e Language Quick Reference

July 2006

This card contains selected **e** constructs. For complete **e** syntax, see the ***e** Language Reference*.

Abbreviations:

arg - argument	inst - instance
bool - boolean	num - number
enum - enumerated	TCM - time-consuming method
expr - expression	TE - temporal expression

Predefined Types

bit // unsigned integer with value 0 or 1 (default: 0)

byte // unsigned integer in the range 0-255 (default: 0)

int // 32-bit signed integer (default: 0)

uint // 32-bit unsigned integer (default: 0)

int | uint (bits: *n* | **bytes:** *n* **)** // n-bit or n-byte signed int or uint

bool // one-bit boolean (0 = FALSE, 1 = TRUE) (default: FALSE)

list [**(key:** *field-name***)**] **of** *type*
// a list of elements of the specified type (default: empty)

string // strings are enclosed in quotes: “my string” (default: NULL)

Type Conversion

expr **=** *expr*.**as_a(** *type* **)**

User-Defined Types — Statements

struct *struct-type* [**like** *base-struct-type*] **{** struct members **};**

unit *unit-type* [**like** *base-unit-type*] **{** unit members **};**

type *type-name* **:** [**u**]**int (bits:** *n* | **bytes:** *n* **);** // defines a scalar type

type *type-name* **: [** *name* [**=***n*], ... **];** // defines an enumerated type

extend *type-name* **: [** *name* [**=***n*], ... **];** // extends an enumerated type

extend *struct-type*|*unit-type* **{** additional struct or unit members **};**
// extends a struct or unit

Struct and Unit Members

fields	constraints	when conditions
methods and TCMs	cover groups	events
temporal struct|unit members	preprocessor directives	

Fields — Struct and Unit Members

[**!**][**%**]*field-name* **:** *type***;** // ! = do not generate, % = physical field

*field-name***[***n***] : list of** *type***;** // creates a list with n elements

field-name **:** *unit-type* **is instance;** // for units only, not structs

Conditional Extensions using When — Struct and Unit Members

type *enum-type***: [***name1***,** *name2***,** ...**];**
struct|unit *struct-type*|*unit-type* **{**
field-name **:** *enum-type***;**
when *name1 struct-type*|*unit-type* **{** additional members **};**
};
extend *name1 struct-type*|*unit-type* **{** ... **};**

Ports — Struct and Unit Members

*port-name***:** *dir* [**buffer_port** | **simple_port**] **of** *data-type* **is instance;**

*port-name***:** *dir* **event_port is instance;**

keep [**soft**] *port_inst.attribute*() == *value;*

keep bind(*inst-name1*, *inst-name2* |**external** |**empty** | **undefined);**

Encapsulation — Statements, Struct and Unit Members

package *package***;** [**package**] **type** *type***;** *package* **::** *type*

package | **protected** | **private** *struct-member-definition***;**

Constraints — Struct and Unit Members

keep [**soft**] *bool-expr***;** // for example, keep field1 <= MY_MAX

keep [**soft**] *field-name* **in [***range***];** // example: keep field1 in [0..256]

keep *bool-expr1* **=>** *bool-expr2***;** // bool-expr1 implies bool-expr2

keep [**soft**] *field-name* **in** *list***;**

keep *list*.**is_all_iterations(** *field-name* **);**

keep *list1*.**is_a_permutation(** *list2* **);**

keep *list*[*index*].*field-name constraint-expr***;**

keep for each (*item* **) in** *list* **{** [**soft**] *bool-expr***; ... };**

keep all of {*constraint-expr***; ... };**

keep soft *bool-expr* **== select {** *weight* **:** *value***; ... };**

keep [**soft**] **gen (** *item-a* **) before (** *item-b* **);**

keep *gen-item*.**reset_soft();** // ignore soft constraints on gen-item

keep *field-name*.**hdl_path() == “***string***”** **;** //field-name is unit instance

keep soft *bool-expr* **== select {** *weight* **:** *value***; ... };**

keep gen_before_subtypes(*determinant-field*: *field*, ...**);**

Predefined Methods of All Structs — Struct and Unit Members

run()	**extract()**	**check()**	**finalize()**
init()	**pre_generate()**	**post_generate()**	
copy()	**do_print()**	**print_line()**	**quit()**

Methods and TCMs — Struct and Unit Members

*regular-method***(** [*arg* **:** *type*, ...] **) [:** *return-type*] **is {** *action*; ... **};**

TCM([*arg* **:** *type*, ...] **) [:** *return-type*] **@***event-name* **is {** *action*; ... **};**

method(*arg* **:** *type*, ... **) [:** *return-type*] [**@***event-name*] **is also|first|only {** *action*; ... **};**

Variable Declarations and Assignments — Actions

var *var-name* **:** *type***;** **var** *var-name* **: =** *value***;**

var-name = *expr* **;** // e.g. field-name=expr, var-name=method()

Conditional Procedures — Actions

if *bool-expr* [**then**] **{** *action***;** ... **}**
[**else if** *bool-expr* [**then**] **{** *action***;** ... **}**] [**else {** *action***;** ... **}**] **;**

case { *bool-expr*[**:**] **{** *action***;** ... **}** **;** [**default**[**:**] **{** *action***;** ... **}** **;**] **};**

case *expr* **{** *value*[**:**] **{** *action***;** ... **}** **;** [**default**[**:**] **{** *action***;** ... **}** **;**] **};**

Checks — Actions

check that *bool-expr* [**else dut_error(** ... **)**];

Loops — Actions

for *i* **from** *expr* [**down**] **to** *expr* [**step** *expr*] [**do**] **{** *action***;** ... **};**
for each [*struct-type*] (*list-item*) [**using index (***index-name***)**]
in [**reverse**] *list* [**do**] **{** *action***;** ... **};**
for each [**line**] [(*line-name*)] **in file** *file-name* [**do**] **{***action***;** ... **};**
while *bool-expr* [**do**] **{** *action***;** ... **};**

break; **continue;**

Invoking Methods and TCMs — Actions

TCM2()**@***event-name* **is {** *TCM1*()**;** *method*()**;};** // calling methods

method1() **is {** *method2*()**;** *method3*()**; };** // calling methods

method() **is { start** *TCM*()**;};** // starting a TCM on a separate thread

Note: A TCM can only be *called* from another TCM. However, a TCM can be *started* from a regular method or from another TCM.

Operators

Operator precedence is left to right, top to bottom in the list

[ ] list indexing	**[..]** list slicing
[:] bit slicing	***f*()** method or routine call
. field selection	**in** range list
{... ; ...} list concatenation	**%{... , ...}** bit concatenation
~ bitwise not	**!**, **not** boolean not
+, **-** unary positive, negative	*****, */*, **%** multiply, divide, modulus
+, **-** plus, minus	**>>**, **<<** shift right, shift left
<, **<=**, **>**, **>=** boolean comparison	**is** [**not**] **a** subtype identification
==, **!=** boolean equal, not equal	**===**,**!==** Verilog 4-state compare
~, **!~** string matching	**&**, **|**, **^** bitwise and, or, xor
&&, **and** boolean and	**||**, **or** boolean or
!, **not** boolean not	**=>** boolean implication
a **?** *b* **:** *c* conditional “if a then b, else c”	

Simulator Interface — Statements and Unit Members

verilog function ’*HDL-path*’(*params*) **:** *n***;** // n is result size in bits

verilog import *file-name***;** // statement only

verilog task ’*HDL-path*’(*params*)**;**

verilog time *Verilog-timescale***;** // statement only

vhdl driver ’*HDL-path*’ **using** *option*, **…;** // unit member only

vhdl function ’*designator*’ **using** *option*, **…;**

vhdl procedure ’*identifier*’ **using** *option*, **…;**

vhdl time *VHDL-timescale***;** // statement only

Generation On the Fly — Actions

gen *gen-item* [**keeping { [soft]** *constraint-bool-expr* **;** ... **}**];

Events

event *event-name* [**is** [**only**] *TE*]; // struct or unit member

emit [*struct-inst.*]*event-name*; // action

Predefined Events

sys.any *struct-inst*.**quit**

Temporal Struct and Unit Members

on *event-name* **{** *action*; ... **} ;**

expect|**assume** [*rule-name* **is** [**only**]] *TE*
[**else dut_error(** "*string*", *expr*, ...)];

Temporal Expressions (TEs)

Basic Temporal Expressions

@[*struct-inst.*]*event-name* // event instance

change|**fall**|**rise**('*HDL-path*') **@sim** // simulator callback annotation

change|**fall**|**rise**(*expr*) **true**(*bool-expr*) **cycle**

Boolean Temporal Expressions

TE1 **and** *TE2* *TE1* **or** *TE2* **not** *TE* **fail** *TE*

Complex Temporal Expressions

TE **@**[*struct-inst.*]*event-name* // explicit sampling

{ *TE*; *TE*; ... **}** // sequence

TE1 **=>** *TE2* // if TE1, then TE2 follows

TE **exec { ***action*; ... **}** // execute when TE succeeds

[*n* **]** [* *TE*] // fixed repeat

{ ... ; **[** [*n*]..[*m*] **]** [* *TE*]; *TE*; ... **}** // first match repeat

~[[*n*]..[*m*] **]** [* *TE*] // true match repeat

delay(*expr***)** **detach(***TE***)**

consume(@[*struct-inst.*]*event-name* **)**

Time-Consuming Actions

wait [[**until**] *TE*]; **sync** [*TE*];

Lock and Release, Sempahores

```
struct struct-type {
    locker-expr: locker;
    TCM() @event-name is {
        locker-expr.lock();
        ...
        locker-expr.release();  };
};
```

Predefined Structs and Methods

```
struct struct-type {
    sem-expr: semaphore;
    TCM() @event-name is {
        sem-expr.up();
        ...
        sem-expr.down();  };
};
```

Packing and Unpacking Pseudo-Methods

expr **= pack(** *pack-options*, *expr*, … **)**

unpack(*pack-options*, *value-expr*, *target-expr* [, *target-expr, ...*] **)**

Printing Action

print *expr*[,…] [**using** *print-options*] ;

Predefined Routines Actions

Deep Copy and Compare Routines

deep_copy(*expr* : struct-type**)** : struct-type

deep_compare[**_physical**](*inst1*: struct-type, *inst2*: struct-type,
max-diffs: int**)**: list of string

Output Routines

out ("*string*", *expr*, ...**);** **out (** *struct-inst* **);**

outf ("*string %c ...*", *expr* **);** // c is a conversion code: s, d, x, b, o, u

Selected Configuration Routines

Note: Categories for these routines are listed in "Configuration Commands" in the Specman Elite Quick Reference.

set_config(*category*, *option*, *option-value* **)**

get_config(*category*, *option* **);**

Selected Arithmetic Routines

min|**max (** *x*: int, *y*: int**)**: int **abs(***x*: int**)**: int

ipow(*x*: int, *y*: int**)**: int **isqrt(***x*: int**)**: int

odd|**even (***x*: int**)**: bool **div_round_up(***x*: int, *y*: int**)**: int

Bitwise Routines

expr.**bitwise_and**|**or**|**xor**|**nand**|**nor**|**xnor(***expr*: int|uint**)**: bit

Selected String Routines

appendf(*format*, *expr*, ...**):** string **append(***expr*, ...**):** string

expr. **to_string()**: string **bin**|**dec**|**hex**(*expr*, ...**):** string

str_join(*list*: list of string, *separator*: string**)**: string

str_match(*str*: string, *regular-expr*: string**)**: bool

str_replace(*str*:string, *regular-expr*:string, *replacement*:string**)**:string

str_split(*str*: string, *regular-expr*: string**)**: list of string

Selected Operating System Interface Routines

system("*command*"**)**: int **date_time()**: string

output_from("*command*"**)**: list of string

output_from_check("*command*"**)**: list of string

get_symbol(*UNIX-environment-variable*: string**)** : string

files.write_string_list(*file-name*: string, *list*: list of string**)**

Stopping a Test

stop_run(); // stops the simulator and invokes test finalization

On-the-Fly Memory Management

do_otf_gc()

Preprocessor Directives Statements, Struct Members or Actiors

#define [']*macro-name* [*replacement*]

#if[**n**]**def** [']*macro-name* **then {***string***}** [**#else {***string***}**] ;

List Pseudo-Methods

Selected List Actions

add[0](*list-item* : list-type**)** **add[0](***list* : list**)**

clear() **delete(***index* : int**)**

pop[0]() : list-type **push[0](***list-item* : list-type**)**

insert(*index* : int**,** *list* : list | *list-item* : list-type**)**

Selected List Expressions

size() : int **top[0]()** : list-type

reverse() : list **sort(***expr* : expr**)** : list

sum(*expr* : int**)** : int **count (***expr* : bool**)** : int

exists(*index* : int**)** : bool **has(***expr* : bool**)** : bool

is_empty() : bool **is_a_permutation(***list*: list**)** : bool

all(*expr* : bool**)** : list **all_indices(***expr* : bool**)** : list of int

first(*expr* : bool**)** : list-type **last(***expr* : bool**)** : list-type

first_index(*expr* : bool**)** : int **last_index(***expr* : bool**)** : int

key(*key-expr* : expr**)** : list-item **key_index(***key-expr* : expr**)** : int

max(*expr* : int**)** : list-type **max_value(***expr* : int**)** : int | uint

min(*expr* : int**)** : list-type **min_value(***expr* : int**)** : int | uint

swap(*small* : int, *large* : int**)** : list of bit

crc_8|**32(***from-byte* : int, *num-bytes* : int**)** : int

unique(*expr* : expr**)** : list

Coverage Groups and Items Struct and Unit Members

cover *cover-group* [**using** [**also**] *cover-group-options*] **is** [**empty**]
[**also**] **{**
item *item-name* [**:** *type* **=** *expr*] [**using** [**also**] *cover-item-options*];
cross *item-name1*, *item-name2*, ... **;** **transition** *item-name*;
};

To enable coverage, extend the **global** struct as follows:
setup_test() is also {set_config(cover, mode, *cover-mode***)}**

Coverage Group Options

text = *string* **weight =** *uint* **no_collect** **radix = DEC**|**HEX**|**BIN**

count_only **global** **when =** *bool-expr*

external=surecov **agent_options=***SureCov options*

Coverage Item Options

text = *string* **when =** *bool-expr* **weight =** *uint*

no_collect **radix=DEC**|**HEX**|**BIN** **name** *name*

at_least = *num* **ignore** | **illegal =** *cover-item-bool-expr*

no_trace **ranges=range([** *n*..*m* **],** *sub-bucket-name*,
sub-bucket-size, *at-least-number* **);**

per_instance **agent_options=***SureCov options*

Specman Elite
Quick Reference

July 2006

This card contains selected Specman Elite commands and procedures. For more information, see the *Specman Elite Command Reference*.

Abbreviations: dir - directory, expr - expression, inst - instance, num - number

General Help

help *syntax-string* **sn_help.sh**

Specview **Help** button

Creating an HDL Stub File

write stubs -ncvlog | **-ncvhdl** | **-verilog** | **-ncsc** | **-esi** [*file-name*]

write stubs -verilog | **-qvh** | **-osci** | **-esi** [*file-name*]

specman -command "load top.e; write stubs -ncverilog"
// creates stub file named specman.v for NC Verilog simulator

Compiler Script

%sn_compile.sh
// use with no arguments to display compiler script options

%sn_compile.sh top.e
// create an executable named "top" with compiled top.e module

Simulator Commands

%sn_compile.sh -sim ncvlog top.e
// creates a Specman Elite executable named "ncvlog_top" that
// includes the compiled top.e module and NC Simulator (Verilog)

%sn_compile.sh top.e -shlib
// creates a library that includes top.e and ModelSim

%sn_compile.sh -sim vcs -vcs_flags "file1.v ... specman.v" top.e
// creates a Specman Elite executable named "vcs_top" that
// includes VCS, compiled top.e and Verilog source files

Incremental Compilation Command Sequence

1. sn_compile.sh -e my_dir -t . first.e
2. sn_compile.sh -s my_dir/first -t . next.e
3. sn_compile.sh -s my_dir/next -t . last.e

Simulator-Related Commands

show tasks [**and functions**] // Verilog

show procedures // VHDL

show subprograms // VHDL

show defines [**-v**] [**-e**] [" [`]*macro-name*"] // Verilog defines

Switching between Specman Elite and Simulator Prompts

<Return> // switch from Specman Elite back to the simulator

<Cntl>-<Return> // switch from Specview to the simulator prompt

$sn ; // switch from Verilog-XL or VCS to Specman Elite
sn // switch from ModelSim to Specman Elite
sn // switch from NC Simulator to Specman Elite

Specman Elite Commands from Simulator Prompt

Verilog-XL or **VCS**: $sn("command"); **ModelSim**: sn "command"

NC Simulator: sn command

Starting Specman Elite or the Specview GUI

Starting Specman Elite in Text Mode

specman [-p[re_commands] *commands* …]
[-c[ommands] *commands* …]

Example:
specman -p "config print -radix = HEX" -p "load top"
// Starts Specman Elite, sets print radix to hex, and loads top.e

Starting the Specview GUI

specview [-p[re_commands] *commands* …]
[-c[ommands] *commands* …] [*integrated-executable parameters*]

Example:
specview xl_specman +gui -s xor.v specman.v
// Starts Specview along with the Verilog-XL GUI, loads the xor.v
// file and the specman.v stubs file

Running from Compiled Executables

%specrun [-pre-commands *command* ...] [-commands *command* ...]
[*integrated-executable parameters*]
// General way to pass pre-commands to a compiled executable

NC Simulator:
% ncvlog_top -s file1.v file2.v specman.v
// Invokes an executable named ncvlog_top to start Specman Elite
// with NC Simulator, and load Verilog files file1.v and file2.v

NC Simulator:
%specrun -p "@batch.ecom" ncvlog_top -s file1.v file2.v specman.v
// Same as above, but with optional pre-commands

ModelSim:
% specrun -p "@batch.ecom" vsim -keepstdout top < batch.do

VCS:
% specrun -p "@batch.ecom" vcs_cpu_top -s -i batch.cmd

Using a Specman Elite Command File

@file-name [*parameter ...*]
Example:
// Contents of my_batch.ecom file:
load <1>;
out("<2> is <3>");
Execute my_batch.ecom:
Specman> @my_batch my_code Today Wednesday
Result:
Loads my_code.e, prints Today is Wednesday

Configuration Commands

Category	Options
print	radix, title, window, raw, items, list_from, list_is_horizontal, list_lines, list_starts_on_right, list_grouping, list_of_bit_in_hex, list_index_radix, list_end_flag, full, source_lines, line_size
debug	watch_list_items
cover	at_least_multiplier, grading_formula, mode, show_mode, verbose_interface, sorted, max_int_buckets, absolute_max_buckets, max_gui_buckets, auto_ranges, test_name, run_name, tag_name, dir, file_name, show_file_names, show_sub_holes, show_instances_only, show_partial_grade, ranking_cost, ranking_precision, gui_sync_mode, check_illegal_immediately, illegal_bucket_color, auto_cover_events, cover_enums_by_numeric_val
gen	seed, default_max_list_size, reorder_fields, warn, max_depth, max_structs, absolute_max_list_size, resolve_cycles, check_unsatisfied_cons, collect_all, long_max_width, determinants_before_subtypes, bool_exp_is_bidir, unit_reference_rule, max_range_strlen, static_analysis_opt, list_constraint_is_bidir
gui	new_help_window, lines_num_in_source_viewer, auto_scroll
run	tick_max, error_command, exit_on, use_manual_tick
memory	gc_threshold, gc_increment, max_size, absolute_max_size, retain_trace_structs, retain_printed_structs, check_consistency, debug_thread_leak, disable_disk_based_gc, print_msg, print_otf_msg, print_process_size
misc	warn, pre_specman_path, post_specman_path, short_is_signed, open_support_page, support_info_file
wave	working_mode, auto_refresh, use_wave, stub_message_len, stub_output, stub_errors, stub_events, event_data, stub_integers, stub_strings, stub_strings_len, stub_booleans, list_items, thread_code_line, hierarchy_name, port, dump_file, timeout, path_separator, port,

show config [*category* [*option*]]

write config [**to**] *file-name*

read config [**from**] *file-name*

Test Phase Commands

test [*-option* = *value*…]	**setup_test**	**generate** [*-option* = *value*…]
start [*-option* = *value*…]		**run** [*-option* = *value*…]
extract	**check**	**finalize_test**

Test Phase Command Options

seed = *n*	**random** **default_max_list_size** = *n*
max_depth = *n*	**absolute_max_list_size** = *n*
max_structs = *n*	**warn** = **TRUE**	**FALSE**
reorder_fields = **TRUE**	**FALSE**	
resolve_cycles = **TRUE**	**FALSE**	
check_unsatisfied_cons = **TRUE**	**FALSE**	

Saving and Restoring the State

save *file-name* **restore** [**-override**] [**-retain** | **-noretain**] [*file-name*]

reload [**-retain | -noretain**] **retain state**

Coverage Commands

read cover *file-name* | **-merge -file =** *file-name*

write cover [**-merge**] *file-name*

clear cover

show cover [**-kind** = **full**|**summary**|**spreadsheet**]
[**-file** = *file-name*] [**-contributors**[= *num*]] [**-window**]
[*struct-type*[.*cover-group*[**(***inst***)**][.*item-name*]]]

show cover -tests

show cover -**def** [*struct-name*[.*event-name*[.*item-name*]]]

show cover -**new** -**cross** = (*struct-type.cover-group.item-name, ...*)
[**-interval** = **(***struct-type.event-name*, [*struct-type.event-name* | **next**])]
[**-only_simultaneous**] [**-win**]

show cover -**unique_buckets** *file_name*

include cover[**_tests**] *full-run-name* [**on**|**off**]

rank cover [**-sort_only**] [**-recover**] [**-window**] [**-file**=*file_name*]
[**-initial_list**=*file_name*] [*item-wild-cards*]

Waveform-Related Commands

set wave [**-mode=***working-mode*] *viewer*

wave [**-when** [**=** *when-regular-expr*]]
[**-field**[**s**] [**=** *fields-regular-expr*]]
[**-event**[**s**] [**-event_data=***event-data*]] [**-thread**[**s**]
[**-code_line=***bool*]] *expr*

wave event [**-data=***data-option*] [*struct-type*.*event-type*]

wave out

Memory Commands

show memory [**-recursive**] [*struct-type* | *unit-type*]

who is [**-full**] *struct-expr* // show paths for all pointers to a struct

Event Commands

collect events [*event-name* [,…]] [**on** | **off**]

echo events [*event-name* [,…]] [**on** | **off**]

delete events

show events [*event-name* | [*num* [..[*num*]]]

show event definitions [*event-name*, …]

show events -chart [*time-value* | **-prev** | **-next** | **-beginning** | **-end**]
[*event-name*, …]

Show Pack and Unpack Commands

show pack(*options*: pack_options, *expr*, ...**)**

show unpack(*options*: pack_options, *value-expr*, *target-expr, ...* **)**

Show Modules Command

show modules

Log Commands

set log *file-name* **set log off**

Shell Commands

shell *shell-command*

Print and Report Commands

Note: **print** and **report** can also be used in **e** code as actions.

print *expr*, … [**using** *print-options*]

report *list-expr*, **{**[*headers*]**}**, *expr*,… [**using** *print-options*]

Note: Use the **show config print** command to display print options.
Examples:
print sys.packets using radix=HEX
report sys.packets, {"Addr \t Indx"; "%d \t %d"},.address,index

tree [*struct-inst* | *list-expr*] // display the contents of a struct or list

Generation Debugger Commands

col[**lect**] **generation** [**off**]

show gen [**-instance** *inst-name*[**.***field-name*]]

Source Code Debugger Commands

continue [**to** *breakpoint-syntax*] **step_anywhere**

step **next** **finish** **abort**

In the next two sections, the *#thread-handle* option can only be used with the "l" (local) form of the command (e.g. **lbreak**, but not **break**). The special events and special wild cards used as options for some of the commands are listed separately at the end.

Setting Breakpoints

[**l**]**break** [**once**] [**on**] **call** [**extension**]
[*struct-wild-card***.**]*method-wild-card* [**@***module-name*]
[**#**[*thread-handle*] [**if** *bool-expr*]

[**l**]**break** [**once**] [**on**] [**return**] [**extension**]
[*struct-wild-card***.**]*method-wild-card* [**@***module-name*]
[**#**[*thread-handle*]] [**if** *bool-expr*]

[**l**]**break** [**once**] [**on**] **line** [*line-number*] [**@***module-name*]
[**#**[*thread-handle*]] [**if** *bool-expr*]

[**l**]**break** [**once**] [**on**] *special-event-name* [*special-wild-card*]
[**@***module-name*] [**#**[*thread-handle*]] [**if** *bool-expr*]

[**l**]**break** [**once**] [**on**] **event** [[*struct-wild-card***.**]*event-wild-card*]
[**@***module-name*] [**#**[*thread-handle*]] [**if** *bool-expr*]

break [**once**] [**on**] **change** *expr*

break [**once**] [**on**] **error**

break [**once**] [**on**] **interrupt**

break [**once**] [**on**] **simulator**

break [**on**] **alloc** [*memory-size*]

Managing Breakpoints

delete break [**last** | *id-number* | **"***pattern***"**]

disable break [**last** | *id-number* | **"***pattern***"**]

enable break [**last** | *id-number* | **"***pattern***"**]

show breakpoint

Setting and Managing Watches

[**l**]**watch** *expr* [**-radix = DEC|HEX|BIN**] [**-items =** *value*] [**#***thread-id*]

update watch *watch-id* [**radix = DEC|HEX|BIN**]
[**-items =** *value*|**default**]

show watch **delete watch** [*watch-id*]

Setting Traces

[**l**]**trace** [**once**] [**on**] **call** [**extension**] [*struct-wild-card*.]*method-wild-card* [**@***module-name*] [**#**[*thread-handle*]] [**if** *bool-expr*]

[**l**]**trace** [**once**] [**on**] **return** [**extension**] [*struct-wild-card***.**]*method-wild-card* [**@***module-name*] [**#**[*thread-handle*]] [**if** *bool-expr*]

[**l**]**trace** [**once**] [**on**] **line** [*line-number*] [**@***module-name*] [**if** *bool-expr*]

[**l**]**trace** [**once**] [**on**] *special-event-name* [*special-wild-card*]
[**@***module-name*] [**#**[*thread-handle*]] [**if** *bool-expr*]

trace [**once**] [**on**] **change** *expr*

trace [**on**] **packing** **trace** [**on**] **reparse**

Special Events and Special Wild Cards

Special Event Name	Special Wild Card
tcm_start	*struct-wild-card***.***tcm-wild-card*
tcm_end	*struct-wild-card***.***tcm-wild-card*
tcm_call	*struct-wild-card***.***tcm-wild-card*
tcm_return	*struct-wild-card***.***tcm-wild-card*
tcm_wait	*struct-wild-card***.***tcm-wild-card*
tcm_state	*struct-wild-card***.***tcm-wild-card*
call	*struct-wild-card***.***method-wild-card*
return	*struct-wild-card***.***method-wild-card*
sim_read	*signal-name-wild-card*
sim_write	*signal-name-wild-card*
output	*text wild-card*

Command-Line Mode Debugging Commands

show stack // show the calls stack for the current thread

show threads // show all threads

show thread source // show the **e** source for the current thread

show thread tree // show the full tree of calls for the current thread

show thread *#thread-handle*

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