PCC Range Estimator – Quick Start Guide

File Menu

The current version of PCC Range Estimator supports only one function: exiting the program. Future versions will add additional functions under the File menu. To exit the program, click **File > Exit**. You may also click the **Exit** button at the bottom of the main screen.

Units Menu

Click the **Units** tab to select Distance, Power or Gain units. The choices are:

- Distance: US Survey (Feet/Miles) & Metrics (SI)
- Power: Watts and dBm
- Antenna Gain: dBi and dBd

The default units are US Survey Feet, Watts & Antenna Gain dBi. To change more than one of these defaults, you must click the **Units** tab multiple times.

The PCC Range Estimator is divided into 5 sections

Section 1: Transmitter Parameters

Allows the user to input Transmitter information

- Product Type: if it is a Pacific Crest product choose ADL for an Advanced Data Link type of radio or PDL for an older type of radio. For a non-Pacific Crest product type choose "Other."
- Frequency: Input the frequency in MHz of the radio channel that will be used
- Transmit Power: Input the RF output power of the transmitter
- Antenna Cable Length: Input the length of the transmitter's antenna cable
- Antenna Cable Type: Choose the cable type from the drop down list
- Connector loss: This is the loss due to all the connectors in the link between the radio modem and the antenna. Minimum loss per connector is 0.25 dB for new, high-quality connectors. Assume used connectors take 0.5 dB loss per connector.
- To reduce connector loss, minimize the number of connectors used and use the highest quality connectors.
- Antenna Gain: Input the gain of the transmitter's antenna
- Antenna Height: Input the height of the transmitter's antenna
- Antenna VSWR: Antenna VSWR (Voltage Standing Wave Ratio) is the impedance mismatch from ideal 50-Ohm impedance. Input the value of VSWR at your frequency or check from manufacturer.
- Cable Loss: PCC Range Estimator calculates the signal loss through the length of the cable. Cable loss depends on the cable type and length. To reduce cable loss, choose low-loss cables, and minimize cable length.
- Antenna Mismatch Loss: Is the loss incurred due to the mismatch between the antenna and the radio modem. To lower antenna mismatch loss, choose an antenna with a lower VSWR.

- Total Loss in Tx Chain: This is the total loss of power in the transmit chain and is a sum of the cable loss, connector loss and antenna mismatch loss.

Section 2: Receiver Parameters

Allows the user to input Receiver information

- Product Type: if it is a Pacific Crest product choose ADL for an Advanced Data Link type of radio or PDL for an older type of radio. For a non-Pacific Crest product type choose "Other."
- Receive Sensitivity: It is the sensitivity of the radio to receiving radio signals. For Pacific Crest product type the program automatically feeds in the value, for non Pacific rest radio, chose product type "Other" and then input the receiver sensitivity value in dBm, it is a negative value, if it is not specified on the product data sheet, ask the manufacturer.
- Antenna Cable Length: Input the length of the receiver's antenna cable
- Antenna Cable Type: Choose the cable type from the drop down list
- Connector Loss: Is the loss due to connectors used between the radio modem and the antenna. Minimum loss per connector is 0.25 dB; for used connectors take 0.5 dB loss per connector. Multiply the total numbers of connectors used with loss per connector.
- To reduce connector Loss, minimize the number of connectors used, and use good connectors.
- Antenna Gain: Input the gain of the receiver's antenna
- Antenna Height: Input the height of the receiver's antenna
- Antenna VSWR: Antenna VSWR (Voltage Standing Wave Ratio) is the impedance mismatch from ideal 50-Ohm impedance. Input the value of VSWR at your frequency or check from manufacturer.
- Cable Loss: PCC Range Estimator calculates the signal loss through the length of the cable. Cable loss depends on the cable type and length. To reduce cable loss, choose low-loss cables, and minimize cable length.
- Antenna Mismatch Loss: Is the loss incurred due to the mismatch between the antenna and the radio modem. To lower antenna mismatch loss, choose an antenna with a lower VSWR.
- Total Loss in Rx Chain: This is the total loss of power in the receive chain and is a sum of the cable loss, connector loss and antenna mismatch loss.

Section 3: Modem RF Configuration

Section 3 applies to Pacific Crest Radios ONLY. It is disabled when the receiver product type is "Other."

- When you input non-default values in the **Modem RF Configuration** section, PCC Range Estimator calculates new values in the **Receive Sensitivity** field of the **Receiver Parameters** Section.
- The receiver sensitivity is affected by the channel bandwidth, the type of modulation, forward error correction and on the RF link rate. The choices are:
    - Channel Bandwidth: 25KHz and 12.5KHz
    - Modulation Type: GMSK and 4FSK
    - FEC: Forward Error Correction (FEC), a digital communication technology that improves signal strength. It is recommended that you always turn FEC on.

- RF Link Rate: It is Over-The-Air data rate of the RF link. Use a lower data rate for a more reliable link.

Section 4: Environmental Factors

Allows the user to select among certain environmental factors that affect the RF Link.

- RF Path: This is an estimate of the path the RF signal between the transmitting and receiving antennas. Choose between:
  - Line of Sight: No interference of any kind in your RF Path
  - Moderate Vegetation: When there are some trees in your RF path
  - Dense Vegetation: When there is a forest in your RF path
  - Semi urban: When the RF path is obstructed by some trees and single-storey buildings
  - City: When your RF Path is obstructed by multi-storey buildings
  - Urban Canyon: When the RF path is obstructed by skyscrapers as in the centers of large cities
- Fade Margin: The amount of "fade" (power loss) the signal undergoes when traversing the RF path from the transmitting antenna to the receiving antenna. Default values of **Fade Margin** for different RF Paths have been programmed to achieve a RF Link Availability of >99%. The user can manually reduce the fade margin to increase the estimated RF Path Range. However, this will reduce the RF Link Availability.

Section 5: Results

Clicking the **Estimate Range** button calculates four types of range and the ERP expected with the various configurations selected by the user.

- Over the Ground Range: Line of Sight range with no interference/obstacles along the path of the radio wave but with ground attenuation effects; this is the range most commonly achieved in open areas within a few meters of the ground
- RF Path Range: The practical range of the radio wave given the choices made in the Environmental Factors section of the program
- Radio Horizon Range: Maximum range allowed by the curvature of the earth
- Free Space Range: Line of Sight range with no interference/obstacles along the path of the radio wave and no ground attenuation effects; this is the range that might be achieved using tall antenna masts, aircraft, etc.
- ERP: Effective (Isotropic) Radiated Power is the actual power of the RF signal transmitted at the antenna terminals