IBM ILOG CPLEX V12.1

Interactive Optimizer

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For technical assistance

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Contains information on how to obtain technical support from IBM worldwide, should you encounter any problems in using IBM products.

Contacting IBM Support

IBM Software Support Handbook

This guide contains important information on the procedures and practices followed in the service and support of your IBM products. It does not replace the contractual terms and conditions under which you acquired specific IBM Products or Services. Please review it carefully. You may want to bookmark the site so you can refer back as required to the latest information. The "IBM Software Support Handbook" can be found on the web at *http://www14.software.ibm.com/webapp/set2/sas/f/handbook/home.html*.

Accessing Software Support

When calling or submitting a problem to IBM Software Support about a particular service request, please have the following information ready:

♦ IBM Customer Number

♦ The machine type/model/serial number (for Subscription and Support calls)

♦ Company name

♦ Contact name

♦ Preferred means of contact (voice or email)

♦ Telephone number where you can be reached if request is voice

♦ Related product and version information

♦ Related operating system and database information

♦ Detailed description of the issue

♦ Severity of the issue in relationship to the impact of it affecting your business needs

Contact by Web

Open service requests is a tool to help clients find the right place to open any problem, hardware or software, in any country where IBM does business. This is the starting place when it is not evident where to go to open a service request.

Service Request (SR) tool offers Passport Advantage clients for distributed platforms online problem management to open, edit and track open and closed PMRs by customer number. Timesaving options: create new PMRs with prefilled demographic fields; describe problems yourself and choose severity; submit PMRs directly to correct support queue; attach troubleshooting files directly to PMR; receive alerts when IBM updates PMR; view reports on open and closed PMRs. You can find information about assistance for SR at *http://www.ibm.com/software/support/help-contactus.html*

System Service Request (SSR) tool is similar to Electronic Service request in providing online problem management capability for clients with support offerings in place on System

i, System p, System z, TotalStorage products, Linux, Windows, Dynix/PTX, Retail, OS/2, Isogon, Candle on OS/390 and Consul z/OS legacy products.

IBMLink SoftwareXcel support contracts offer clients on the System z platform the IBMLink online problem management tool to open problem records and ask usage questions on System z software products. You can open, track, update, and close a defect or problem record; order corrective/preventive/toleration maintenance; search for known problems or technical support information; track applicable problem reports; receive alerts on high impact problems and fixes in error; and view planning information for new releases and preventive maintenance.

Contact by phone

If you have an active service contract maintenance agreement with IBM , or are covered by Program Services, you may contact customer support teams by telephone. For individual countries, please visit the Technical Support section of the *IBM Directory of worldwide contacts*.

Commands of the Interactive Optimizer

Lists the commands of the Interactive Optimizer.

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Introduces commands of the Interactive Optimizer.

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Lists the commands of the Interactive Optimizer with links to samples or further documentation.

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Describes access to parameters in the Interactive Optimizer.

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Describes purpose and use of a parameter specification file.

Overview of commands

This manual lists the commands of the Interactive Optimizer of IBM® 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 *CPLEX User's Manual* or *Getting Started*.

These topics follow the table:

Table of the commands of the Interactive Optimizer

Interactive Optimizer Command	Options		Example
add			Adding constraints and bounds *in Getting Started*
baropt			Using alternative optimizers *in Getting Started*
baropt	dualopt		
baropt	primopt		
baropt	stop		
change	bounds		Changing bounds *in Getting Started*
change	coefficient		Changing coefficients of variables *in Getting Started*
change	delete		Deleting entire constraints or variables *in Getting Started*
change	delete	constraints	
change	delete	qconstraints	
change	delete	filters	
change	delete	indconstraints	
change	delete	mipstarts	MIP starts and the Interactive Optimizer *in User's Manual*
change	delete	solutions	
change	delete	sos	
change	delete	variables	
change	delete	equality	
change	delete	greater-than	
change	delete	less-than	
change	name		Changing constraint or variable names *in Getting Started*
change	objective		Objective and RHS coefficients *in*

Interactive Optimizer Command		Options	Example
			Getting Started
change	problem	*type*	Using the MIP solution
			Changing problem type in QPs

Interactive Optimizer Command		Options	Example
			Diagnosing QP infeasibility *in User's Manual*
change	problem	fixed *i*	Accessing a solution in the solution pool *in User's Manual*
change	qpterm		Changing quadratic terms *in User's Manual*
change	rhs		Objective and RHS coefficients *in Getting Started*
change	sense		Changing sense *in Getting Started*
change	type		Changing variable type *in User's Manual*
change	values		Changing small values to zero *in Getting Started*
conflict			Meet the conflict refiner in the Interactive Optimizer *in User's Manual*
display	auxilliary	filters	displays names of filters associated with solution pool
display	auxilliary	mipstarts	displays names of MIP starts
display	auxilliary	summary	displays information about filters, MIP starts, priorities, bases
display	conflict	all	Displaying a conflict in the Interactive Optimizer *in User's Manual*
display	conflict	constraints	Displaying a conflict in the Interactive Optimizer *in User's Manual*
display	conflict	indicators	
display	conflict	qconstraints	
display	conflict	sos	
display	conflict	variables	Displaying a conflict in the Interactive Optimizer *in User's Manual*
display	problem	all	Displaying a problem *in Getting Started*

Interactive Optimizer Command		Options	Example
`display`	`problem`	`binaries`	Interactive Optimizer display options for MIP problems *in User's Manual*
`display`	`problem`	`bounds`	Displaying bounds *in Getting Started*
`display`	`problem`	`constraints`	Displaying constraints *in Getting Started*
`display`	`problem`	`generals`	Interactive Optimizer display options for MIP problems *in User's Manual*
`display`	`problem`	`histogram`	Detecting and eliminating dense columns *in User's Manual or*

Interactive Optimizer Command		Options	Example
			Displaying a histogram of nonzero counts *in Getting Started*
display	problem	indicators	
display	problem	integers	Interactive Optimizer display options for MIP problems *in User's Manual*
display	problem	names	Displaying variable or constraint names *in Getting Started*
display	problem	qconstraints	
display	problem	qpvariables	
display	problem	semi-continuous	
display	problem	sos	
display	problem	stats	Solve the problem you intended *or* Interactive Optimizer display options for MIP problems *in User's Manual*
display	problem	variable	
display	sensitivity	lb	Performing sensitivity analysis *in Getting Started*
display	sensitivity	objective	Performing sensitivity analysis *in Getting Started*
display	sensitivity	rhs	Performing sensitivity analysis *in Getting Started*
display	sensitivity	ub	Performing sensitivity analysis *in Getting Started*
display	settings		Displaying parameter settings *in Getting Started*
display	settings	all	Displaying parameter settings *in Getting Started*
display	settings	changed	Displaying parameter settings *in Getting Started*

Interactive Optimizer Command		Options	Example
display	solution	basis	
display	solution	bestbound	
display	solution	difference i j	Examining the solution pool *in User's Manual*
display	solution	dual	
display	solution	kappa	Measuring problem sensitivity with basis condition number *in User's Manual*
display	solution	list i n	Examining the solution pool *in User's Manual*
display	solution	member	Examining the solution pool *in User's Manual*
display	solution	objective	
display	solution	pool	Examining the solution pool *in User's Manual*
display	solution	qcslacks	
display	solution	quality	Coping with an ill-conditioned problem or handling unscaled infeasibilities *or* Understanding solution quality from

Interactive Optimizer Command		Options	Example
			the barrier LP optimizer *in User's Manual*
display	solution	reduced	
display	solution	slacks	Displaying post-solution information *in Getting Started*
display	solution	variables	Displaying post-solution information *in Getting Started*
display	solution number	i objective	Examining the solution pool *in User's Manual*
display	solution number	i qcslacks	
display	solution number	i quality	
display	solution number	i slacks	
display	solution number	i variables	
enter			Entering a problem *in Getting Started*
feasopt	constraints		Invoking FeasOpt *in User's Manual*
feasopt	variables		Invoking FeasOpt *in User's Manual*
feasopt	all		Invoking FeasOpt *in User's Manual*
help			Using help *in Getting Started*
mipopt			Using the mixed integer optimizer *in User's Manual*
netopt			Example: network optimizer in the Interactive Optimizer *or* CPX_ALG_HYBNETOPT inParameter

Interactive Optimizer Command		Options	Example
			settings for RootAlg and NodeAlg *in User's Manual*
`optimize`			Solving a problem *in Getting Started*
`populate`			Populating the solution pool *in User's Manual*
`primopt`			Using alternative optimizers *in Getting Started*
`quit`			Quitting CPLEX *in Getting Started*
`read`	*filename*	*type*	Starting from an advanced basis *or* Understanding the network log file *or* Filter files *in User's Manual*
`set`	`advance`		Starting from an advanced basis *in User's Manual*
`set`	`barrier`		Using the barrier optimizer *in User's Manual*
`set`	`barrier`	`algorithm`	Using the barrier optimizer *or* Choosing an ordering algorithm *in User's Manual*
`set`	`barrier`	`colnonzeros`	Detecting and eliminating dense columns *in User's Manual*
`set`	`barrier`	`convergetol`	
`set`	`barrier`	`crossover`	
`set`	`barrier`	`display` *level*	Using the barrier optimizer *or* Numeric instability due to elimination

Interactive Optimizer Command		Options	Example
			of too many dense columns *in User's Manual*
set	barrier limits	corrections	Change the limit on barrier corrections *in User's Manual*
set	barrier limits	growth	
set	barrier limits	iterations	
set	barrier limits	objrange	Difficulties with unbounded problems *in User's Manual*
set	barrier limits	threads	
set	barrier	ordering	
set	barrier	qcpconvergetol	
set	barrier	startalg	
set	clocktype		
set	conflict	display *level*	
set	defaults		Resetting defaults *in Getting Started*
set	emphasis	memory	Lack of memory *or* Memory emphasis: letting the optimizer use disk for storage *in User's Manual*
set	emphasis	mip	Emphasizing feasibility and optimality *in User's Manual*
set	emphasis	numerical	Numerical emphasis settings *(LP) or* Numerical emphasis settings *(barrier) in User's Manual*
set	feasopt	tolerance	
set	logfile	*filename*	Filing iteration logs *in Getting Started*
set	lpmethod		
set	mip cuts	all	

Interactive Optimizer Command		Options	Example
set	mip cuts	*class*	Parameters for controlling cuts *in User's Manual*
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	mcfcut	
set	mip cuts	mircut	
set	mip cuts	pathcut	
set	mip cuts	zerohalf	Zero-half cuts *in User's Manual*
set	mip	display	
set	mip	interval	
set	mip limits	aggforcut	
set	mip limits	cutpasses	
set	mip limits	cutsfactor	Parameters affecting cuts *in User's Manual*
set	mip limits	gomorycand	
set	mip limits	gomorypass	
set	mip limits	nodes	Parameters to limit MIP optimization *in User's Manual*
set	mip limits	polishtime	

Interactive Optimizer Command		Options	Example
set	mip limits	populate	Parameters of the solution pool *in User's Manual*
set	mip limits	probetime	
set	mip limits	repairtries	
set	mip limits	solutions	Parameters to limit MIP optimization *in User's Manual*
set	mip limits	strongcand	
set	mip limits	strongit	
set	mip limits	strongthreads	
set	mip limits	submipnodelim	
set	mip limits	threads	
set	mip limits	treememory	Reset the tree memory parameter *in User's Manual*
set	mip	ordtype	
set	mip pool	absgap	Parameters of the solution pool *in User's Manual*
set	mip pool	capacity	Parameters of the solution pool *in User's Manual*
set	mip pool	intensity	Parameters of the solution pool *in User's Manual*
set	mip pool	relgap	Parameters of the solution pool *in User's Manual*
set	mip pool	replace	Parameters of the solution pool *in User's Manual*
set	mip strategy	backtrack	Parameters for controlling branch & cut strategy *in User's Manual*
set	mip strategy	bbinterval	Parameters for controlling branch & cut strategy *in User's*

Interactive Optimizer Command		Options	Example
			Manual
set	mip strategy	branch	Parameters for controlling branch & cut strategy *in User's Manual*
set	mip strategy	dive	
set	mip strategy	file	
set	mip strategy	heuristicfreq	Heuristics *in User's Manual*
set	mip strategy	lbheuristic	
set	mip strategy	nodeselect	Parameters for controlling branch & cut strategy *in User's Manual*
set	mip strategy	order	
set	mip strategy	presolvenode	
set	mip strategy	probe	Probing *in User's Manual*
set	mip strategy	rinsheur	Relaxation induced neighborhood search (RINS) heuristic *in User's Manual*
set	mip strategy	search	MIP dynamic search switch *in Parameters Reference Manual*
set	mip strategy	startalgorithm	
set	mip strategy	subalgorithm	NodeAlg parameter and difficult subproblems *in User's Manual*
set	mip strategy	variableselect	Parameters for controlling branch & cut strategy *in User's Manual*
set	mip tolerances	absmipgap	
set	mip tolerances	integrality	
set	mip tolerances	lowercutoff	

Interactive Optimizer Command		Options	Example
set	mip tolerances	mipgap	
set	mip tolerances	objdifference	Time wasted on overly tight optimality criteria *in User's Manual*
set	mip tolerances	relobjdifference	
set	mip tolerances	uppercutoff	
set	network	display	Understanding the network log file *in User's Manual*
set	network	iterations	Limiting iterations in the network optimizer *in User's Manual*
set	network	netfind	
set	network	pricing	Selecting a pricing algorithm for the network optimizer *in User's Manual*
set	network tolerances	feasibility	Controlling tolerance *in User's Manual*
set	network tolerances	optimality	
set	output	*channel*	
set	output	mpslong	
set	output	logonly	Interpreting solution quality *in User's Manual*
set	parallel	*mode*	Using parallel optimizers in the Interactive Optimizer *in User's Manual*
set	preprocessing	aggregator	Preprocessing Preprocessing and memory requirements

Interactive Optimizer Command		Options	Example
			Parameters for controlling MIP preprocessing *in User's Manual*
set	preprocessing	boundstrength	Parameters for controlling MIP preprocessing *in User's Manual*
set	preprocessing	coeffreduce	Parameters for controlling MIP preprocessing Examples: optimizing a simple MIP problem *in User's Manual*
set	preprocessing	dependency	Preprocessing *(continuous)* Preprocessing *(discrete) in User's Manual*
set	preprocessing	dual	Using a starting-point heuristic *in User's Manual*
set	preprocessing	fill	Preprocessing *in User's Manual*
set	preprocessing	linear	
set	preprocessing	numpass	
set	preprocessing	presolve	Preprocessing and memory requirements *(continuous) in User's Manual* Parameters for controlling MIP preprocessing *in User's Manual*
set	preprocessing	qpmakepsd	
set	preprocessing	reduce	Preprocessing *(continuous) or*

Interactive Optimizer Command		Options	Example
			Preprocessing and feasibility *(discrete) in User's Manual*
set	preprocessing	relax	Parameters for controlling MIP preprocessing *in User's Manual*
set	preprocessing	repeatpresolve	Preprocessing: presolver and aggregator *(discrete) in User's Manual*
set	preprocessing	symmetry	
set	qpmethod		
set	read	constraints	
set	read	datacheck	Displaying problem statistics *in Getting Started*
set	read	nonzeroes	
set	read	qpnonzeroes	
set	read	scale	Scaling *in User's Manual*
set	read	variables	
set	sifting	algorithm	
set	sifting	display	
set	sifting	iterations	
set	simplex	crash	CraInd parameter settings for the primal simplex optimizer *in User's Manual*
set	simplex	dgradient	
set	simplex	display	
set	simplex limits	iterations	
set	simplex limits	lowerobj	
set	simplex limits	perturbation	Stalling due to degeneracy *in User's*

Interactive Optimizer Command		Options	Example
			Manual
set	simplex limits	singularity	Repeated singularities *in User's Manual*
set	simplex limits	upperobj	
set	simplex	perturbation	Stalling due to degeneracy *in User's Manual*
set	simplex	pgradient	
set	simplex	pricing	
set	simplex	refactor	Refactoring frequency and memory requirements *in User's Manual*
set	simplex tolerances	feasibility	Maximum bound infeasibility: identifying largest bound violation *in User's Manual*
set	simplex tolerances	markowitz	Inability to stay feasible *in User's Manual*
set	simplex tolerances	optimality	Maximum reduced-cost infeasibility *in User's Manual*
set	threads		
set	timelimit		Parameters to limit MIP optimization *in User's Manual*
set	tune display	*i*	Tuning tool *in User's Manual*
set	workdir	*prompt for directory*	Memory emphasis: letting the optimizer use disk for storage *in User's Manual*
set	workmem	*prompt for new value of working memory available*	Memory emphasis: letting the optimizer use disk for storage *or*

Interactive Optimizer Command	Options		Example
			Parameters to limit MIP optimization *in User's Manual*
`tranopt`			
`tune`	*filenames*	*parameterfile* `.prm`	Example: time limits on tuning in the Interactive Optimizer *and* Fixing parameters and tuning multiple models in the Interactive Optimizer *in User's Manual*
`write`	*filenames*	*type*	Preprocessing *(continuous) or* Repeated singularities *or* Difficulty solving subproblems: overcoming degeneracy *or* MIP starts and the Interactive Optimizer *or* Saving QP problems *in User's Manual*
`xecute`	`command`		Executing operating system commands *in Getting Started*

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 *CPLEX Parameters Reference Manual*, 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 CPLEX® Callable Library (C API), the group `optim.cplex.manageparameters` documents the Callable Library routines that access parameters.

Saving a parameter specification file

You can tell the Interactive Optimizer to read customized parameter settings from a parameter specification file. By default, CPLEX® expects a parameter specification file to be named `cplex.par`, and it looks for that file in the directory where it is executing. However, you can rename the file, or tell CPLEX® to look for it in another directory by setting the system environment variable `CPLEXPARFILE` 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, CPLEX® locates any available parameter specification file (by checking the current execution directory for `cplex.par` and by checking the environment variable `CPLEXPARFILE`) and reads that file. As it opens the file, CPLEX® displays the message "Initial parameter values are being read from `cplex.par`" (or from the parameter specification file you specified). As CPLEX® displays that message on the screen, it also writes the message to the log file. If 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 CPLEX® reads a parameter specification file, if the parameter name and value are valid, CPLEX® sets the parameter and writes a message about it to the screen and to the log file. If CPLEX® encounters a repeated parameter, it uses the last value specified. 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 CPLEX® to use wall clock rather than CPU time while limiting total run time to 60 seconds. It also instructs CPLEX® to open a log file named `problem.log` .

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