Modem Signal Strength and Signal Quality

Support Team - 2016-12-16 - Comments (0) - Wireless Communications

Content

The measure of a connection depends on both the **Signal Strength** and **Signal Quality**. RSSI is a measure of **Signal Strength**, while CINR, SINR, and Ec/Io are measures of **Signal Quality** for various technologies. The values we report are specific to different technologies (e.g. LTE) and carriers (e.g. Verizon).
Signal Strength influences the connection to the cellular tower. Signal Quality influences data throughput (speeds) on the mobile network. There are different values for signal quality depending on the technology used, detailed below:
NOTE: The following values are approximations; they are solely CradlePoint's interpretations. Each of these values will vary for different technologies and carriers: contact your carrier for more authoritative information. CradlePoint does not guarantee adequate performance, regardless of the Signal Strength and Signal Quality. An adequate connection depends on many different factors, including:
• Proximity to the cellular tower
• Tower load
• Physical barriers (mountains, buildings, trains, etc.)
• Competing signals
• Weather
• Signal going through a cellular repeater
Signal Strength and Signal Quality numbers do not incorporate all of the relevant factors. In particular, measurements of Signal Strength and Signal Quality for a specific moment do not reflect on the STABILITY of a connection, as these values will vary as conditions change.

Signal Strength

RSSI = Received signal strength indicator (measured in dBm)

Excellent	**above −65 (closer to 0 is better)**
Good	**−65 to −75**
Fair	**−75 to −85**
Poor	**below −85**

Signal Quality

Ec/Io (several technologies including HSPA+ and EVDO; measured in dB)

Excellent	**above −2 (closer to 0 is better)**
Good	**−2 to −5**
Fair	**−5 to −10**
Poor	**below −10**

SINR = Signal to Interference plus Noise Ratio (LTE only; measured in dB)

Excellent	**above 12.5**
Good	**10 to 12.5**
Fair	**7 to 10**
Poor	**below 7**

RSRP = Reference Signal Received Power (LTE only; measured in dB)

Excellent	**> -84**
Good	**-85 to -102**
Fair	**-103 to -111**
Poor	**< -112**

RSRQ = Reference Signal Received Quality (LTE only; measured in dB)

Excellent	**> -5**
Good	**-6 to -10**
Fair to Poor	**< -11**

Additional Disclaimers:

There is no black and white answer to what constitutes a successful connection. It is possible to disconnect with green values – or connect with red values – for several reasons, including:
1) Modems may vary.
We support hundreds of modems, and not all of them have the same ranges of acceptable values. For example: in our experience the Pantech UML290 and Novatel 551L require minimum RSSI values of −64 for acceptable connections.

2) You must factor in BOTH Signal Strength and Signal Quality.

It is possible to have excellent RSSI but disconnect because of poor quality (and vice versa).

3) Signal Strength and Signal Quality values do not hold constant.

The variance of a signal is a significant factor in the success of a connection. A particular reading represents one moment, but these values may vary dramatically over time. A stable connection requires consistency. This is a sample graph of RSSI values that shows how much the values jump (from http://radiomobile.pe1mew.nl/):

4) Environmental Factors can affect all of the above values.

Everything from other network hardware, to heavy machinery, to the weather can have any affect on RSSI, SINR, Ec/Io, RSRP, and RSRQ.

5) Other factors: tower load, signal going through a repeater/booster, etc.

Some factors that don't show up in Signal Strength/Signal Quality values can greatly impact a connection.

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