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# **ILOG CPLEX 10.2**

## **Interactive Optimizer**

**March 2007**

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# Interactive Optimizer Commands

This manual lists the commands of the Interactive Optimizer of ILOG CPLEX. For an introduction to the Interactive Optimizer, see the manual *Getting Started*, especially the tutorial for the Interactive Optimizer.

This manual begins with a table that lists Interactive Optimizer commands in alphabetic order with their primary options. For some commands, it also tells where examples of their use can be found in the *ILOG CPLEX User's Manual* or *Getting Started*.

These topics follow the table:

- ◆ *Managing Parameters in the Interactive Optimizer* on page 16
- ◆ *Saving a Parameter Specification File* on page 17

Interactive Optimizer Command		Options	Example
add			<i>Adding Constraints and Bounds</i> on page 60 in <i>Getting Started</i>
baropt			<i>Using Alternative Optimizers</i> on page 50 in <i>Getting Started</i>
baropt	dualopt		

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Interactive Optimizer Command		Options	Example
baropt	primopt		
baropt	stop		
change	bounds		<i>Changing Bounds on page 63 in Getting Started</i>
change	coefficient		<i>Changing Coefficients on page 64 in Getting Started</i>
change	delete		<i>Deleting on page 64 in Getting Started</i>
change	delete	constraints	<i>Deleting a Constraint on page 359 in User's Manual</i>
change	delete	qconstraints	
change	delete	indconstraints	
change	delete	sos	
change	delete	variables	
change	delete	equality	
change	delete	greater-than	
change	delete	less-than	
change	name		<i>Changing Constraint or Variable Names on page 62 in Getting Started</i>
change	objective		<i>Objective &amp; RHS Coefficients on page 64 in Getting Started</i>
change	problem	<i>type</i>	<i>Using the MIP Solution on page 271 Changing Problem Type in QPs on page 222 Diagnosing QP Infeasibility on page 225 in User's Manual</i>
change	qp term		<i>Changing Quadratic Terms on page 223 in User's Manual</i>
change	rhs		<i>Objective &amp; RHS Coefficients on page 64 in Getting Started</i>
change	sense		<i>Changing Sense on page 62 in Getting Started</i>
change	type		<i>Changing Variable Type on page 250 in User's Manual</i>

Interactive Optimizer Command		Options	Example
conflict			<i>Meet the Conflict Refiner in the Interactive Optimizer on page 356 in User's Manual</i>
display	conflict	all	<i>Displaying a Conflict on page 358 in User's Manual</i>
display	conflict	constraints	<i>Displaying a Conflict on page 358 in User's Manual</i>
display	conflict	indicators	
display	conflict	qconstraints	
display	conflict	sos	
display	conflict	variables	<i>Displaying a Conflict on page 358 in User's Manual</i>
display	problem	all	<i>Displaying a Problem on page 42 in Getting Started</i>
display	problem	binaries	<i>Interactive Optimizer Display Options for MIP Problems on page 248 in User's Manual</i>
display	problem	bounds	<i>Displaying Bounds on page 47 in Getting Started</i>
display	problem	constraints	<i>Displaying Constraints on page 46 in Getting Started</i>
display	problem	generals	<i>Interactive Optimizer Display Options for MIP Problems on page 248 in User's Manual</i>
display	problem	histogram	<i>Detecting and Eliminating Dense Columns on page 200 in User's Manual or Displaying a Histogram of NonZero Counts on page 47 in Getting Started</i>
display	problem	indicators	
display	problem	integers	<i>Interactive Optimizer Display Options for MIP Problems on page 248 in User's Manual</i>
display	problem	names	<i>Displaying Variable or Constraint Names on page 45 in Getting Started</i>
display	problem	qconstraints	
display	problem	qpvariables	

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Interactive Optimizer Command		Options	Example
display	problem	semi-continuous	
display	problem	sos	
display	problem	stats	<i>Solve the Problem You Intended on page 140 or Interactive Optimizer Display Options for MIP Problems on page 248 in User's Manual</i>
display	problem	variable	
display	sensitivity	lb	<i>Performing Sensitivity Analysis on page 52 in Getting Started</i>
display	sensitivity	objective	<i>Performing Sensitivity Analysis on page 52 in Getting Started</i>
display	sensitivity	rhs	<i>Performing Sensitivity Analysis on page 52 in Getting Started</i>
display	sensitivity	ub	<i>Performing Sensitivity Analysis on page 52 in Getting Started</i>
display	settings		<i>Displaying Parameter Settings on page 60 in Getting Started</i>
display	settings	all	<i>Displaying Parameter Settings on page 60 in Getting Started</i>
display	settings	changed	<i>Displaying Parameter Settings on page 60 in Getting Started</i>
display	solution	basis	
display	solution	bestbound	
display	solution	dual	
display	solution	kappa	<i>Measuring Problem Sensitivity with Basis Condition Number on page 177 in User's Manual</i>
display	solution	objective	
display	solution	quality	<i>Coping with an Ill-Conditioned Problem or Handling Unscaled Infeasibilities on page 180 or Understanding Solution Quality from the Barrier LP Optimizer on page 195 in User's Manual</i>
display	solution	reduced	

Interactive Optimizer Command		Options	Example
display	solution	slacks	<i>Displaying Post-Solution Information on page 51 in Getting Started</i>
display	solution	qcslacks	
display	solution	variables	<i>Displaying Post-Solution Information on page 51 in Getting Started</i>
enter			<i>Entering a Problem on page 38 in Getting Started</i>
feasopt	constraints		<i>Invoking FeasOpt on page 372 in User's Manual</i>
feasopt	variables		<i>Invoking FeasOpt on page 372 in User's Manual</i>
feasopt	all		<i>Invoking FeasOpt on page 372 in User's Manual</i>
help			<i>Using Help on page 36 in Getting Started</i>
mipopt			<i>Using the Mixed Integer Optimizer on page 251 in User's Manual</i>
netopt			<i>Example: Network Optimizer in the Interactive Optimizer on page 209 or CPX_ALG_HYBNETOPT on page 287 in User's Manual</i>
optimize			<i>Solving a Problem on page 48 in Getting Started</i>
primopt			<i>Using Alternative Optimizers on page 50 in Getting Started</i>
quit			<i>Quitting ILOG CPLEX on page 67 in Getting Started</i>
read	<i>filename</i>	<i>type</i>	<i>Starting from an Advanced Basis on page 168 or Understanding the Network Log File on page 210 in User's Manual</i>
set	advance		<i>Starting from an Advanced Basis on page 168 in User's Manual</i>
set	barrier		<i>Using the Barrier Optimizer on page 190 in User's Manual</i>
set	barrier	algorithm	<i>Using the Barrier Optimizer on page 190 or Choosing an Ordering Algorithm on page 200 in User's Manual</i>

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Interactive Optimizer Command		Options	Example
set	barrier	colnonzeros	<i>Detecting and Eliminating Dense Columns on page 200 in User's Manual</i>
set	barrier	convergetol	
set	barrier	crossover	
set	barrier	display level	<i>Using the Barrier Optimizer on page 190 or Numeric Instability Due to Elimination of Too Many Dense Columns on page 204 in User's Manual</i>
set	barrier limits	corrections	<i>Change the Limit on Barrier Corrections on page 203 in User's Manual</i>
set	barrier limits	growth	
set	barrier limits	iterations	
set	barrier limits	objrange	<i>Difficulties with Unbounded Problems on page 205 in User's Manual</i>
set	barrier limits	threads	
set	barrier	ordering	
set	barrier	qcpconvergetol	
set	barrier	startalg	
set	clocktype		
set	conflict	display level	
set	defaults		<i>Resetting Defaults on page 59 in Getting Started</i>
set	emphasis	memory	<i>Lack of Memory on page 173 or Memory Emphasis: Letting the Optimizer Use Disk for Storage on page 198 in User's Manual</i>
set	emphasis	mip	<i>Emphasizing Feasibility and Optimality on page 251 in User's Manual</i>
set	emphasis	numerical	<i>Numerical Emphasis Settings on page 175 (LP) or Numerical Emphasis Settings on page 202 (barrier) in User's Manual</i>
set	feasopt	tolerance	

Interactive Optimizer Command		Options	Example
set	logfile	<i>filename</i>	<i>Filing Iteration Logs on page 50 in Getting Started</i>
set	lpmethod		
set	mip cuts	all	
set	mip cuts	<i>class</i>	<i>Parameters for Controlling Cuts on page 264 in User's Manual</i>
set	mip cuts	cliques	
set	mip cuts	covers	
set	mip cuts	disjunctive	
set	mip cuts	flowcovers	
set	mip cuts	gomory	
set	mip cuts	gubcovers	
set	mip cuts	implied	
set	mip cuts	mircut	
set	mip cuts	pathcut	
set	mip	display	
set	mip	interval	
set	mip limits	aggforcut	
set	mip limits	cutpasses	
set	mip limits	cutsfactor	<i>Parameters Affecting Cuts on page 264 in User's Manual</i>
set	mip limits	gomorycand	
set	mip limits	gomorypass	
set	mip limits	nodes	<i>Parameters to Limit MIP Optimization on page 254 in User's Manual</i>
set	mip limits	polishtime	
set	mip limits	probetime	
set	mip limits	repairtries	

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Interactive Optimizer Command		Options	Example
set	mip limits	solutions	<i>Parameters to Limit MIP Optimization on page 254 in User's Manual</i>
set	mip limits	strongcand	
set	mip limits	strongit	
set	mip limits	strongthreads	
set	mip limits	submipodelim	
set	mip limits	threads	
set	mip limits	treememory	<i>Reset the Tree Memory Parameter on page 282 in User's Manual</i>
set	mip	ordtype	
set	mip strategy	backtrack	<i>Parameters for Controlling Branch &amp; Cut Strategy on page 257 in User's Manual</i>
set	mip strategy	bbinterval	<i>Parameters for Controlling Branch &amp; Cut Strategy on page 257 in User's Manual</i>
set	mip strategy	branch	<i>Parameters for Controlling Branch &amp; Cut Strategy on page 257 in User's Manual</i>
set	mip strategy	dive	
set	mip strategy	file	
set	mip strategy	heuristicfreq	<i>Heuristics on page 265 in User's Manual</i>
set	mip strategy	lbheuristic	
set	mip strategy	nodeselect	<i>Parameters for Controlling Branch &amp; Cut Strategy on page 257 in User's Manual</i>
set	mip strategy	order	
set	mip strategy	presolvenode	
set	mip strategy	probe	<i>Probing on page 260 in User's Manual</i>
set	mip strategy	rinsheur	<i>relaxation induced neighborhood search (RINS)</i>
set	mip strategy	startalgorithm	
set	mip strategy	subalgorithm	<i>NodeAlg Parameter on page 287 in User's Manual</i>

Interactive Optimizer Command		Options	Example
set	mip strategy	variableselect	<i>Parameters for Controlling Branch &amp; Cut Strategy on page 257 in User's Manual</i>
set	mip tolerances	absmipgap	
set	mip tolerances	integrality	
set	mip tolerances	lowercutoff	
set	mip tolerances	mipgap	
set	mip tolerances	objdifference	<i>Time Wasted on Overly Tight Optimality Criteria on page 279 in User's Manual</i>
set	mip tolerances	relobjdifference	
set	mip tolerances	uppercutoff	
set	network	display	<i>Understanding the Network Log File on page 210 in User's Manual</i>
set	network	iterations	<i>Limiting Iterations in the Network Optimizer on page 211 in User's Manual</i>
set	network	netfind	
set	network	pricing	<i>Selecting a Pricing Algorithm for the Network Optimizer on page 211 in User's Manual</i>
set	network tolerances	feasibility	<i>Controlling Tolerance on page 211 in User's Manual</i>
set	network tolerances	optimality	
set	output	<i>channel</i>	
set	output	mpslong	
set	output	logonly	<i>Interpreting Solution Quality on page 181 in User's Manual</i>
set	preprocessing	aggregator	<i>Preprocessing on page 166 Preprocessing and Memory Requirements on page 174 Parameters for Controlling MIP Preprocessing on page 267 in User's Manual</i>
set	preprocessing	boundstrength	<i>Parameters for Controlling MIP Preprocessing on page 267 in User's Manual</i>

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Interactive Optimizer Command		Options	Example
set	preprocessing	coeffreduce	<i>Parameters for Controlling MIP Preprocessing on page 267</i> <i>Examples: Optimizing a Basic MIP Problem on page 288 in User's Manual</i>
set	preprocessing	dependency	<i>Preprocessing on page 166 (continuous)</i> <i>Preprocessing on page 199 (discrete) in User's Manual</i>
set	preprocessing	dual	<i>Using a Starting-Point Heuristic on page 201 in User's Manual</i>
set	preprocessing	fill	<i>Preprocessing on page 166 in User's Manual</i>
set	preprocessing	linear	
set	preprocessing	numpass	
set	preprocessing	presolve	<i>Preprocessing and Memory Requirements on page 174 (continuous) in User's Manual</i> <i>Parameters for Controlling MIP Preprocessing on page 267 in User's Manual</i>
set	preprocessing	qpmakepsd	
set	preprocessing	reduce	<i>Preprocessing on page 166 (continuous) or Preprocessing and Feasibility on page 347 (discrete) in User's Manual</i>
set	preprocessing	relax	<i>Parameters for Controlling MIP Preprocessing on page 267 in User's Manual</i>
set	preprocessing	repeatpresolve	
set	preprocessing	symmetry	
set	qpmethod		
set	read	constraints	
set	read	datacheck	<i>Displaying Problem Statistics on page 43 in Getting Started</i>
set	read	nonzeroes	
set	read	qpnonzeroes	
set	read	scale	<i>Scaling on page 171 in User's Manual</i>
set	read	variables	

Interactive Optimizer Command		Options	Example
set	sifting	algorithm	
set	sifting	display	
set	sifting	iterations	
set	simplex	crash	<i>Crash Parameter Settings for the Primal Simplex Optimizer on page 172 in User's Manual</i>
set	simplex	dgradient	
set	simplex	display	
set	simplex limits	iterations	
set	simplex limits	lowerobj	
set	simplex limits	perturbation	<i>Stalling Due to Degeneracy on page 178 in User's Manual</i>
set	simplex limits	singularity	<i>Repeated Singularities on page 177 in User's Manual</i>
set	simplex limits	upperobj	
set	simplex	perturbation	<i>Stalling Due to Degeneracy on page 178 in User's Manual</i>
set	simplex	pgradient	
set	simplex	pricing	
set	simplex	refactor	<i>Refactoring Frequency and Memory Requirements on page 174 in User's Manual</i>
set	simplex tolerances	feasibility	<i>Maximum Bound Infeasibility: Identifying Largest Bound Violation on page 182 in User's Manual</i>
set	simplex tolerances	markowitz	<i>Inability to Stay Feasible on page 179 in User's Manual</i>
set	simplex tolerances	optimality	<i>Maximum Reduced-Cost Infeasibility on page 182 in User's Manual</i>
set	threads		
set	timelimit		<i>Parameters to Limit MIP Optimization on page 254 in User's Manual</i>

Interactive Optimizer Command		Options	Example
set	workdir	<i>prompt for directory</i>	<i>Memory Emphasis: Letting the Optimizer Use Disk for Storage on page 198 in User's Manual</i>
set	workmem	<i>prompt for new value of working memory available</i>	<i>Memory Emphasis: Letting the Optimizer Use Disk for Storage on page 198 or Parameters to Limit MIP Optimization on page 254 in User's Manual</i>
tranopt			
write	<i>filenames</i>	<i>type</i>	<i>Preprocessing on page 166 (continuous) or Repeated Singularities on page 177 or Difficulty Solving Subproblems: Overcoming Degeneracy on page 285 or Saving QP Problems on page 222 in User's Manual</i>
xecute	command		<i>Executing Operating System Commands on page 66 in Getting Started</i>

---

## Managing Parameters in the Interactive Optimizer

To see the current value of a parameter that interests you in the Interactive Optimizer, use the command `display settings`. The command `display settings changed` lists only those parameters where the value is not the default value. The command `display settings all` lists all parameters and their values.

To change the value of a parameter in the Interactive Optimizer, use the command `set` followed by options to indicate the parameter and the value you want it to assume.

In the reference manual of ILOG CPLEX Parameters, you will find the name of each parameter and its options in the Interactive Optimizer, along with the name of the parameter in Concert Technology and the Callable Library. That manual also describes the purpose of each parameter and documents its possible settings.

In the reference manual of the ILOG CPLEX Callable Library, the group `optim.cplex.manageparameters` documents the Callable Library routines that access parameters.

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## Saving a Parameter Specification File

You can tell the ILOG CPLEX Interactive Optimizer to read customized parameter settings from a *parameter specification file*. By default, ILOG CPLEX expects a parameter specification file to be named `plex.par`, and it looks for that file in the directory where it is executing. However, you can rename the file, or tell ILOG CPLEX to look for it in another directory by setting the system environment variable `CPLXPARGFILE` to the full path name of your parameter specification file. You set that environment variable in the customary way for your platform. For example, on a UNIX platform, you might use a shell command to set the environment variable, or on a personal computer running Microsoft Windows, you might click on the System icon in the control panel, then select the environment tab from the available system properties tabs, and then define the variable there.

During initialization in the Interactive Optimizer, ILOG CPLEX locates any available parameter specification file (by checking the current execution directory for `plex.par` and by checking the environment variable `CPLXPARGFILE`) and reads that file. As it opens the file, ILOG CPLEX displays the message “Initial parameter values are being read from `plex.par`” (or from the parameter specification file you specified). As ILOG CPLEX displays that message on the screen, it also writes the message to the log file. If ILOG CPLEX cannot open the file, it displays no message, records no note in the log file, and uses default parameter settings.

You can use a parameter specification file to change any parameter or parameters accessible by the `set` command in the Interactive Optimizer. The parameter types, names, and options are those used by the `set` command in the Interactive Optimizer.

To create a parameter specification file, you can use either of these alternatives:

- ◆ Use an ordinary text editor to create a file where each line observes the following syntax:

*parameter-name option value*

- ◆ Use the command `display settings` in the Interactive Optimizer to generate a list of current parameter settings. Those settings will be recorded in the log file. You can then edit the log file with your preferred text editor to create your parameter specification file.

`display settings changed` lists parameters different from the default with their values.

`display settings all` lists all parameters with their values.

Each entry on a line must be separated by at least one space or tab. Blank lines in a parameter specification file are acceptable; there are no provisions for comments in the file. You may abbreviate parameter names to unique character sequences, as you do in the `set` command.

As ILOG CPLEX reads a parameter specification file, if the parameter name and value are valid, ILOG CPLEX sets the parameter and writes a message about it to the screen and to the

## Interactive Optimizer Commands

log file. If ILOG CPLEX encounters a repeated parameter, it uses the last value specified. ILOG CPLEX terminates under the following conditions:

- ◆ if it encounters a parameter that is unknown;
- ◆ if it encounters a parameter that is not unique;
- ◆ if the parameter is correctly specified but the value is missing, invalid, or out of range.

Here is an example of a parameter specification file that tells ILOG CPLEX to use wall clock rather than CPU time while limiting total run time to 60 seconds. It also instructs ILOG CPLEX to open a log file named `problem.log`.

```
clocktype 2
timelimit 60
logfile  problem.log
```

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