# How to resolve convergence error

Problem

How can I troubleshoot convergence failures?

Solution

Common causes Of Convergence failure in Allegro AMS Simulator (PSpice) are:

1. Lack of Limiting
2. Rapid Voltage Transitions
3. Model Discontinuities
4. ABM expression singularities
5. Large Floating Capacitors

From SPB 16.2 version onwards, you have a function called AutoConverge under Simulation Settings > Options > Analog Simulation, as shown below:
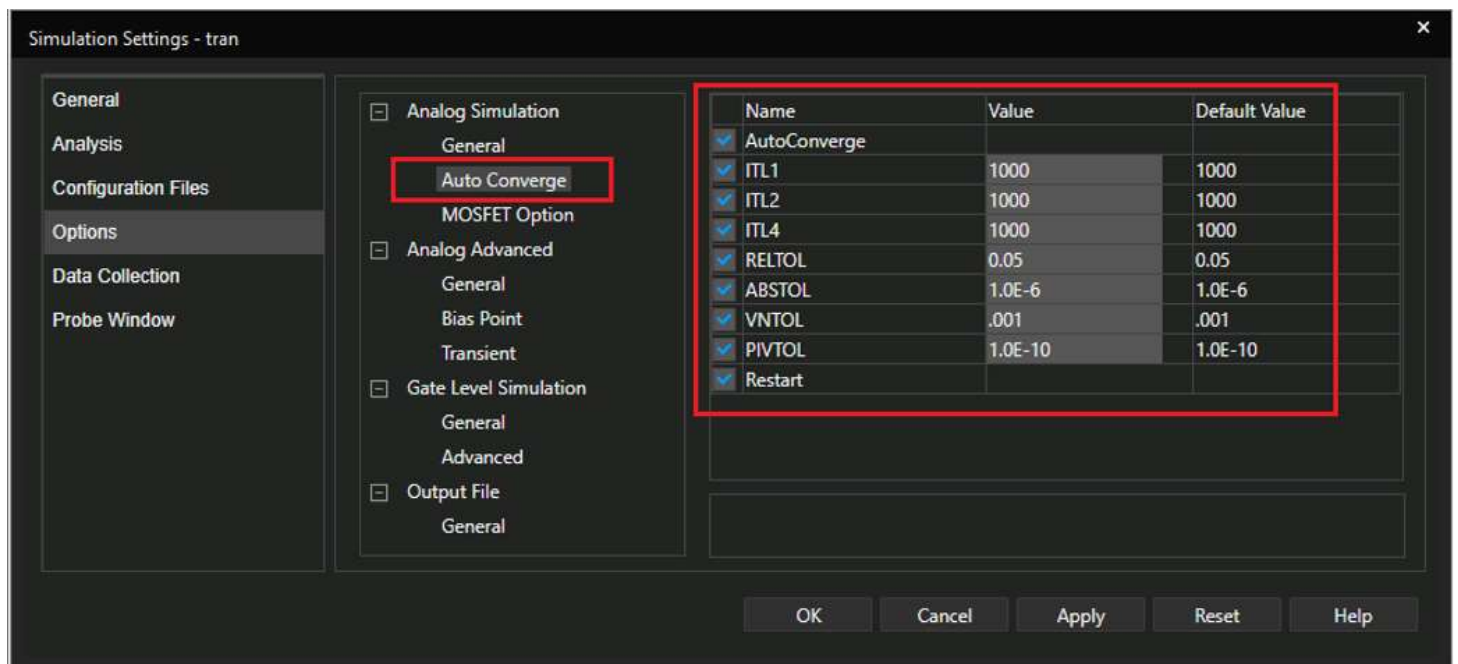
You could activate the AutoConverge option and run the simulation. Above functionality should avoid your most of the convergence problem but below are few troubleshooting guidelines for Convergence Failure:

1. Examine the non-convergence error message in the .out file to further localize the problem. In the previous/current iteration voltage printout, note the largest voltages (as large as 1E10) to help find the root the problem.
2. Check the direction of independent and dependent current sources. A convergence problem can result when current is forced backward through diodes or pn junctions.
3. Check that diodes are forward biased in the reported voltages for the last iteration. Add a shunt resistor if necessary to keep them forward biased.
4. Try using GMIN stepping.
5. Try raising ITL1 to 500, RELTOL to 0.01, and using NODESETs.
6. Look for large currents for the problem devices and currents. A current or voltage that reaches +/-1E10 indicates that the maximum value has been reached. These locations are often the starting point of nonconvergence. For high power circuits where currents exceed 1000A, it will be necessary to increase ABSTOL, as the default (1e-12) is set for IC currents.
7. In a DC sweep, consider increasing ITL2 to 500, and using a smaller step size.
8. If a particular model is suspect, isolate it in a test circuit to attempt to generate similar DC curves. If a single device shows the problem, look for unrealistic model parameters. Try simplifying the model to obtain better convergence.
9. Try using NODESETs to help PSpice find a stable solution.
10. Transient analysis can occasionally have convergence issues with very small time steps, especially if the small time steps results in model discontinuities to become significant. To avoid this try increasing the max step size (from PSpice > Edit simulation settings > options) and then check.
11. Divide the circuit into smaller pieces and simulate them individually.

12. Check that for singularities in ABM expressions. In particular, look for denominators which contain circuit variables. Try adding a small offset to the denominator to prevent it from becoming zero.