AUTO 2000 Quick Reference

Command line:

Aliases	Description
ap append	Append data files
cat	Print the contents of a file
cd	Change directories
clean cl	Clean the current directory
copydemo	Copy a demo into the current directory
sv save	Save data files
gui	Show AUTOs graphical user interface
delete dl	Deleta data files
df deletefort	Clear the current directory of fort files.
double db	Double a solution.
man help	Get help on the AUTO commands.
ls	List the current directory.
move mv	Move data-files to a new name
cn constantsget	Get the current continuation constants.
bt diagraman-dsolutionget	Parse both bifurcation diagram and solution.
dg diagramget	Parse a bifurcation diagram
sl solutionget	Parse solution file.
p2 pl plot	2D plotting of data.
plot3 p3	3D plotting of data.
br bp branchpoint	Print the “branch-point function”
ev eg eigenvalue	Print eigenvalues of Jacobian (algebraic case).
fl floquet	Print the Floquet multipliers.
hb hp hopf lp	Print the value of the “Hopf function”
it iterations	Print the number of Newton iterations.
lm limitpoint	Print the value of the “limit point function”.
nt note	Print notes into file.

Aliases	Description
ss st stepsize	Prints continuation stepsizes.
r rn run	Run AUTO.
ld load	Load file into AUTO runner.
shell	Run a shell command.
pc pr printconstant	Print continuation parameters.
us userdata	Covert user-supplied data files.

Solution Types:

BP	**(1)**	Branch point (algebraic systems).
LP	**(2)**	Fold (algebraic system).
HB	**(3)**	Hopf bifurcation
	(4)	User-specified regular output point
UZ	**(-4)**	Output at user-specified parameter value.
LP	**(5)**	Fold (differential equations)
BP	**(6)**	Branch point (differential equations).
PD	**(7)**	Period doubling bifurcation
TR	**(8)**	Torus bifurcation
EP	**(9)**	End point of branch normal termination.
MX	**(-9)**	Abnormal termination: no convergence

Output Files:

1. **b.xxx bifurcation**
2. **s.xxx solution**
3. **d.xxx dynamics of stability**

Constants:

Problem Constants

NDIM - dimension of the system of equations
NBC - number of boundary conditions
NINT - number of integral conditions
JAC - {0,1} no derivative, supplied derivative

Discretization Constants

NTST - number of mesh intervals used for discretization
NCOL - number of Gauss collocations points per mesh interval, typically [2,7]
IAD - 0 fixed mesh, >0 adapt the mesh every IAD steps along branch usually IAD=3

Tolerances

EPSL - use values10^{-6} or 10^{-7}
EPSU - use values10^{-6} or 10^{-7}
EPSS - use values10^{-4} or 10^{-5}, should be 100 to 1000 times the value of EPSL/EPSU
ITMX - maximum number of iterations to locate a special solution ITMX=8
NWTN - full Newton applied when Jacobian frozen NWTN=3
ITNW - maximum number of combined Newton-Chord iterations ITNW=5

Continuation Step Size

DS - defines the pseudo-arclength stepsize for first attempted
DSMIN- minimum pseudo-arclength step
DSMAX- maximum pseudo-arclength step
IADS - controls the frequency of adaptation of pseudo-arclength stepsize (0 fixed) IADS=1
NTHL - defines the number of parameters whose weights is to be modified If NTHL=0 all weights have defaults 1.0.If NTHL>0 then enter *Parameter index Weight*, with each pair on a separate line.
NTHU – modify state variables NTHU=0 all weights will have default value 1.0

Diagram Limits

NMX – maximum number of steps to be taken along any branch
RL0 – lower bound on the principal continuation parameter
RL1 – upper bound on the principal continuation parameter
A0 - lower bound on the principal solution measure
A1 - upper bound on the principal solution measure

Free Parameter

NICP – number of free parameters
ICP – designates the free parameters

Fix point NICP = 1 ICP(1)= 1. → PAR(1) designated as free parameter
Periodic Solution NICP = 2 ICP(1)= 1 ICP(2)= 10.
Folds and Hopf NICP = 2 ICP(1)= 1 ICP(2)= 2. and ISW = 2

Computation Constants

ILP – {0,1} detection of folds (0 no detection)
ISP – detection of branch points, period-doubling, and torus bifurcations

ISP = 0 disables detection
ISP = 1 for algebraic equations
ISP = 2 enables the detection of all special solutions
ISP = 3 branch points detected (Floquet multipliers not monitor)

ISW – controls branch switching at branch points

ISW = 1 normal values of ISW
ISW = -1 branch switching
ISW = 2 fold, Hopf bifurcations

MXBF – only effects algebraic problems
IRS – label of the solution where computation starts

IRS = 0 first run IRS > 0 restart at a given label

IPS – defines the problem type

IPS=1 stationary solutions of ODEs with detection of Hopf - stable + unstable (fort.7)
IPS=2 periodic solutions - stable + unstable or unknown (fort.7)

Output control

NPR – write output every NPR steps
IID – controls output printed in fort.9 {0,1,2,3,4,5} greater IID more details
IPLT – redefinition of the principal solution measure IPLT=0 L_2-norm is printed
NUZR – parameter values written in fort.8 NUZR=0 (no output)