HSPICE Quick Reference Card

Input Deck Format

*.TITLE
* COMMENT
$ COMMENT
*(OPTIONS)
*(TEMP) temperatures
*(Analysis)
*(PRINT/PLOT)
Circuit Description
+ CONTINUATIONS
*INCLUDE modules.n
 *(LIB) library-files
*(ALTER
  .DEL LIB
  .LIB
  Circuit Description
  Restricted Commands
)
*.END

File Inclusion
*.INCLUDE 'filename'

Library Definitions
General form of a library file is
.LIB entry_name1
  (valid HSPICE syntax)
.ENDL entry_name1
.LIB entry_name2
  (valid HSPICE syntax)
.ENDL entry_name2

Library Call Statement
*.LIB 'lib_file_name' entry_name

Library Delete Statement
*.DEL LIB 'lib_file_name' entry_name

Subcircuit Definition
*.SUBCKT subroutine (local nodes) (parameters)
  Subcircuit Description
.ENDS subroutine

Subcircuit Call Statement
XXXXXX nodes subroutine (parameters) (M = multi)

Types of Analysis
*.OP (ALL | VOLTAGE | CURRENT) (time)
.DC var1 start1 stop1 incr1 (var2 start2 stop2 incr2)
.DC var1 start1 stop1 incr1 (SWEEP var2 type np start2 stop2)
.DC var1 type np start1 stop1 (SWEEP MONTE = val)
.DC var1 type np start1 stop1 (SWEEP DATA = dataname)
.DC DATA = dataname (var2 start2 stop2 incr2)
.AC type np fs start fsstop
.AC type np fs start fsstop (SWEEP var pstart pstop pstep)
.AC type np fs start fsstop (SWEEP var np start stop)
.AC type np fs start fsstop (SWEEP DATA = dataname)
.AC type np fs start fsstop (SWEEP MONTE = val)
.TRAN step1 start1 step2 stop2... (START = printtime UIC)
+ (SWEEP MONTE = val)
  For .DC, .AC or .TRAN as follows:
  1) type may be one of the following keynames DEC, OCT, LIN, and POL.
  2) Two distributions, Gaussian and Uniform, are available for Monte Carlo analysis by using
  .PARAM xx = UNIF(nom_val, variation)
  or
  .PARAM xx = GAUSS(nom_val, variation, sigma).
.PZ output input
  Output may be node voltage or branch current. Input may be independent voltage or current source.
.NET input (VIN = val) or .NET output (val) — one port network
.NET output input (ROUT = val) (VIN = val) or .NET output input (val) — two port network
.TF output_variable input_source
.SENS output_variables
.DISTO output_load_resistor (inter (skw2 (refpwr (spwf)))
  - 1e-3 < skw2 < 1
.NOISE output_variable source print_interval
.SAMPLE FS = fs (TOL = val) (NUMF = n) (MAXFLD = nfold)
+ (BETA = val)
  Sample noise. fs is a sample frequency in hertz.
.FOUR freq output_variable

Passive Devices
Rxxxxxx n1 n2 rval (TC = tc1 (tc2 (scale))) (M = multi)
  - Effective resistance is
  r(T) = r(T0) * scale * (1 + (tc1 * Δ T) + (tc2 * (Δ T)^2))
Cxxxxxx n1 n2 cval (tc1(tc2(scale))) (IC = v0) (M = multi)
  - v0 is used in .TRAN and is overridden by IC
Cxxxxxx n1 n2 POLY c0 c1 c2 ... (IC = v0)
  - Non-linear capacitor; effective capacitance is
  C(v) = c0 + c1 * v(t) + c2 * v^2(t) + ...
Lxxxxxx n1 n2 ival (tc1) (tc2) (IC = i0)
Lxxxxxx n1 n2 POLY c0 c1 c2 ...l (IC = i0)
  - Non-linear inductor
Kxxxxxx Lyyyyyy Lzzzzzz iival
Kxxxxxx Lyyyyyy (Lzzzzzz, ... ... modelname (MAG = mval)
  - magnetic core transformer
Lxxxxxx n1 n2 DT = nival (R = rval) (IC = i0)
  - magnetic core winding element
Txxxxxx n1 nr1 n2 nr2 Z0 = val TD = val (IC = v1,i1,v2,i2)

Sources
Vxxxxxx n + n- (DC = dcval) (AC = mag (phase)) scrtype
lxxxxxx n + n- (DC = dcval) (AC = mag (phase)) scrtype
Valid source types are:
  PULSE vlo vhi (delay rise fall width period)
  PWL v1 t1 (t2 v2...) (R)
  PL v1 t1 (v2 t2...) (R)
  SIN vo va (freq td theta phase)
  EXP v1 v2 (td1 tau1 td2 tau2)
  SFFM vo va (fc mdi fs)
Linear and non-linear dependent sources are also available. Consult manual Chapter 8 for more info.
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Parameters
.PARAM name1 = value1...

PN Diodes
Dxxxxx n + n-modelname (area) (IC = vds0) (M = mult)

Bipolar Devices
Qxxxxxx nc nb ne ns modelname (area) (M = mult)
+ (IC = vbe0, vce0)

JFET Devices
Jxxxxxx nd ng ns modelname (area) (IC = vds0, vgs0)
+ (M = multi)

MOS Devices
Mxxxxxx nd ng ns (nb) modelname (L = length)
+ (W = width) (IC = vds0, vgs0, vbs0) (M = multi)

MODELS
.MODEL mname type (pname1 = pval1 ... pnamen = pvaln)
- type - model type must be one of the following 11 types:
  (1) R - linear resistor (wire) model.
  (2) C - linear capacitance model.
  (3) L - magnetic core model.
  (4) AMP - OP-AMP model.
  (5) D - diode model.
  (6) NPN - NPN BJT model.
  (7) PNP - PNP BJT model.
  (8) NJF - n-channel JFET model.
  (9) PFJ - p-channel JFET model.
(10) NMOS - n-channel MOSFET model.
(11) PMOS - p-channel MOSFET model.

Measuring Rise/Fall/Delays
.MEAS DC | TRAN | AC measurablename TRIG_var
+ VAL = trig_val
+ (TD = time_delay) (CROSS = #crossing) (RISE = #rise)
+ (FALL = #fall)
+ TARG tar_var VAL = tar_val (TD = time_delay)
+ (CROSS = #crossing) (RISE = #rise) (FALL = #fall)

Measuring Average/RMS/Min/Max/P2P
.MEAS DC | TRAN | AC measurablename func out_var
+ (FROM = value) (TO = value)
- func may be the one of AVG, RMS, MIN, MAX, or PP.

Measuring ERR
.MEAS DC | TRAN | AC measurablename ERR out_var1 out_var2
+ (MINVAL = val) (IGNOR = val) (FROM = value) (TO = value)

DATA Statement
.DATA data_name pnam1 (pnam2 ... pnam9, pnam 10)
+ pval1 (pval2 ... pval9 pval10)
+ pval11 (pval12 ... pval19 pval10"
+ ... (.........................)

Run-Time Options
.OPT options
- Options may be changed or reset from run to run.
- Some useful options:
  LIST : Print element summary listing.
  NODE : Print nodal cross-reference table.
  NOMOD : Suppress printing of model parameter data.
  NUMDGT = x : Number of output digits. (1 < x < 7;
  default = 4)
  OPTS = X : Print values of options used.
  TNOM = 0 : Reset nominal temperature
  (default = 25 degrees C)
  INGOLD = 1 : Output numbers in engineering format
  (using *m for milli, for example)
  CO = x : Set output width (Default = 80; see also
  .WIDTH below)

.WIDTH (IN = columns_in) (OUT = columns_out)

Printing / Plotting Output
.PRINT analysis_type var1 (var2 ...)
.PLOT analysis_type var1 (lo1, hi1) (var2) (lo2, hi2)
- Each plot variable is plotted using the first set of limits to its
  right. Each variable need not have its own limits. Program
  calculates default limits if not specified. Use (0,0) for defaults to
  be applied to an individual variable.

Output variable format:
V(n1) - Single node voltage.
V(n1, n2) - Voltage between two nodes.

Xij(z), ZIN(z), ZOUT(z), YIN(z), YOUT(z) - AC network
analysis.
X may be the one of Z, Y, H, or S. The i or j may be 1 or 2.
/ z may be the one of the output types R, I, M, P, DB, or T
(group time delay).

F(element_name).POWER - The instantaneous element power
and total power dissipation for DC or TRAN analysis type.

For group time delay calculation, VT replaces V and GN replaces
In(element_name).
For AC, use VDB, VM, VP, VI, or VR in place of V.
I (vsrc) - Current through a voltage source (+ to -).
I (Xsubckt0, Xsubckt1, Lvsr) - Current through voltage source
vsrc in subckt1, which itself is part of subckt 0.

In(Xsubckt0, Xsubckt1, element)
- Current through the nth node of an element (as listed in the
  element statement).
LXNN(XXXX) - To obtain output of user-input statement
variables and model parameters.
LXNN(XXXX) - To obtain output of stored charges, capacitance
current, capacitances, and variable derivatives.
XXXX represents element name.
See Chapter 10.3.4.