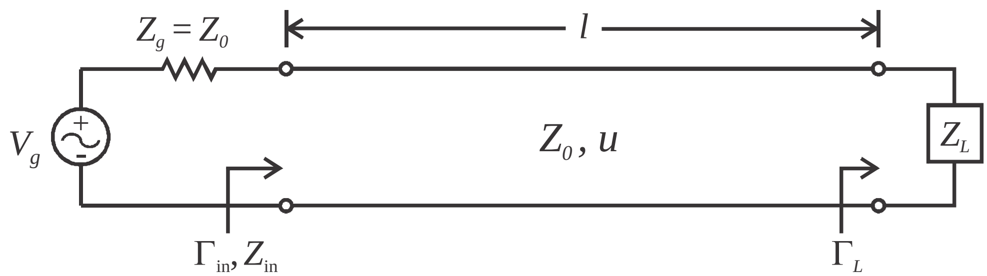
Matching load using a discrete series components

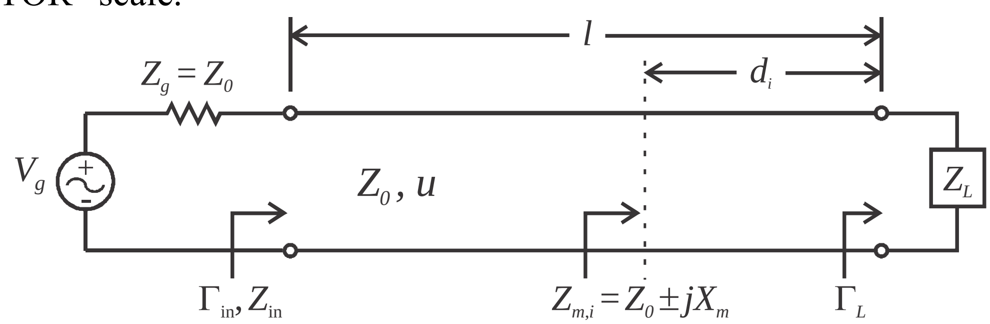
- Assume we have a source matched to the characteristic impedance Z_0 of the transmission line.



- 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.

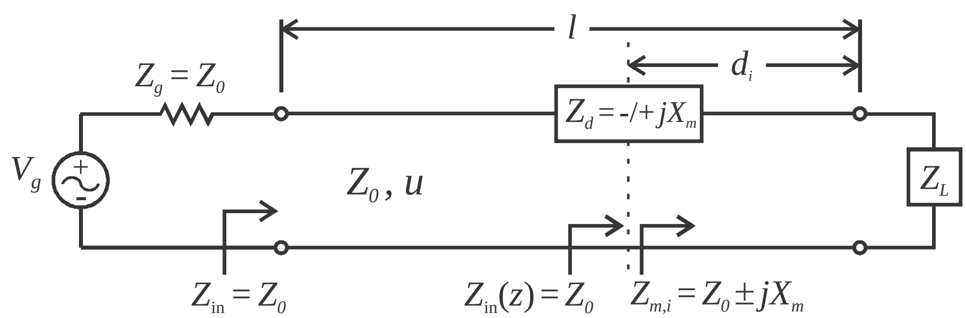
Steps

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) There are two points (i.e., match point points) on the circle of constant $|\Gamma|$ that intersect the circle where the normalized resistance r is equal to one, i.e., $z_{m,i} = 1 \pm jx_m$. In terms of input impedance this is where $Z_{m,i} = Z_0 \pm jX_m$.
4) Find the distance d_i from z_L to the match points using the "WAVELENGTHS TOWARD GENERATOR" scale.



5) Select one of the match points and add a discrete component (i.e., capacitor or inductor) in series with a reactance $Z_m = \mp\, jX_m$. Remember $Z_{cap} = -j/\omega C$ and $Z_{ind} = j\omega L$.

6) Now, everywhere toward the generator from this location will see a normalized input impedance $z_{in} = (1 \pm jx_m) \mp jx_m = 1$, i.e., $Z_{in} = Z_0$.



Simple
Smith Chart