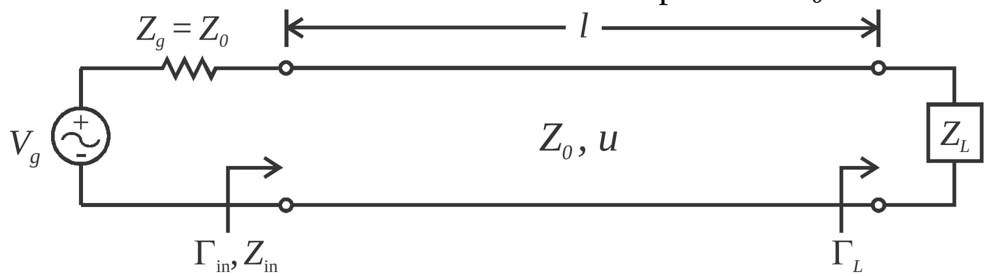
Matching load using a discrete parallel components

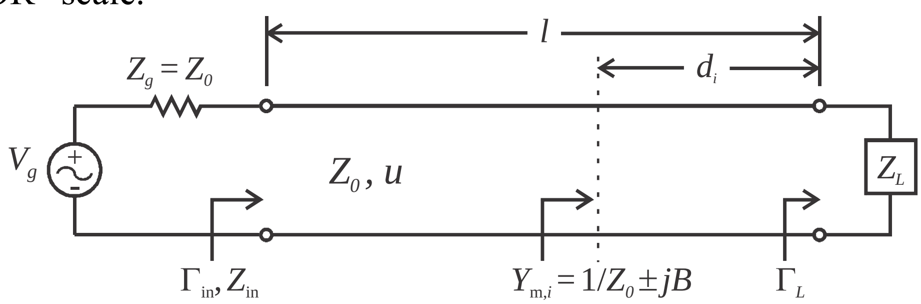
- Assume we have a source matched to characteristic impedance Z_0 of the transmission line.



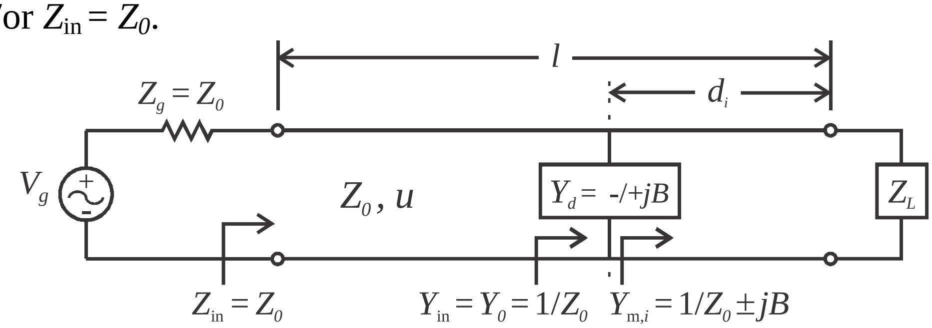
- Therefore, we are seeking to match the load Z_L to Z_0 as well, i.e., we want $Z_{in} = Z_0$.
- To avoid power losses, we will only use purely reactive components for matching.

Steps

1) Calculate $z_L = Z_L/Z_0$ and plot on Smith chart.
2) Draw circle, centered on Smith chart, through z_L point. This circle of constant $|\Gamma|$ includes the locus of all possible z_{in} (and y_{in}) along the transmission line with this load.
3) Go $\lambda/4$ around the circle of constant $|\Gamma|$ from z_L point to y_L point.
4) There are two points (i.e., match point points) on the circle of constant $|\Gamma|$ that intersect the circle where the normalized conductance g is equal to one, i.e., $y_{m,i} = 1 \pm jb$. In terms of input admittance this is where $Y_{m,i} = y_{m,i}/Z_0 = 1/Z_0 \pm jB$.
5) Find the distance d_i from y_L to the match points using the "WAVELENGTHS TOWARD GENERATOR" scale.



6) Select one of the match points and add a discrete component (i.e., capacitor or inductor) in parallel with a susceptance $Y_d = \mp jB$. Remember $Y_{cap} = j\omega C$ and $Y_{ind} = -j/\omega L$.
7) Now, everywhere toward the generator from this location will see a normalized input admittance of $y_{in} = y_{m,i} + y_d = (1 \pm jb) \mp jb = 1$ or normalized input impedance $z_{in} = 1$, i.e., $Y_{in} = Y_0$ and/or $Z_{in} = Z_0$.



Simple
Smith Chart