

RPS2 Spike Interface Document

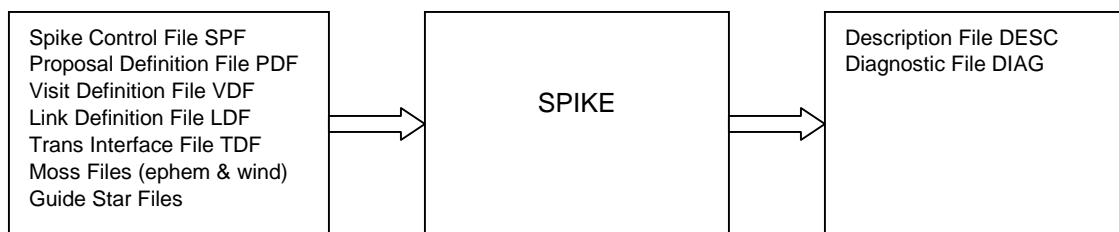
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1. Introduction

This document describes the current file based interface to Spike in RPS2. This document is used to help define what is needed for APT.



2. Input Files To Spike

This section describes the input files to Spike. All input to Spike is via files. This section also provides a mapping between what the PI can specify and what form it generates to communicate to Spike

Target specification

Fixed target specification	
Target Position	(define-fixed-target..)
Moving target specification	
Target Position (Level 1,2,3 or Ephem)	(define-moving-target ...)
MT Windows	

Pattern specification

Number_of_Points
Point_Spacing
Pattern_Orient

Visit specification

Visit_Requirements	
On Hold For (visit)	(define-sequential-link ...)
PCS Mode	
Guiding Tolerance	
Drop to Gyro if Necessary	
Orient	(define-absolute-orient ...)

Orient From (another visit)	(define-orient-from-nominal ...)
Same Orient As (visit)	(define-orient-from-link ...)
CVZ	(define-same-orient-link ...)
Sched	(define-visit ...)
Notrack	(define-visit ...)
After (a date)	(define-proposer-window ...)
After (a visit)	(define-sequential-link ...)
Before (a date)	(define-proposer-window ...)
Between (two dates)	(define-proposer-window ...)
Group (some visits) Within (some time)	(define-group-within ...)
Sequence (some visits) Within (some time)	(define-sequential-within ...)

Exposure specification

How they under or over fill orbits

Special_Requirements

Position Target	
Pattern	
RT Analysis	
Requires Ephem Correction	(define-ephemeris-correction-link ...)
Low-Sky	(define-visit ...)
Shadow	(define-visit ...)
Phase	(define-phase ...)
Save/Use Offset	(define-save-offset-link ...)

PC modifiable:

- GSPair
- Exp PCS Mode
- GS Acquisition Scenario

Generic Time Stamp Forms

Every file that Spike reads as input has a timestamp form as the first and last form in each file. See below.

<RPS-Stamp>

<File Specific Forms>

<End-RPS-File>

(RPS-Stamp

:proposal	<integer>
:absolute-time	<integer>
:sub-system	<string>
:version	<string>
:file-name	<string>

)

(RPS-Stamp

:proposal	1
:absolute-time	0
:sub-system	"PREPROCESSOR"
:version	"10.0"

```

        :file-name          "1.pp-pdf"
    )
(End-RPS-File
    :checksum              <number>
)
(End-RPS-File
    :checksum              0
)

```

Spike Control File (SPF)

There is only one SPF file for Spike. This file contains control parameters that Spike uses to calculate scheduability information. It is not changeable by the PI and therefore will not be generated by RPS2 or APT. This file is supplied by STScI and is assessible to the Spike server.

SPF FILENAME FORMAT

<filename>.spf

cycle12.spf

SPF FILE FORMS

An example file is shown here since the file doesn't need to be generated by RPS2 or APT.

```

(RPS-Stamp
  :proposal nil
  :visit nil
  :absolute-time 2985360238
  :sub-system "CASM"
  :version "8.1"
  :filename "cyc.spf"
)

(define-scheduling-parameters
  :af-database-style :sybase
  :scheduling-start "1998.335:00:00:00"
  :scheduling-end "2000.335:00:00:00"
  :load-assist-commits t
  :si-dark-earth-limb-angle 6.0
  :si-bright-earth-limb-angle 20.0
  :fgs-bright-earth-limb-angle 15.5
  :fgs-dark-earth-limb-angle 7.6
  :low-sky-si-bright-earth-limb-angle 40
  :moon-angle-table '((0 9 0) (9 180 1))
  :min-sun-angle 50
  :max-sun-angle 180
  :sun-angle-restrictions '(*MINUS-INFINITY* (50 180) 30)
  :orient-range-table '((50 nil)(90 5)(93 24.21)(96 24.06) (99 24.17)
                        (102 24.45) (105 24.88) (108 25.46) (111 25.54))
)

```

```

(114 24.45) (117 23.59) (120 22.96) (123 22.53)
(126 22.30) (129 22.18) (132 22.14) (135 22.26)
(138 22.57) (141 23.12) (144 23.94) (147 25.07)
(150 26.64) (153 28.82) (178 30) (180.1 180))
:guide-star-table '(:fine-lock-nominal
(*MINUS-INFINITY* 0.0 1 0.5 2 0.75 3 1.0)
:fine-lock-off-nominal
(*MINUS-INFINITY* 0.0 1 0.2 2 0.3 3 0.4)
:course-lock-nominal
(*MINUS-INFINITY* 0.0 1 1.0)
:course-lock-off-nominal
(*MINUS-INFINITY* 0.0 1 0.5))

:visibility-pad 60
:low-sky-visibility-pad 90
:trans-efficiency-level 30
:acquisition-time 7.12 ;; In seconds this is 427
:reacquisition-time 5.27 ;; In seconds this is 316
:dark-visibility-interval 32
:casm-running-mode :pi ;; :PI OR :PC
:caching-style :flat ;; :DIR OR :FLAT
:constraint-set-name "casm-oct98"
:low-sky-display :combined ;;; :separate
:phase-period-cutoff 7
:orbit-model "oct98" ;orbit model name
:st-information '(:inclination 28.470 ;inclination in degrees
:time-asc-node 7091.5 ;time of ascending node in truncated Julian date
:RA-asc-node 246.75 ;right ascension of ascending node in degrees
:regression-rate -6.3961 ;nodal regression rate in degrees per day
:period 96.41 ;nodal period in minutes
:semimajor-axis 6971.75) ;semi-major axis in kilometers
:tdrsw-information '(:longitude -171.0
:period 86164.09054 ;nodal period in minutes
:semimajor-axis 42164.69) ;semi-major axis in kilometers
:tdrse-information '(:longitude -41.0
:period 86164.09054 ;nodal period in minutes
:semimajor-axis 42164.69) ;semi-major axis in kilometers
:moving-target-mode :ephemeris
)

```

```

(End-RPS-File
:checksum 0
)

```

Proposal Definition File (PDF)

There is only one PDF file per proposal. This file mainly is used to convey which visits to process in the proposal and if there were errors in the preprocessor.

PDF FILENAME FORMAT

<proposal-id>.pdf

1.pdf

PDF FILE FORMS

RPS-Stamp (required - only 1)
define-proposal (required - only 1)
End-RPS-File (required - only 1)

```
(define-proposal
  :proposal-id      <integer>
  :preprocessor-errors <integer>
  :proposal-version <integer>
  :visit-ids       <list of visit id strings>
)
```

```
(define-proposal
  :proposal-id      1
  :preprocessor-errors 12
  :proposal-version -1
  :visit-ids       '("01" "02" "03" "04" "05" "06" "07" )
)
```

Visit Definition File (VDF)

There is one VDF file per visit per proposal. This file is used to convey visit specific information such as target(s) and visit specific special requirements .

VDF FILE NAME FORMAT

<proposal-id>-<visit-id>.pv-vdf

1-08.pv-vdf

VDF FILE FORMS

RPS-Stamp (required - only 1)
define-fixed-target |
define-moving-target |
define-generic-target |
define-internal-target |
define-external-target (required - could be more than one)
define-visit (required - only 1)
define-absolute-orient (optional)
define-orient-from-nominal (optional)
define-proposer-windows (optional)
define-phase (optional)
End-RPS-File

```

;; external fixed targets
(define-fixed-target
  :proposal-id      <integer>
  :visit-id        <string length 2>
  :target-number   <string>
  :target-id       <string>
  :ra              <float J2000>
  :dec             <float J2000>
)

(define-fixed-target
  :proposal-id      1
  :visit-id        "01"
  :target-number   "1"
  :target-id       "TARGET1"
  :ra              0.0000000000000000e+00
  :dec             0.0000000000000000e+00
)

;; external calibration targets
(define-external-target
  :proposal-id      <number>
  :visit-id        <string length 2>
  :target-id       <string>
)

(define-external-target
  :proposal-id      1
  :visit-id        "04"
  :target-id       "EARTH-CALIB"
)

;; internal calibration targets
(define-internal-target
  :proposal-id      <integer>
  :visit-id        <string length 2>
  :target-id       <string>
)

(define-internal-target
  :proposal-id      1
  :visit-id        "07"
  :target-id       "DARK"
)

;; moving targets, planets, comets, moons, etc
(define-moving-target
  :proposal-id      <integer>
  :visit-id        <string length 2>
  :target-number   <string>
  :target-id       <string>
  :level-1        <string>
)

```

```

:level-2      <string>
:level-3      <string>
)

(define-moving-target
:proposal-id  1
:visit-id     "02"
:target-number "2"
:target-id    "TARGET2"
:level-1     "STD=MARS"
:level-2     ""
:level-3     ""
)

;; generic targets
(define-generic-target"
:proposal-id      <integer>
:visit-id         <string length 2>
:target-number    <string>
:target-id        <string>
:generic-target-description <string>
)

(define-generic-target
:proposal-id      1
:visit-id         "03"
:target-number    "3"
:target-id        "TARGET3"
:generic-target-description "RA=0.0D +/- 10.0D,DEC=0.0D +/- 10.0D"
)

;; visit definition
(define-visit
:proposal-id      <integer>
:visit-id         <string length 2>
:target-ids       <list of strings>
:dark             <t | nil>
:low-sky          <t | nil>
:trans-efficiency-level <integer>
:cvz              <t | nil>
:parallel         <t | nil>
:visit-status     <:on-hold | :active>
)

(define-visit
:proposal-id      1
:visit-id         "03"
:target-ids       ('("TARGET3" )
:dark             nil
:low-sky          nil
:trans-efficiency-level 30
:cvz              nil
:parallel         nil
)

```

```
:visit-status      :active
)
```

```
:: absolute orients
```

```
(define-absolute-orient"
:proposal-id <integer>
:visit-id    <string length 2>
:orient-start <real degrees>
:orient-end   <real degrees>
:orient-ranges <list of lists of <real degrees> <real degrees>>
)
```

```
(define-absolute-orient
:proposal-id      1
:visit-id         "08"
:orient-start     50
:orient-end       60
:orient-ranges    '((50 60)(20 30))
)
```

```
:: orient from nominal
```

```
(define-orient-from-nominal
:proposal-id <integer>
:visit-id    <string length 2>
:orient-start <real degrees>
:orient-end   <real degrees>
)
```

```
(define-orient-from-nominal
:proposal-id      1
:visit-id         "08"
:orient-start     10
:orient-end       20
)
```

```
:: between, after, before
```

```
(define-proposer-window
:proposal-id <integer>
:visit-id    <string length 2>
:window-start <string yyyy.ddd.hh.mm.ss> | :minus-infinity
:window-end   <string yyyy.ddd.hh.mm.ss> | :plus-infinity
:windows      <list of lists of <string yyyy.ddd.hh.mm.ss>|:minus-infinity
               <string yyyy.ddd.hh.mm.ss>|:plus-infinity>>
)
```

```
(define-proposer-window
:proposal-id      1
:visit-id         "08"
:window-start     "2001.001:00:00:00"
:window-end       "2001.032:00:00:00"
:windows          '(( "2001.001:00:00:00" "2001.032:00:00:00" )
                   ( "2001.091:00:00:00" "2001.121:00:00:00" ))
)
```



```
)
(define-proposer-window
 :proposal-id      1
 :visit-id        "08"
 :window-start    "2001.001:00:00:00"
 :window-end      :plus-infinity
 :windows         '(( "2001.001:00:00:00" :plus-infinity))
)
```

:: Phase requirement

```
(define-phase
 :proposal-id      <integer>
 :visit-id        <string length 2>
 :zero-phase      <string yyyy.ddd.hh.mm.ss>
 :phase-start     <real [0-1.0]>
 :phase-end       <real [0-1.0]>
 :period          <integer seconds>
 :period-uncertainty <integer 0>
)
```

```
(define-phase
 :proposal-id      1
 :visit-id        "08"
 :zero-phase      "2001.001:00:00:00"
 :phase-start     0.5
 :phase-end       0.75
 :period          864000
 :period-uncertainty 0
)
```

Link Definition File (LDF)

This file contains all the visit special requirements which link two or more visits together. There is one LDF per proposal.

LDF FILE NAME FORMAT

<proposal-id>.pp-ldf
 1.pp-ldf

LDF FILE FORMS

RPS-Stamp	(required – only 1)
define-sequential-link	(optional - 1 or more)
define-group-within	(optional - 1 or more)
define-same-orient-link	(optional - 1 or more)
define-orient-from-link	(optional – 1 or more)

define-sequential-within (optional – 1 or more)
define-save-offset-link (optional – 1 or more)
define-ephemeris-correction-link. (optional – 1 or more)
End-RPS-File

```
(define-sequential-link
  :proposal-id      <integer>
  :visit1-id       <string>
  :visit2-id       <string>
  :minimum-separation <seconds 0 or up>
  :maximum-separation <seconds or :plus-infinity>
  :link-type       <:after | :on-hold-for>
)
```

```
(define-sequential-link
  :proposal-id      1
  :visit1-id       "01"
  :visit2-id       "02"
  :minimum-separation 0
  :maximum-separation 200000
  :link-type       :after
)
```

```
(define-group-within
  :proposal-id      <integer>
  :visit-ids       <list of strings>
  :time-interval   <seconds>
)
```

```
(define-group-within
  :proposal-id      1
  :visit-ids       ('("01" "02"))
  :time-interval   86400
)
```

```
(define-same-orient-link
  :proposal-id      <integer>
  :visit-ids       <list of strings>
)
```

```
(define-same-orient-link
  :proposal-id      1
  :visit-ids       ('("01" "02"))
)
```

```
(define-orient-from-link
  :proposal-id      <integer>
  :visit1-id       <string>
  :visit2-id       <string>
  :orient-start    <real – degrees>
  :orient-end      <real – degrees >
)
```

```
(define-orient-from-link
  :proposal-id      1
)
```

```

        :visit1-id          "01"
        :visit2-id          "02"
        :orient-start       45.0
        :orient-end         100.0
    )
(define-sequential-within
  :proposal-id             <integer>
  :visit-ids               <list of strings>
  :time-interval           <seconds>
)

(define-sequential-within
  :proposal-id             1
  :visit-ids               ('("01" "02"))
  :time-interval           86400
)

(define-save-offset-link
  :proposal-id             <integer>
  :offset-id               <string>
  :save-offset-visit       <string>
  :use-offset-visit        <string>
  :minimum-separation      <integer – seconds>
)

(define-save-offset-link
  :proposal-id             1
  :offset-id               "offset-1"
  :save-offset-visit       "01"
  :use-offset-visit        "02"
  :minimum-separation      86400
)

(define-ephemeris-correction-link
  :proposal-id             <integer>
  :offset-id               <string>
  :visit-ids               <list of strings>
)

(define-ephemeris-correction-link
  :proposal-id             1
  :offset-id               "id-1"
  :visit-ids               ('("01" "02"))
)

```

Trans Interface File (TDF)

There is one file per visit per proposal generated from TRANS.

TDF FILE NAME FORMAT

<proposal-id>-<visit-id>.tv-tic
 1-01.tv-tic

TDF FILE FORMS

This interface file between Trans and Spike is defined at

<http://www.stsci.edu/apsb/doc/trans/TIC-Interface-Document.html>.

Moss Ephemeris and Windows Files

This is the current Spike - Moss interface used at STScI. There are two files per moving target observation. There is an ephemeris file which contains ephemeris data for the target. This file is used by Spike to calculate target visibility with respect to the earth, sun & moon. There is a windows file which contains visibility windows when the target or feature is visible to the earth. These windows also take into account occultation of local bodies (planets or satellites) around the target. If the target is say a feature on a moon of Jupiter, then the windows file will report available windows when the feature is oriented toward earth and is unocculted by Jupiter or other Jupiter satellites. These files are generated by Moss and supplied with Spike like the SPF file.

FILE NAME FORMAT

<program-id>-<target-id>-<obs-id>.wnd - window file

<program-id>-<target-id>-<obs-id>.trh - ephemeris file

where <program-id> is a 4 character string, Annn - Znnn, where n is a number

<target-id> is a 2 character numeric string left padded with zeros

<obs-id> is a 2 character numeric string left padded with zeros

FILENAME FORMATS

Windows File

The first line in the file is simply a header line and is ignored by Spike. Each subsequent line in the file is a availability window with two dates per line. The first date is the start time of the window and the second time is the end time of the window. Dates are inclusive. The start/end time formats is yyyy.doy:hh:mm:ss.

Example

C399 LA1001 5757_1 CYCLE CYCLE 4 PLANET SATURN

1994.179:22:46:38 1994.181:21:04:43

1994.182:05:00:43 1994.184:03:15:20

1994.184:11:09:07 1994.184:11:45:26

Ephemeris File

The first line in the file is simply a header line and is ignored by Spike. Each subsequent line in the file is a ephemeris record consisting of seven elements. The ephemeris record format is as follows.

<date> <position-vector> <velocity-vector>

where <date> is a julian date

<position-vector> is a 3 tuple position vector

<velocity-vector> is a 3 tuple position vector

Example

```
C399 LA1001 5757_1 CYCLE CYCLE 4 PLANET SATURN
2449532.39554 1320884032.7 -366048410.6 -205937797.2 -25.81931 5.02032 1.86678
2449532.44905 1320764703.4 -366025157.7 -205929149.8 -25.81645 4.99633 1.85636
```

NGSS Guide Star File Interface ()

FILE NAME FORMAT

Jesse to supply

FILE FORMS

Jesse to supply

3. Output Files From Spike To DG

This section describes the output files from Spike to the RPS2 DG. All output from Spike is file based.

Diagnostic File (diag)

There is one file for proposal level diagnostics and one per visit for visit specific diagnostics. The format of the files are the same. The order of the forms in the file is described below.

RPS_Stamp	(required)
rps-diagnostic	(optional – 0 or more)
End-RPS-File	(required)

DIAG FILE NAME FORMAT

<proposal-id>-<visit-id>.cv-diag

1-01.cv-diag

<proposal-id>.cp-diag

1.cp-diag

DIAG FILE FORMS

```
(rps-diagnostic
:severity      <"I" | "W" | "E">
:object        <"visit" | "proposal">
:visit         <visit-id – not supplied if it is a proposal level diagnostic>
:type          <"schedulability">
:text          <string>
:explanation    <string>
)
```

```
(rps-diagnostic
:severity      "I"
:object        "visit"
:visit         "02"
:type          "schedulability"
:text          "short message goes here"
:explanation    "Big message explaining the error goes here"
)
```

Description File (desc)

There is one file per visit for visit specific scheduling information. The order of the forms in the file is described below.

RPS_Stamp	(required)
schedulability-description-parameters	(required)
roll-range-description	(2 copies)
schedulability-description	(1 or more)
End-RPS-File	(required)

DESC FILE NAME FORMAT

<proposal-id>-<visit-id>.cv-desc

1-01.cv-desc

DESC FILE FORMS

```
(schedulability-description-parameters
:proposal      <integer>
:visit         <string – length 2>
:planning-start <real – truncated julian date>
:planning-end  <real – truncated julian date>
)
```

```
(schedulability-description-parameters
:proposal      1
:visit         "01"
:planning-start 7878.5
:planning-end   8609.5
)
```

```
(roll-range-description
:type          <:COMBINED | :TARGET>
:start-time    <string yyyy.ddd>
```

```

:end-time          <string yyyy.ddd>
:roll-ranges      < '(' |
                  list of sublists of the form ("yyyy.ddd" (start degrees) (end degrees))>
:display          <"NO" | "YES">
)

```

```

(roll-range-description
:type :COMBINED
:start-time "2000.335"
:end-time "2002.335"
:roll-ranges '(
              ("2000.335" (288.60 298.60))
              ("2000.336" (288.52 298.52))
              ("2000.337" (288.44 298.44))
              ("2000.338" (288.36 298.36))
              ("2000.339" (288.27 298.27)))
:display "NO"
)

```

```

(schedulability-description
:constraint        <string>
:suitability        <PCF of the form
                  '(*MINUS-INFINITY* <value> <truncated julian date> value ..)
:constraint-calculated <"y" | "n">
:print-name        <string>
:comments          <list of strings>
;; display is optional and depend on the constraint
:display           <"YES" | "NO"> optional
;; Roll range is for guide star and absolute orient constraints only
:roll-range        <NIL or list of sublists of the form (start degrees end degrees)>
;; for orbital viewing constraint only
:cvz-pcf
:alignments-fit-pcf <PCF of the form
                  '(*MINUS-INFINITY* <value> <truncated julian date> value ..)
:flexibility-pcf    <PCF of the form
                  '(*MINUS-INFINITY* <value> <truncated julian date> value ..)
:eff-level-schedulability-pcf <PCF of the form
                  '(*MINUS-INFINITY* <value> <truncated julian date> value ..)
:actual-schedulability-pcf <PCF of the form
                  '(*MINUS-INFINITY* <value> <truncated julian date> value ..)
:saa-pcf           <PCF of the form
                  '(*MINUS-INFINITY* <value> <truncated julian date> value ..)
)

```

```

(schedulability-description
:constraint        "orb-viewing"
:suitability        '(*MINUS-INFINITY* 0 7878.0 1 8609.499988425925 0)
:constraint-calculated "y"
:print-name        ""
:comments          '()
:cvz-pcf           '(*MINUS-INFINITY* 0)
:alignments-fit-pcf '(*MINUS-INFINITY* 0)
:flexibility-pcf    '(*MINUS-INFINITY* 0)
:eff-level-schedulability-pcf '(*MINUS-INFINITY* 0)
)

```

```
:actual-schedulability-pcf      (*MINUS-INFINITY* 0)
:saa-pcf                        (*MINUS-INFINITY* 0)
)
```

```
(schedulability-description
```

```
:constraint                    "moss"
:suitability                    (*MINUS-INFINITY* 1)
:constraint-calculated         "y"
:print-name                    ""
:comments                      ("Could not find ephemeris for 1-02-TARGET2 in proposal
directory. Using default ephemeris for MARS. Contact your PC if you need to obtain a target
specific ephemeris."
"Moss Window file /usr/tmp/rps2-atropos.stsci.edu-25805/1_2.wnd is missing. Assuming
Schedulability everywhere. Please contact your PC if you need to obtain a target specific window
file.")
)
```