



Alphabetic Key Word Catalogue for PUFF 2.1

Key Word	Commands / key combinations
Break port connection to circuit	Press F1. Position the cursor on appropriate connection point of a port in circuit and then enter key combination <Shift + port number>.
Change dielectric constants of material in printed circuit board	Press F4, then enter new value under menu item "er".
Change external dimensions of printed circuit board	Press F4, then enter new value under menu item "s".
Rectangular plot diagram: Change horizontal frequency axis or vertical dB axis	Press F2, then press the "Cursor up" or "Cursor down" key until you reach the desired value or the desired diagram axis. Now the new minimum or maximum value can be entered on the frequency axis or on the dB results axis.
Change intervals of printed circuit board	Press F4, then enter new value under menu item Ports "c".
Change loss tangent of printed circuit board material	Open the setup.puf file or the special file of the project with a text editor. Then search for the appropriate line starting with "lt" and enter the new value. Note: Please use "scientific notation", in the form of a figure and a power of ten when entering data! Example: lt 2.0E-0004 {dielectric loss tangent}
Change metal thickness on a printed circuit board	Open setup.puf file or *.puf file of a special project using a text editor and enter new value in "mt" line. Example: mt 0.035mm. (metal thickness, use Um for micrometers)
Change microstrip with dispersion and attenuation	Enter tline! (or simply just "t!") instead of tline. Note: Before Puff is loaded, the appropriate file must first be called up with a text editor (or the SETUP.puf file for a new start). Then the printed circuit board thickness, the thickness of the Copper layer, the surface roughness and the loss tangent for the intended design frequency must be entered and saved there. Example:



	<p>Values for FR4, material for frequency 1,700MHz $\epsilon_r = 4.33$ loss tangent = 1.5 E-2 Printed circuit board thickness $s = 1.5\text{mm}$. Conductor thickness = 0.035mm. Surface roughness = 0.002mm.</p>
Change number of plot points	Press F2, position cursor on "points" and enter number of calculation steps by hand (max. 499 in normal version, 1,000 in protected mode).
Change Smith diagram radius	Press F2 then, position cursor on "Smith radius", then enter desired radius (values between zero and infinity are permissible). Values under 1 give "Section magnification".
Change start frequency for plot procedure and calculation	Press F2 and then the cursor key (up or down) until the cursor is on start frequency for lower right hand of the diagram (Rectangular Plot for frequency response). Enter the new frequency, then start plot procedure using <p> or <q>.
Change stop frequency for plot procedure and calculation	Press F2 and then the cursor (up or down) until cursor is on stop frequency for lower right hand of the diagram (Rectangular Plot for frequency response). Enter new stop frequency, then start plot procedure using <p>.
Change surface roughness of copper layer on a printed circuit board	<p>Open the setup.puf file or the *.puf file of the special project with a text editor and enter the new value in the line "s".</p> <p>Example: sr: 2,000 Um (metal surface roughness, use Um for micrometers)</p>
Change thickness of printed circuit board material	Press F4, then enter new value under menu item "h".
Changing port connection intervals on printed circuit board in field F1	Press F4, then enter the new value under menu item "s"
Connect port to layout	Press F1. Position the cursor on appropriate end point of circuit, enter number of port, followed by <Return>.
Inserting coupled lines	Enter these in F3 component list, using "Clines" or just "cl" followed by the values of "Even" and "Odd" impedance, if the impedance level of the coupled lines is different from the system imped-



	<p>ance. Then the electrical length must also be specified.</p> <p>NOTE: If all spurious effects and losses are to be taken into account, enter an exclamation mark after "cl". If the impedance levels of the system and the coupled line correspond, then only one of the two impedance values must be entered (irrespective of whether it is "Even" or "Odd"). Puff then calculates the second missing value, using the formula</p> <p>"$Z_2 - Z_{\text{even}} \times Z_{\text{odd}}$" and copies it into the *.puf file.</p> <p>(Incidentally, scarcely any competitors products can do this.)</p>
Degree sign (°) for entering the angle for components e.g. for electrical lengths of line sections	<Alt d> (if in the F3 list)
Delete component on printed circuit board	Press F1, position cursor at start of component and delete it with key combination <shift + cursor direction key>.
Delete component (in F1 layout)	Press F1, move the cursor to start of the component and delete it using key combination <shift+cursor direction key>
Delete entire circuit on printed circuit board	Press F1, then <CTRL E>
Delete jump response in time domain	<s> (in the F2 list)
Delete pulse response	<i> (in the F2 list)
Displaying dimensions of components and lines	<p>Press F3, position cursor on component line in question and press <=>. The data then appear in the dialogue window.</p> <p>Note: If "real" simulation has been selected by adding an exclamation mark, then the first time you press this key you will just obtain the actual values for the impedances and the electrical length at low frequencies. Only when you have deleted the exclamation mark will the equals sign cause the mechanical line data to be displayed!</p>
Bring earth connection to a circuit point in printed circuit board	< = > (in the F1 area)
Enter component value (in F3 list)	<p>Press F3, move cursor to a free line of list and enter: "lumped..." (the letter "l" is sufficient).</p> <p>The components can be entered individually or as series or as a parallel circuit. Permissible units for</p>



	resistances are either " Ω , $k\Omega$, etc." or values standardised to the system impedance ("1z", "0.3z", etc.). Dummy elements can be specified using the correct unit (e.g. pF, mH) or as an imaginary impedances ("+j10") or as imaginary impedances standardised to the system impedance ("-j5z"). Example for series circuit: "2 + j4-j3z"
Exit Puff	Press <ESC> twice.
Expand F3 component list (because items a...h are not sufficient)	Press F3, then press the tab key.
Help	Press key <F10>.
Jump to next node in layout	<CTRLn> (in the F1 area)
Load American character set (to get Ohms sign, etc.)	Before loading PUFF.EXE: <cd c:\puff>, then <chcp 437> (Note: Change AUTOEXEC.BAT and CONFIG.SYS first!)
Load a design file	Press F3, enter <CTRLr> then the file name and press <Return>. (Note: The file must have extension *.puf. But this need not be indicated.)
Load printer driver	<cd c:\puff> before loading PUFF.EXE: then, e.g. <vga2pro.com> for IBM Proprinter. Then <puff.exe>
Manhattan setting in field F4	Press key F4, then you can switch between microstrip, stripline and Manhattan entries in circuit diagram field F1, using the tab key. "Manhattan" signifies that the lines listed in the F3 list and then entered using F1 are represented as being the same size as discrete components, irrespective of their actual length. This saves space and avoids the message: "the part lies outside the board". Everything eventually looks rectangular and uniform like a street plan of New York.
Micro-sign " μ " (e.g. for micro-Henry)	<Alt m> (if in the F3 list)
Microstrip setting in F4 list	Press key F4, then you can switch between microstrip, stripline and Manhattan entries in the design area F1, using the tab key. "Microstrip" signifies that a line or coupled line entered in the F3 list is being treated and calculated as a microstrip version by the stripline calculator. Pressing the equals sign then shows the associated mechanical data for the line.



Enter Ohms sign "Ω"	<Alt o> (if in the F3 list)
Output alternate parallel circuit for S11 or S22	Press F2, set the desired frequency and check whether the Smith chart is set to "Conductance" ("admittance"). (It's easy to recognise here that the "little circles around the infinity point" are on the left in the diagram.) If not, then switch over using the tab key. Now you can position the cursor on S11 or S22 in the F2 list. If the equals sign is now entered, then the dialogue window shows the parallel effective resistance, the parallel reactive impedance and the parallel inductance or capacity associated with the reactive impedance.
Output alternate series circuit for S11 or S22	Press F2, select desired frequency and check whether Smith chart is set to "Impedance". (Easy to recognise that the "little circles round the infinity point" are on the right in the diagram.) If not, switch over using the tab key before positioning cursor on S11 or S22. If the equals sign is entered now, the dialogue window displays series effective resistance, series reactive impedance and the series inductance and/or series capacity associated with the reactive impedance.
Enter parallel sign for discrete component combinations	<Alt p> (in the F3 list)
Position component (in F1 layout)	Press F1, select the connection point for the component using the cursor and enter correct letter (see component list in F3 list). Then position component by pressing appropriate cursor direction key
Print design layout	Press F2, then <CTRLa>. (If required the magnification factor p must be entered directly in circuit file *.puf (new if desired), using a text processor)
Print out screen	For DOS: Press <PRINTSCREEN> key. (Note: Only works if printer driver, e.g. VGA2PRO.COM, is loaded before starting PUFF). For WINDOWS, this only copies screen to the Clipboard. It can then be further processed using an appropriate graphics program: e.g. CAPTURE, PAINT, PAINTSHOP PRO, IRFAN-VIEW, etc. and/or printed out
Print out Smith diagram	Press <PRINT SCREEN> key (Note: Will not work in DOS unless print driver loaded before start, e.g. VGA2PRO.COM). In Windows, this copies screen to the Clipboard and it can then be further process-



	ed using a suitable graphics program (CAPTURE, PAINT, PAINTSHOP PRO, IRFAN-VIEW, etc.) and/or printed out.
Smith diagram: Re-position frequency mark	Activate using "Page up" or "Page down" key.
Save a design file	Press F2, then <CTRL>, enter a new file name if applicable and press <Return>.
Select S parameter for calculation and plot procedure	Press F2, move the cursor down and enter the desired parameter after the letter "S" (e.g. S11).
Set Puff up for first start	DOS: Put a "PUFF.BAT" batch file into basic directory c: content: <chcp 437>, <cd c:\puff>, <vga2pro.com>, <puff> under Windows: use an icon with a link to start screen, but don't forget to set the main memory ranges under "Properties, memory". The conventional memory and the initial environment memory must be set to "Auto". The other hand, EMS, XMS and DPMI must each be set to "4096 kilobytes". Otherwise nothing at all will work!
Smith diagram: Switch from resistance display to conductance display	Press F2, then press the tab key.
Start plot procedure (including calculation)	<p> (in the F2 list)
Start plot procedure after change and also represent old plot	<CTRL p> (in the F2 list)
Start plot procedure as quick display (goes much faster, but result not shown until after all calculations in diagram completed)	<q> (in the F2 list)
Start plot procedure as quick display after a change and also display old plot	<CTRL q> (in the F2 list)
Set stripline in F4 list	Press key F4, you can then use the tab key to switch between microstrip, stripline and Manhattan entries in the circuit diagram F1. "Stripline" means that a line or coupled line is treated and calculated as a "coplanar" version by the stripline calculator. Press-ing the equals sign then shows the associated mechanical data for the line.

**Component Sweep**

A component from the parts list can have its value changed by the program while the other components and the frequency are kept constant. In this way, a circuit can be optimised. But to do this we must first go to the F3 list and put a question mark in front of the component value.

Example: lumped ?10pF

or tline 50 ?900

Now press F2, the "Sweep limits" for the component are first set on the horizontal axis of the rectangular plot diagram, e.g.

5pF to 15pF for capacitors or

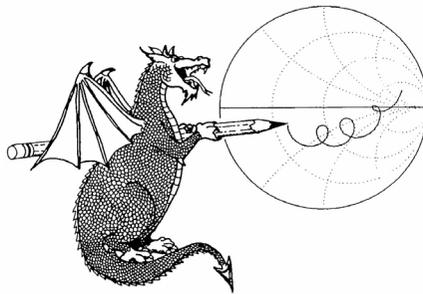
70° to 110° for microstrip line

Switch Smith diagram to "Full Screen"

Press F2, then <Alt s>.

Switch Smith diagram back from "Full Screen" to "Small Diagram" with separately displayed frequency response curve

<ALT s> (in the F2 list)



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Available from K M Publication, 63 Ringwood Road, Luton,
Beds, LU2 7BG, UK

Tel/Fax: +44 (0)1582 581051 email: andy@vhfcomm.co.uk
web: www.vhfcomm.co.uk