

Unit 1 Code Description

This document (and the `_code` documents in future units) will describe: any ACT-R commands used in the unit's models which are not described in the main unit text, general information about the code that implements the task/experiment for the models in that unit, how ACT-R is interfaced with the task/experiment, and additional commands that one can use interactively when working with ACT-R (most of the information available through the tools of the Environment can also be obtained directly from commands).

For this unit there are no tasks for the models and all of them run simply by using the ACT-R run command. They start with a predefined goal that is specifically placed into the goal buffer, they have a given set of declarative memories, and the result is a modification of the goal chunk representing the processing that took place. Later units will include tasks which have much more involved perception and action, but for this unit all of the models have the same basic structure as shown here in a solution to the multi-column addition model one was to write for unit1:

```
(clear-all)

(define-model tutor-model

  (sgp :esc t :lf .05 :trace-detail medium)

  ;; Add Chunk-types here

  (chunk-type addition-fact addend1 addend2 sum)
  (chunk-type add-pair one1 ten1 one2 ten2 ten-ans one-ans carry)

  ;; Add Chunks here

  (add-dm
    (fact17 isa addition-fact addend1 1 addend2 7 sum 8)
    (fact34 isa addition-fact addend1 3 addend2 4 sum 7)
    (fact67 isa addition-fact addend1 6 addend2 7 sum 13)
    (fact103 isa addition-fact addend1 10 addend2 3 sum 13)
    (goal isa add-pair ten1 3 one1 6 ten2 4 one2 7))

  ;; Add productions here

  (p start-pair
    =goal>
      ISA add-pair
      one1 =num1
      one2 =num2
      one-ans nil
    ==>
    =goal>
      one-ans busy
    +retrieval>
      ISA addition-fact
      addend1 =num1
      addend2 =num2)

  (p add-ones
```

```

=goal>
  ISA add-pair
  one-ans busy
  one1 =num1
  one2 =num2
=retrieval>
  ISA addition-fact
  addend1 =num1
  addend2 =num2
  sum =sum
==>
=goal>
  one-ans =sum
  carry busy
+retrieval>
  ISA addition-fact
  addend1 10
  sum =sum)

(p process-carry
=goal>
  ISA add-pair
  ten1 =num1
  ten2 =num2
  carry busy
  one-ans =ones
=retrieval>
  ISA addition-fact
  addend1 10
  sum =ones
  addend2 =remainder
==>
=goal>
  carry 1
  ten-ans busy
  one-ans =remainder
+retrieval>
  ISA addition-fact
  addend1 =num1
  addend2 =num2)

(p no-carry
=goal>
  ISA add-pair
  ten1 =num1
  ten2 =num2
  one-ans =ones
  carry busy
?retrieval>
  buffer failure
==>
=goal>
  carry nil
  ten-ans busy
+retrieval>
  ISA addition-fact
  addend1 =num1
  addend2 =num2)

(p add-tens-done
=goal>
  ISA add-pair
  ten-ans busy

```

```

        carry nil
    =retrieval>
        ISA addition-fact
        sum =sum
==>
    =goal>
        ten-ans =sum)

(p add-tens-carry
  =goal>
    ISA add-pair
    carry 1
    ten-ans busy
  =retrieval>
    ISA addition-fact
    sum =sum
==>
    =goal>
        carry nil
  +retrieval>
    ISA addition-fact
    addend1 1
    addend2 =sum)

(goal-focus goal)
)

```

It starts with a call to a function called **clear-all** followed by a call to the command **define-model**. Inside the call to **define-model** there is a call to a command called **sgp**, then all of the components of the model are defined (chunk-types, chunks, and productions) and finally the starting goal chunk gets set using the **goal-focus** command.

Most of these commands were described in the main unit text, which also described some tools in the ACT-R Environment for inspecting and debugging models. Here we will provide some additional details for some of those commands, describe the **sgp** command, and show how one can also perform some of the actions that were done using the Environment tools from the prompt in the ACT-R window. In later units, we will also show how those commands can be accessed remotely using the included Python module as an example.

Additional ACT-R command details

Clear-all

The **clear-all** command is used to set the ACT-R software to its initial state. It removes all of the models that are currently defined, returns the clock to time 0, and removes any events which are on the event queue. If a model (or set of models) is contained within a single file, then one probably should call **clear-all** in that file to make sure ACT-R is initialized before defining the model components.

An additional side effect of the **clear-all** command is that it records the name of the file that contains it when it is loaded. That is how the **reload** command and “Reload” button in the ACT-R Environment know which file to load.

Define-model

The **define-model** command takes one required parameter which is the name of a new model to create and then an arbitrary number of other parameters which are the commands that create the initial conditions for the model. The name should be a symbol and must be unique with respect to other models that are currently defined. When a **reset** happens, all of the commands specified inside of the **define-model** are reevaluated for that model in the order they were specified. Each call to **define-model** creates a new model which is independent of the other models, but all of the models will run in parallel when the **run** command is called.

SGP

The **sgp** command is used to set or show a model's parameters (it stands for set/show general parameters). The parameters for a model control many different things. Some are used in equations that control the performance of the model's cognitive modules, others are there to help the modeler with debugging by changing the outputting of information or the seed of the pseudorandom number generator, and others are available to provide ways that the modeler can extend or modify internal ACT-R mechanisms. The details of all of the parameters can be found in the reference manual.

When using **sgp** to set parameters the syntax is to specify a parameter and then the new value you want to assign to that parameter. Any number of parameters and values may be specified in a single call to **sgp**. All of the parameters in ACT-R begin with a ":" (in Lisp syntax they are called keywords). All of the unit1 models have a call to **sgp** similar to this:

```
(sgp :esc t :lf .05 :trace-detail medium)
```

That is setting three parameters: **:esc**, **:lf**, and **:trace-detail**. The first two together are specifying that retrieval requests will always take 50ms to complete, but further details on those are beyond the scope of this unit and will be discussed fully in later units. The third parameter being set, **:trace-detail**, controls how much information is shown in the trace when a model runs. The default value is **medium**, and that is also how it is being set in the example above. The other values that it can have are **high** and **low**. When it is set to **high**, effectively every action the model does shows in the trace. Here is the trace of the two-digit addition model with **:trace-detail** set to **high**:

0.000	GOAL	SET-BUFFER-CHUNK GOAL GOAL NIL
0.000	PROCEDURAL	CONFLICT-RESOLUTION
0.000	PROCEDURAL	PRODUCTION-SELECTED START-PAIR
0.000	PROCEDURAL	BUFFER-READ-ACTION GOAL
0.050	PROCEDURAL	PRODUCTION-FIRED START-PAIR
0.050	PROCEDURAL	MOD-BUFFER-CHUNK GOAL
0.050	PROCEDURAL	MODULE-REQUEST RETRIEVAL
0.050	PROCEDURAL	CLEAR-BUFFER RETRIEVAL
0.050	DECLARATIVE	start-retrieval
0.050	PROCEDURAL	CONFLICT-RESOLUTION

0.100	DECLARATIVE	RETRIEVED-CHUNK FACT67
0.100	DECLARATIVE	SET-BUFFER-CHUNK RETRIEVAL FACT67
0.100	PROCEDURAL	CONFLICT-RESOLUTION
0.100	PROCEDURAL	PRODUCTION-SELECTED ADD-ONES
0.100	PROCEDURAL	BUFFER-READ-ACTION GOAL
0.100	PROCEDURAL	BUFFER-READ-ACTION RETRIEVAL
0.150	PROCEDURAL	PRODUCTION-FIRED ADD-ONES
0.150	PROCEDURAL	MOD-BUFFER-CHUNK GOAL
0.150	PROCEDURAL	MODULE-REQUEST RETRIEVAL
0.150	PROCEDURAL	CLEAR-BUFFER RETRIEVAL
0.150	DECLARATIVE	start-retrieval
0.150	PROCEDURAL	CONFLICT-RESOLUTION
0.200	DECLARATIVE	RETRIEVED-CHUNK FACT103
0.200	DECLARATIVE	SET-BUFFER-CHUNK RETRIEVAL FACT103
0.200	PROCEDURAL	CONFLICT-RESOLUTION
0.200	PROCEDURAL	PRODUCTION-SELECTED PROCESS-CARRY
0.200	PROCEDURAL	BUFFER-READ-ACTION GOAL
0.200	PROCEDURAL	BUFFER-READ-ACTION RETRIEVAL
0.250	PROCEDURAL	PRODUCTION-FIRED PROCESS-CARRY
0.250	PROCEDURAL	MOD-BUFFER-CHUNK GOAL
0.250	PROCEDURAL	MODULE-REQUEST RETRIEVAL
0.250	PROCEDURAL	CLEAR-BUFFER RETRIEVAL
0.250	DECLARATIVE	start-retrieval
0.250	PROCEDURAL	CONFLICT-RESOLUTION
0.300	DECLARATIVE	RETRIEVED-CHUNK FACT34
0.300	DECLARATIVE	SET-BUFFER-CHUNK RETRIEVAL FACT34
0.300	PROCEDURAL	CONFLICT-RESOLUTION
0.300	PROCEDURAL	PRODUCTION-SELECTED ADD-TENS-CARRY
0.300	PROCEDURAL	BUFFER-READ-ACTION GOAL
0.300	PROCEDURAL	BUFFER-READ-ACTION RETRIEVAL
0.350	PROCEDURAL	PRODUCTION-FIRED ADD-TENS-CARRY
0.350	PROCEDURAL	MOD-BUFFER-CHUNK GOAL
0.350	PROCEDURAL	MODULE-REQUEST RETRIEVAL
0.350	PROCEDURAL	CLEAR-BUFFER RETRIEVAL
0.350	DECLARATIVE	start-retrieval
0.350	PROCEDURAL	CONFLICT-RESOLUTION
0.400	DECLARATIVE	RETRIEVED-CHUNK FACT17
0.400	DECLARATIVE	SET-BUFFER-CHUNK RETRIEVAL FACT17
0.400	PROCEDURAL	CONFLICT-RESOLUTION
0.400	PROCEDURAL	PRODUCTION-SELECTED ADD-TENS-DONE
0.400	PROCEDURAL	BUFFER-READ-ACTION GOAL
0.400	PROCEDURAL	BUFFER-READ-ACTION RETRIEVAL
0.450	PROCEDURAL	PRODUCTION-FIRED ADD-TENS-DONE
0.450	PROCEDURAL	MOD-BUFFER-CHUNK GOAL
0.450	PROCEDURAL	CLEAR-BUFFER RETRIEVAL
0.450	PROCEDURAL	CONFLICT-RESOLUTION
0.450	-----	Stopped because no events left to process

That can be very useful when debugging a model but it can be a bit too much at other times. Here is the same model running with a **medium** level of **:trace-detail** (which is the default value):

0.000	GOAL	SET-BUFFER-CHUNK GOAL GOAL NIL
0.000	PROCEDURAL	CONFLICT-RESOLUTION
0.050	PROCEDURAL	PRODUCTION-FIRED START-PAIR
0.050	PROCEDURAL	CLEAR-BUFFER RETRIEVAL
0.050	DECLARATIVE	start-retrieval
0.050	PROCEDURAL	CONFLICT-RESOLUTION
0.100	DECLARATIVE	RETRIEVED-CHUNK FACT67

0.100	DECLARATIVE	SET-BUFFER-CHUNK RETRIEVAL FACT67
0.100	PROCEDURAL	CONFLICT-RESOLUTION
0.150	PROCEDURAL	PRODUCTION-FIRED ADD-ONES
0.150	PROCEDURAL	CLEAR-BUFFER RETRIEVAL
0.150	DECLARATIVE	start-retrieval
0.150	PROCEDURAL	CONFLICT-RESOLUTION
0.200	DECLARATIVE	RETRIEVED-CHUNK FACT103
0.200	DECLARATIVE	SET-BUFFER-CHUNK RETRIEVAL FACT103
0.200	PROCEDURAL	CONFLICT-RESOLUTION
0.250	PROCEDURAL	PRODUCTION-FIRED PROCESS-CARRY
0.250	PROCEDURAL	CLEAR-BUFFER RETRIEVAL
0.250	DECLARATIVE	start-retrieval
0.250	PROCEDURAL	CONFLICT-RESOLUTION
0.300	DECLARATIVE	RETRIEVED-CHUNK FACT34
0.300	DECLARATIVE	SET-BUFFER-CHUNK RETRIEVAL FACT34
0.300	PROCEDURAL	CONFLICT-RESOLUTION
0.350	PROCEDURAL	PRODUCTION-FIRED ADD-TENS-CARRY
0.350	PROCEDURAL	CLEAR-BUFFER RETRIEVAL
0.350	DECLARATIVE	start-retrieval
0.350	PROCEDURAL	CONFLICT-RESOLUTION
0.400	DECLARATIVE	RETRIEVED-CHUNK FACT17
0.400	DECLARATIVE	SET-BUFFER-CHUNK RETRIEVAL FACT17
0.400	PROCEDURAL	CONFLICT-RESOLUTION
0.450	PROCEDURAL	PRODUCTION-FIRED ADD-TENS-DONE
0.450	PROCEDURAL	CLEAR-BUFFER RETRIEVAL
0.450	PROCEDURAL	CONFLICT-RESOLUTION
0.450	-----	Stopped because no events left to process

In that trace we no longer see the individual condition tests and only some of the actions of the productions. Now, here is the same model run with a **low** setting for **:trace-detail**:

0.000	GOAL	SET-BUFFER-CHUNK GOAL GOAL NIL
0.050	PROCEDURAL	PRODUCTION-FIRED START-PAIR
0.100	DECLARATIVE	SET-BUFFER-CHUNK RETRIEVAL FACT67
0.150	PROCEDURAL	PRODUCTION-FIRED ADD-ONES
0.200	DECLARATIVE	SET-BUFFER-CHUNK RETRIEVAL FACT103
0.250	PROCEDURAL	PRODUCTION-FIRED PROCESS-CARRY
0.300	DECLARATIVE	SET-BUFFER-CHUNK RETRIEVAL FACT34
0.350	PROCEDURAL	PRODUCTION-FIRED ADD-TENS-CARRY
0.400	DECLARATIVE	SET-BUFFER-CHUNK RETRIEVAL FACT17
0.450	PROCEDURAL	PRODUCTION-FIRED ADD-TENS-DONE
0.450	-----	Stopped because no events left to process

At **low** we only see production firings and buffer settings. The setting of **:trace-detail** does not change how the model actually runs. It only affects how the trace is displayed to the modeler and which events are available to “step” to using the Stepper tool in the ACT-R Environment.

If one wants to completely turn off the model trace, there is another parameter which can be set to do so, and that will be described in a future unit.

To get a parameter’s current value using **sgp** only the name of the parameter (or parameters) should be specified. When all of the values passed to **sgp** are the names of parameters it will print out the details of those parameters and return a list of their current values. Typically that is not necessary when defining a model (with one exception which

can be very helpful for debugging a model and that will be described in a later unit), but it can be used at the ACT-R prompt to inspect the model settings (there is also an inspector in the Environment for doing so). Here is an example which is checking the values of the **:trace-detail** and **:lf** parameters:

```
? (sgp :trace-detail :lf)
:TRACE-DETAIL MEDIUM (default MEDIUM) : Determines which events show in the
trace
:LF 0.05 (default 1.0) : Latency Factor
```

If no parameters are provided to **sgp** then it will print out all of the parameters and their details.

Interacting with a model

In this unit we used the ACT-R Environment tools to load, run, reset, and inspect the model components. Most of the GUI tools in the Environment are using commands which are also available to the modeler for interacting with the model from the command prompt or in experiment or task code. Here we will describe some of the commands that correspond to the Environment tools used for this unit with respect to using them from the ACT-R command prompt (as was shown above for **sgp**). In future units we will discuss how those commands can also be used in experiments or tasks written in Lisp or Python¹.

Loading a model

To load the models in this unit we used the “Load ACT-R code” button to pick a file to load. There is a command in ACT-R which can also be used to load a model file which is called **load-act-r-model**. It requires one parameter which is a string specifying the pathname of the file to load. Typically, the full pathname of the file must be specified, but it does accept a simplified specification for files located in the directory containing the ACT-R files which is based on the Lisp logical pathname convention. The format for those relative pathnames is to start with ACT-R: and then follow that with the file name or subdirectories separated by semicolons and then the file name. Here is an example of loading the count.lisp model from the default ACT-R distribution:

```
? (load-act-r-model "ACT-R:tutorial;unit1;count.lisp")
T
```

¹ There are examples of connecting other languages included in the examples/connections directory, but those are just simple examples and would need to be extended to provide sufficient support to be able to implement the tutorial tasks. The documentation on the protocol for remote connections is in the docs directory if one is interested in extending those examples.

The **T** printed after the call is the return value from the command, and **T** is the Lisp symbol for true, which for this command means it was successful in loading the file. If the file is not found or there is an error in loading it then it will print a warning indicating the issue and the return value would be **nil** instead.

Resetting and Reloading

Instead of pressing the buttons to reset or reload a model one can call the corresponding commands, which are named reset and reload. They require no parameters and will return **T** if successful:

```
? (reset)
T
? (reload)
T
```

Running the model

There are actually multiple commands which can be used to run a model based on how it should determine when to stop running. The one that corresponds to the button on the Control Panel is called **run**. It requires one parameter which is the maximum number of seconds to run the model, but it will stop earlier if the model has no more actions to perform. In later units we will introduce more of the running commands and show them being used in creating tasks that automatically run the model as needed. Here is an example of using the **run** command at the prompt after loading the semantic model:

```
? (run 1)
0.000 GOAL SET-BUFFER-CHUNK GOAL G1 NIL
0.000 PROCEDURAL CONFLICT-RESOLUTION
0.050 PROCEDURAL PRODUCTION-FIRED INITIAL-RETRIEVE
0.050 PROCEDURAL CLEAR-BUFFER RETRIEVAL
0.050 DECLARATIVE start-retrieval
0.050 PROCEDURAL CONFLICT-RESOLUTION
0.100 DECLARATIVE RETRIEVED-CHUNK P14
0.100 DECLARATIVE SET-BUFFER-CHUNK RETRIEVAL P14
0.100 PROCEDURAL CONFLICT-RESOLUTION
0.150 PROCEDURAL PRODUCTION-FIRED DIRECT-VERIFY
0.150 PROCEDURAL CLEAR-BUFFER RETRIEVAL
0.150 PROCEDURAL CONFLICT-RESOLUTION
0.150 ----- Stopped because no events left to process
0.15
24
NIL
```

After the trace there are multiple return values shown from the run command which indicate how long it ran (in model time), how many events occurred during the run, and whether it ended unexpectedly or not (a value of **nil** means a successful ending because it was not unexpected).

Inspecting model components

During the unit we inspected the contents of the buffers, the model's declarative memory, and checked why productions did not match. All of those can also be done using commands.

Buffers

You can use the command named **buffer-chunk** to find the names of the chunks in the buffers and inspect their contents. Calling it without any parameters will show all of the buffers and the chunks they contain returning a list of lists with a buffer name and the name of the chunk in that buffer if it has one. Here is an example after running the semantic model:

```
? (buffer-chunk)
RETRIEVAL: NIL
IMAGINAL: NIL
MANUAL: NIL
GOAL: GOAL-CHUNK0
IMAGINAL-ACTION: NIL
VOCAL: NIL
AURAL: NIL
PRODUCTION: NIL
VISUAL-LOCATION: NIL
AURAL-LOCATION: NIL
TEMPORAL: NIL
VISUAL: NIL
((RETRIEVAL) (IMAGINAL) (MANUAL) (GOAL GOAL-CHUNK0) (IMAGINAL-ACTION) (VOCAL)
(AURAL) (PRODUCTION) (VISUAL-LOCATION) (AURAL-LOCATION) (TEMPORAL) (VISUAL))
```

If you call it with the name of a buffer (or multiple buffers), then it will print out the chunks in the named buffers and return a list of the names of the chunks in those buffers in the order they were provided (or nil if it does not have a chunk):

```
? (buffer-chunk retrieval goal)
RETRIEVAL: NIL
GOAL: GOAL-CHUNK0
GOAL-CHUNK0
  OBJECT CANARY
  CATEGORY BIRD
  JUDGMENT YES

(NIL GOAL-CHUNK0)
```

Declarative Memory

You can also inspect declarative memory from the command prompt. The command **dm** will print out all of the chunks in the model's declarative memory and return a list with the names of those chunks. You can also specify the names of chunks as parameters to the **dm** command and only those chunks will be printed. Here are some examples using the count model:

```

? (dm)
FIRST-GOAL
  START TWO
  END FOUR

FIVE
  NUMBER FIVE

FOUR
  NUMBER FOUR
  NEXT FIVE

THREE
  NUMBER THREE
  NEXT FOUR

TWO
  NUMBER TWO
  NEXT THREE

ONE
  NUMBER ONE
  NEXT TWO

(FIRST-GOAL FIVE FOUR THREE TWO ONE)

? (dm four one)
FOUR
  NUMBER FOUR
  NEXT FIVE

ONE
  NUMBER ONE
  NEXT TWO

(FOUR ONE)

```

It is also possible to search declarative memory using the command **sdm**. Its parameters are a chunk specification just as one would specify in a retrieval request in a production, but without the +retrieval> indicator at the beginning. It prints out only those chunks from the model's declarative memory which match that specification and returns the list of their names. Here are some examples using the semantic model:

```

? (sdm object shark)
P1
  OBJECT SHARK
  VALUE TRUE
  ATTRIBUTE DANGEROUS

P2
  OBJECT SHARK
  VALUE SWIMMING
  ATTRIBUTE LOCOMOTION

P3
  OBJECT SHARK
  VALUE FISH
  ATTRIBUTE CATEGORY

```

(P1 P2 P3)

? (sdm - attribute category - attribute nil)

P1

OBJECT SHARK
VALUE TRUE
ATTRIBUTE DANGEROUS

P2

OBJECT SHARK
VALUE SWIMMING
ATTRIBUTE LOCOMOTION

P4

OBJECT SALMON
VALUE TRUE
ATTRIBUTE EDIBLE

P5

OBJECT SALMON
VALUE SWIMMING
ATTRIBUTE LOCOMOTION

P7

OBJECT FISH
VALUE GILLS
ATTRIBUTE BREATHE

P8

OBJECT FISH
VALUE SWIMMING
ATTRIBUTE LOCOMOTION

P10

OBJECT ANIMAL
VALUE TRUE
ATTRIBUTE MOVES

P11

OBJECT ANIMAL
VALUE TRUE
ATTRIBUTE SKIN

P12

OBJECT CANARY
VALUE YELLOW
ATTRIBUTE COLOR

P13

OBJECT CANARY
VALUE TRUE
ATTRIBUTE SINGS

P15

OBJECT OSTRICH
VALUE FALSE
ATTRIBUTE FLIES

P16

OBJECT OSTRICH
VALUE TALL
ATTRIBUTE HEIGHT

```
P18
  OBJECT BIRD
  VALUE TRUE
  ATTRIBUTE WINGS
```

```
P19
  OBJECT BIRD
  VALUE FLYING
  ATTRIBUTE LOCOMOTION
```

```
(P1 P2 P4 P5 P7 P8 P10 P11 P12 P13 P15 P16 P18 P19)
```

One thing to note about the second example is that it specifies both that the attribute slot is not category and also not nil (which means the chunk must have some value for the slot). Here is what it returns if it were to only specify that the attribute slot is not category:

```
? (sdm - attribute category)
...
(G1 G2 G3 P1 P2 P4 P5 P7 P8 P10 P11 P12 P13 P15 P16 P18 P19 SHARK DANGEROUS
LOCOMOTION SWIMMING FISH SALMON EDIBLE BREATHE GILLS ANIMAL MOVES SKIN CANARY
COLOR SINGS BIRD OSTRICH FLIES HEIGHT TALL WINGS FLYING TRUE FALSE)
```

In this case it also finds all of the chunks which do not have an attribute slot because chunks without the slot fail the “attribute category” test and thus the negation of that is then true. That is something to be careful about when using the negation modifier in specifying retrieval requests in your productions as well.

Testing why not? for productions

The command to test whether a production matches the current state is called **whynot**. If you pass it no parameters it will print out each production in the model’s procedural memory along with either an indication that it matches or a reason why it does not match. You can also provide it with specific production names to test. It returns a list of the names of the productions which do match the current state. Here is an example using productions from the semantic model after it has been reset:

```
? (whynot direct-verify fail)
```

```
Production DIRECT-VERIFY does NOT match.
```

```
(P DIRECT-VERIFY
  =GOAL>
    OBJECT =OBJ
    CATEGORY =CAT
    JUDGMENT PENDING
  =RETRIEVAL>
    OBJECT =OBJ
    ATTRIBUTE CATEGORY
    VALUE =CAT
  ==>
  =GOAL>
    JUDGMENT YES
)
```

It fails because:
The GOAL buffer is empty.

Production FAIL does NOT match.

```
(P FAIL
  =GOAL>
    OBJECT =OBJ1
    CATEGORY =CAT
    JUDGMENT PENDING
  ?RETRIEVAL>
    BUFFER FAILURE
  ==>
  =GOAL>
    JUDGMENT NO
)
```

It fails because:
The GOAL buffer is empty.
NIL

Other model commands

Any of the commands that are specified in the model definition can also be called from the ACT-R command prompt. The **add-dm** and **p** commands are not usually called from the prompt since you want that knowledge to be included in the model when it starts running, but a command like **goal-focus** can occasionally be useful if you want to change the goal chunk for a model and run it again. That could have been convenient for the semantic model because instead of changing the file and reloading it to switch the goals one could have run the different goals sequentially by just calling goal-focus to change the chunk in the goal buffer and then run it again:

```
? (run 1)
0.000 GOAL SET-BUFFER-CHUNK GOAL G1 NIL
0.000 PROCEDURAL CONFLICT-RESOLUTION
0.050 PROCEDURAL PRODUCTION-FIRED INITIAL-RETRIEVE
0.050 PROCEDURAL CLEAR-BUFFER RETRIEVAL
0.050 DECLARATIVE start-retrieval
0.050 PROCEDURAL CONFLICT-RESOLUTION
0.100 DECLARATIVE RETRIEVED-CHUNK P14
0.100 DECLARATIVE SET-BUFFER-CHUNK RETRIEVAL P14
0.100 PROCEDURAL CONFLICT-RESOLUTION
0.150 PROCEDURAL PRODUCTION-FIRED DIRECT-VERIFY
0.150 PROCEDURAL CLEAR-BUFFER RETRIEVAL
0.150 PROCEDURAL CONFLICT-RESOLUTION
0.150 ----- Stopped because no events left to process
0.15
24
NIL
? (goal-focus g2)
G2
? (run 1)
0.150 GOAL SET-BUFFER-CHUNK GOAL G2 NIL
0.150 PROCEDURAL CONFLICT-RESOLUTION
0.200 PROCEDURAL PRODUCTION-FIRED INITIAL-RETRIEVE
0.200 PROCEDURAL CLEAR-BUFFER RETRIEVAL
0.200 DECLARATIVE start-retrieval
0.200 PROCEDURAL CONFLICT-RESOLUTION
0.250 DECLARATIVE RETRIEVED-CHUNK P14
0.250 DECLARATIVE SET-BUFFER-CHUNK RETRIEVAL P14
0.250 PROCEDURAL CONFLICT-RESOLUTION
```

0.300	PROCEDURAL	PRODUCTION-FIRED CHAIN-CATEGORY
0.300	PROCEDURAL	CLEAR-BUFFER RETRIEVAL
0.300	DECLARATIVE	start-retrieval
0.300	PROCEDURAL	CONFLICT-RESOLUTION
0.350	DECLARATIVE	RETRIEVED-CHUNK P20
0.350	DECLARATIVE	SET-BUFFER-CHUNK RETRIEVAL P20
0.350	PROCEDURAL	CONFLICT-RESOLUTION
0.400	PROCEDURAL	PRODUCTION-FIRED DIRECT-VERIFY
0.400	PROCEDURAL	CLEAR-BUFFER RETRIEVAL
0.400	PROCEDURAL	CONFLICT-RESOLUTION
0.400	-----	Stopped because no events left to process
0.25		
36		
NIL		
? (goal-focus g3)		
G3		
? (run 1)		
0.400	GOAL	SET-BUFFER-CHUNK GOAL G3 NIL
0.400	PROCEDURAL	CONFLICT-RESOLUTION
0.450	PROCEDURAL	PRODUCTION-FIRED INITIAL-RETRIEVE
0.450	PROCEDURAL	CLEAR-BUFFER RETRIEVAL
0.450	DECLARATIVE	start-retrieval
0.450	PROCEDURAL	CONFLICT-RESOLUTION
0.500	DECLARATIVE	RETRIEVED-CHUNK P14
0.500	DECLARATIVE	SET-BUFFER-CHUNK RETRIEVAL P14
0.500	PROCEDURAL	CONFLICT-RESOLUTION
0.550	PROCEDURAL	PRODUCTION-FIRED CHAIN-CATEGORY
0.550	PROCEDURAL	CLEAR-BUFFER RETRIEVAL
0.550	DECLARATIVE	start-retrieval
0.550	PROCEDURAL	CONFLICT-RESOLUTION
0.600	DECLARATIVE	RETRIEVED-CHUNK P20
0.600	DECLARATIVE	SET-BUFFER-CHUNK RETRIEVAL P20
0.600	PROCEDURAL	CONFLICT-RESOLUTION
0.650	PROCEDURAL	PRODUCTION-FIRED CHAIN-CATEGORY
0.650	PROCEDURAL	CLEAR-BUFFER RETRIEVAL
0.650	DECLARATIVE	start-retrieval
0.650	PROCEDURAL	CONFLICT-RESOLUTION
0.700	DECLARATIVE	RETRIEVAL-FAILURE
0.700	PROCEDURAL	CONFLICT-RESOLUTION
0.750	PROCEDURAL	PRODUCTION-FIRED FAIL
0.750	PROCEDURAL	CLEAR-BUFFER RETRIEVAL
0.750	PROCEDURAL	CONFLICT-RESOLUTION
0.750	-----	Stopped because no events left to process
0.35		
48		
NIL		