong enough to work properly.

A front panel LED on the CDI device will flash a number of times corresponding to indicate the signal strength as per the table below.

<table>
<thead>
<tr>
<th>RSSI</th>
<th>Signal Strength</th>
<th>CDI LED FLASHES</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; -70dBm</td>
<td>Excellent</td>
<td>6</td>
</tr>
<tr>
<td>-70 dBm to -85 dBm</td>
<td>Good</td>
<td>4-5</td>
</tr>
<tr>
<td>-86 dBm to -100 dBm</td>
<td>Fair</td>
<td>3-4</td>
</tr>
<tr>
<td>&lt; -100 dBm</td>
<td>Poor</td>
<td>1-2</td>
</tr>
<tr>
<td>-110 dBm</td>
<td>No Signal</td>
<td>12</td>
</tr>
</tbody>
</table>

**B. Signal Quality**

1. Influences data throughput speeds on mobile broadband networks.
2. Represented by signal noise ratios, measured in dBm.
3. Noise ratio representation varies by mobile broadband technology.

Signal Quality above -10dBm (-6,-7,-8,-9, etc..) is considered good enough to operate.
1. **How to turn your smart phone into a field test device for signal strength.**

   a. Most phones provide signal strength with the representation of a few increasing bars on the screen. This representation is too vague to measure signal strength when doing a site survey.

   b. Most smart phones can be configured to provide signal strength in –dBm values. This is called “FIELD TEST MODE”. When the phone is placed in field test mode, it will display all kinds of information about the strength of the cellular signal and sometimes the quality of that signal as well.

   c. This can be useful in determining whether a cellular data device will work in that location. Remember to use a phone with the same carrier that the data device will be using as different carriers will have different signal strengths and qualities at the same location.

   i. **APPLE devices:**

      1. Accessing Field Test Mode on the iPhone is relatively simple, just open the Phone app, switch to the keypad and dial the following code: *3001#12345#* and then press call. If you dialed it correctly, your iPhone will enter Field Test Mode and you’ll see the numerical value for signal strength in the upper left hand corner of the screen where the signal strength was previously displayed in bars. To exit and return your iPhone to normal status, all you need to do is hit the Home button. The mode is available on any iPhone running iOS 4.1 and all later versions.

      2. If you want your iPhone to always display numerical signal strength instead of signal bars, you can perform the following process. Once in Field-test mode (accessed by entering and dialing the code above), hold down the power button until you see “Slide to Power Off”, then release it. Then hold the Home button until you’re returned to your main app screen. You’ll now see your numerical signal strength while you use your phone, and you’ll be able to tap the signal numbers to switch to signal bars, and vice versa. To exit this permanent field-test mode, simply reboot the phone or re-load Field Test Mode and exit it via the Home button.

   ii. **ANDROID devices:**

      1. You simply need to find your way to “Settings” > “About Phone”, and your numerical signal strength will be available under either Network or Status, depending on the model of the phone you own.

      2. There is also a “Field Test” app you can download thru google play by Azuca Digital.
iii. Other:

1. You should be able to find information on entering your phone into “Field Test Mode” by researching the internet for the access codes or apps.

2. Antennas and extensions:
   
a. CDI devices are delivered with one high gain primary antenna that connects directly to the device.

b. A secondary or “Diversity” Antenna can be connected to the device which will cleanup any “signal bounce”. The diversity antenna lets the radio see if the signal has bounced off of a metal object and is being re-read by the radio. This antenna needs to be placed at least six feet away from the primary antenna. That is why our diversity antennas are shipped as a magnetic mount with a six foot cable.

c. The mag mount antenna can also be used as a primary antenna, allowing the antenna to be placed closer to a signal, like near a window, high up on a rack, or upside down on a track from the ceiling.

d. Two mag mounts can be used to grab the maximum signal if available.

e. Antenna extenders can be used to get the antenna to a location that is better for signal. An example would be if your device is located underground you may want to use an antenna extender cable to locate the antenna above ground near a window.

f. The technical info on antenna extension cables is that the longer the cable, the more loss results for the cable. So it is best to keep the run as short as possible. We do not recommend runs longer than 75 feet, although we have seen 100 foot runs work properly. Antenna extension cables are available from CDI.