SYMBOLIC

The **SYMBOLIC** statement performs a symbolic factorization in preparation for the LU decompositions in the solution phase of the program.

```
SYMBOLIC

{NEWTON | GUMMEL}
CARRIERS=<N> [ {ELECTRON | HOLES} ]
[ ELE.TEMP [COUP.ELE] ] [ HOL.TEMP [COUP.HOL] ] [EB.POST]
[ LAT.TEMP [COUP.LAT] ]
[MIN.DEGR] [ILUCGS] | [BICGS]) [STRIP] [VIRTUAL] [PRINT]
```

Parameter	Type	Definition	Default	Units
NEWTON	logical	Specifies that the Newton solution method is used.	true	
GUMMEL	logical	Specifies that the Gummel solution method is used.	false.	
CARRIERS	number	The number of carriers to be simulated.	1	none
ELECTRON	logical	Specifies that the simulation is for electrons if a solution for one carrier is being obtained.	true	
HOLES	logical	Specifies that the simulation is for holes if a solution for one carrier is being obtained.	false	
ELE.TEMP	logical	Specifies that the simulation is done for Poisson, continuity and electron temperature.	false	
COUP.ELE	logical	Specifies that the electron temperature equation is fully coupled (i.e. solved simultaneously) with the carrier continuity equation(s) and the Poisson equation.	false	
HOL.TEMP	logical	Specifies that the simulation is done for Poisson, continuity and hole temperature.	false	
COUP.HOL	logical	Specifies that the hole temperature equation is fully coupled (i.e. solved simultaneously) with the carrier continuity equation(s) and the Poisson equation.	false	
EB.POST	logical	Specifies that post-processing energy balance analysis is used. Post-processing energy balance ignores the electron/hole temperature dependence of the continuity equations giving an approximate solution, but with great savings in CPU time over the complete energy balance model.	false	
LAT.TEMP	logical	Specifies that the simulation is done for Poisson, continuity and lattice temperature. This parameter is only used with the Lattice Temperature AAM.	false	
COUP.LAT	logical	Specifies that the lattice temperature equation is fully coupled with the Poisson and continuity equations. This parameter is only used with the Lattice Temperature AAM.	false	
MIN.DEGR	logical	Specifies that a minimum degree ordering of the pivots for decomposition in order to reduce the size of the generated L and U matrices. In the case that a solution method using a complete LU factorization is used, this reduces the solution time for solving the linear system. If an iterative method relying on incomplete factorization is selected, specifying this parameter may inhibit convergence.	true	

Parameter	Type	Definition	Default	Units
ILUCGS	logical	Specifies that an incomplete symbolic factorization is performed instead of direct LU decomposition in order to conserve memory and ILUCGS is used to solve the linear system. **synonym: INCOMPLE**	false	
BICGS	logical	Specifies that an incomplete symbolic factorization is performed instead of direct LU decomposition in order to conserve memory and Bi-CGSTAB is used to solve the linear system.	false	
STRIP	logical	Specifies that if two adjoining elements form a rectangle, the coupling between the nodes along the diagonal are removed from the symbolic map.	False if **NEWTON** is specified and **IMPACT.I**, **PRP-MOB**, or **EJ.MOBIL** has been selected on the **MODELS** statement; otherwise, true.	
VIRTUAL	logical	Generates virtual nodes at heterojunctions	false	
PRINT	logical	Specifies that memory allocation information for the run should be printed to the standard output file.	false	

Description

The **SYMBOLIC** statement performs a symbolic factorization in preparation for the LU decompositions in the solution phase of the program.

See Also... To further illustrate the **SYMBOLIC** statement, refer to:

- Input file *mdex1* in "Saving Zero Bias Solution" on page 4-9
- Input file *mdex2* in "Generation of the Simulation Structure" on page 5-1
- Most other examples where a solution is calculated

Usage

Because each of the available numerical solution techniques used by the program may result in entirely different linear systems, the method used and the number of carriers to be simulated must be specified at this time. A symbolic factorization should be performed whenever the solution technique is changed, and before the next **SOLVE** statement if the mesh has been refined as the result of a **REGRID** statement