Phase II Target Submission Language Project

C. Mason, M. Shetrone, M. E. Cornell

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NOTICE: Target Submission Language continuously evolves. This document may not contain the latest updates for TSL language constructs, key words and valid parameter values. The definitive reference can be found in the online documentation on the HETqueue server at http:/hydra.as.utexas.edu (click on PhaseII > TSL).

OVERVIEW

The Phase II Target Submission Language (TSL) project is a component of the new Night Operations Software System (NOSS). The primary goal of the submission language project is the creation of a flexible, extensible and user-friendly Phase II target submission language for the Hobby-Eberly Telescope (HET). The original version of this new language was written by Matthew Shetrone and fashioned after the Penn State Keyword system. The 'Language Examples' section was written by Mark Cornell who also has contributed to language design revisions and parser testing. A TSL parser has been developed by Cloud Mason in tandem with the language and will serve as the means to validate TSL PI target submissions and act as an interface to the current plan.db based NOSS software with the expectation that this interface will be replaced eventually by an SQL DBMS interface.

The key deliverables for this project are:

1. A new Phase II target submission language definition
2. A working parser to interpret the new language
3. User documentation
4. Draft SQL NOSS database schema

FUNCTIONAL REQUIREMENTS

1. Language must provide a means to group actions and tracks that will allow the PI to specify:
   - A list of actions that all are done in a single track
   - Associated separate tracks to be done on a single night, or across several nights
   - A set of tracks for which only a specified number are required
2. Allow a PI a separate entry to give a relative priority among their targets within a given program
3. Allow a PI to specify the exact calibrations needed for each action
4. Break the instrument configuration into separate entries rather than a long string to allow for new options such as which HRS blocking filter to use or LRS binning, while providing backward compatibility with old style (plan.db) instrument configuration strings
5. Add support for an exposure time for individual frames, and the number of required exposures, NUMEXP, in addition to the current total exposure time and CRSPLIT terminology
6. Allow a PI to submit a practice Phase II to check their submission techniques
7. Allow a PI to verify that a track is observable and has enough time for the requested actions
8. Allow a PI to check the total requested time usage vs. the TAC allocation
9. Language shall be text based (i.e., ASCII)
10. Submission files shall be editable by any text editor
11. Format shall be line oriented and not require tab delimiters
12. Parser shall provide error checking for language syntax
13. Parser shall provide error checking for parameter values
14. Error messages shall specify source file line numbers
15. Error messages for parameter values shall provide valid values and/or syntax for each parameter

LANGUAGE STRUCTURE

TSL is a line oriented language where the PI submits a target list as an ASCII file (or several appended files.) Each submission file is fundamentally structured as a series of blocks which contain parameter/value pairs. The blocks are hierarchical and represent the nested elements of the language as described below.

STANDARD BLOCKS

COMMON — A collection of parameter/value pairs which apply to any subsequent GROUP, TRACK, or ACTION unless explicitly overridden in a subsequent block.

TRACK — One or more actions that take place during a single HET trajectory for a specified DEC and RA or for a non-sidereal object.

GROUP — A set of associated TRACKs or ACTIONs with specific operational characteristics. For example, a GROUP can specify:

1. A set of TRACKs which must be executed on the same night (Group type = AND)
2. A set of TRACKs of which only a subset are required (Group type = POOL)
3. A set of TRACKs to be executed in a specific sequence on the same night (Group type = SEQ)
4. A set of TRACKs to be executed in a specific order on one or more nights (Group type = ORD)

There may be any number of groups within a single program but groups do NOT cross program boundaries.

Group names must be unique only within a given program.

ACTION — A single schedulable event. Examples include a science exposure or a calibration lamp.

LIST BLOCKS

There are two additional block types, TARGET_LIST and ACTION_LIST, representing aggregate TRACKs (with implied ACTIONs) and ACTIONs, respectively. These allow the PI to specify TARGET and ACTION parameters in a row/column format where the first row is the list of parameters names and each subsequent row in the block is a list of TARGET and/or ACTION values.

LANGUAGE SYNTAX

Delimiters

As mentioned above, TSL is line oriented. Keywords and parameter values are separated by white space (i.e., one or more blanks or tabs) and newline characters. Blank lines are ignored by the parser as are internal comments. Internal comments begin with the '#' character and continue to the end of the line unless the ‘#’ character is appears within a quoted string.

Minimum Requirement

A submission file must define at least one track. Each track must define at least one action. An action can be specified explicitly with an ACTION or ACTION_LIST block or it can be defined implicitly with a TRACK or TRACK_LIST block that is not directly followed by an ACTION or ACTION_LIST block.

Block Keywords

Block keywords must be specified one per line and define the beginning of a logical block which continues until another block keyword or end-of-file is encountered. They have no associated value fields.

After each block keyword there MUST be at least one parameter keyword/value pair before another block keyword is encountered.

The legitimate sequences for blocks are defined as follows, where blocks in brackets are optional (*the indentions below are for display purposes only and are not required by or have any meaning in the language*):

```
[ COMMON ]
    [ GROUP  ]
        TRACK or TRACK_LIST
            [ACTION or ACTION_LIST]
```

Any number of variants of the sequences above may be concatenated to form a legitimate submission file.

Parameter Keywords

For the standard blocks -- COMMON, GROUP, TRACK and ACTION -- parameter keyword/value pairs must appear on a single line with the keyword appearing first (after optional white space) followed by white space then the parameter value. Note that whitespace is NOT allowed in any parameter value unless it is a double quoted string. For example:

```
EXP         1200
DEC         +12:05:36.7
NOTES       "This argument contains white space and must be enclosed in double quotes."
```

For the list blocks, TRACK_LIST and ACTION_LIST, parameter keywords are placed on a single line where keywords are separated by white space. Values for the list block parameters are then placed on subsequent lines separated by white space. Here are two examples from different submission files:

```
TRACK_LIST
    OBJECT      RA           DEC           MAG   PRI   EXP   VISITS
    mytarget    12:12:12.12  +13:12:12.1   12    1     1200  2
    mystandard  12:12:12.12  +13:12:12.1   13    2     1300  3
```

```
ACTION_LIST
  GASCELL     TYPE     EXP     COMMENT
    0         Sci      1200    "This is the gas cell out exposure"
    1         Sci      1200    "This is the gas cell in exposure"
    1         hrsff    5       "This is my flat with the gas cell in "
```

Parameter Scope

Recall that the block types are hierarchical. A parameter defined in a given block retains its value within the scope of the block unless locally overridden within a sub-block. For example, if the gascell parameter, GASCELL, were set to 1 in a TRACK block, then all actions within that block would use a GASCELL value of 1 unless a value for GASCELL was explicitly defined within one of the ACTION blocks. So in the following example the first and third actions inherit a GASCELL value of 1 from the preceding TRACK block while the second action overrides that value by setting GASCELL to 0.

```
TRACK
   OBJECT          N1_748
   RA              12.12.12.12
   DEC             +13:12:12.1
   GASCELL         1
ACTION
   EXP             400
   NUMEXP          2
ACTION
   EXP             500
   NUMEXP          2
   GASCELL         0
ACTION
   EXP             600
   NUMEXP          1
```

In any given submission file, parameter values for a given block persist until one of two conditions exists: 1) they are overridden with a subsequent declaration inside the same sub-block, or 2) another block of the same or higher position in the hierarchy is encountered.

Default and Required Values for Parameters

The majority of parameters have predefined default values. The default values for these parameters were guided by an analysis of one year's worth of HET plan.db entries.

Of course many of the parameters, which have no default value, are required for all target submissions, such as program name, RA and DEC. Others are instrument dependent, such as FILTER, which is has default values for HRS and MRS but not for all LRS grisms.

The PI does not have to specify any parameter in a submission file that is not required or if it has a default value. This allows for very simple submission files. For example, the following target submission file defines a single track with three actions:

```
TRACK
  PROGRAM         UT07-1-023
  INSTRUMENT      HRS
  OBJECT          obj1
  SKYBRIGHT       18.0
  PRI             2
  MAG             12.12
  RA              12:12:12.12
  DEC             +13:12:12.1
ACTION_LIST
     GASCELL   TYPE     EXP    COMMENT
     0         Sci      1200   "This is the gas cell out exposure"
     1         Sci      1200   "This is the gas cell in exposure"
     1         hrsff    5      "This is my flat with the gas cell in"
```

LANGUAGE EXAMPLES

```
# Example 1a:
#
# A simplified first visit for a planet search program.
#
# Note:  2 actions in the same track.
# Note:  Notice how NOTES and COMMENT are combined in the TSL output.
# Note:  New optional keywords to describe instrument configuration.
# Note:  Instead of specifying CRSPLIT and a total exposure time, one can
# specify the number of exposures, NUMEXP, and an exposure time per frame.
#
TRACK
  PROGRAM       UT08-1-001
  OBJECT        myplanet
  RA            12:12:12.12
  DEC           +12:12:12.1
  EQUINOX       2000.0
  MAG           12.0
  PA            par
  PRI           2
  SEEING        2.0
  SKYBRIGHT     18.0
  SKYTRANS      S
  NUMEXP        1              # an alternative to CRSPLIT
  VISITS        1
  MOVING        N
  SYNFREQ       RAND15-30
  SYNDATE       >20071215
  STDCALS       Y              # now means do standard cals in addition to other requests
  FLUX          N
  RV            N
  TELL          N
  SKYCALS       N
  NOTES         "My first visit"
ACTION
  INSTRUMENT    HRS
  RES           30k
  ECHELLE       central
  XD            316g5936
  FIBER         2as
  SKYFIBER      0
  SLICER        0
  BINCOL        2
  BINROW        1
  EXP           1200
  GASCELL       0
  COMMENT       "This is the gas cell out exposure"
ACTION
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  SKYFIBER      0
  SLICER        0
  BINCOL        2
  BINROW        1
  EXP           1200
  GASCELL       1
  COMMENT       "This is the gas cell in exposure"
```

```
# Example 1b:
#
# A simplified first visit for a planet search program.
#
# Note:  a COMMON block is more efficient than Example 1a.
#
COMMON
  PROGRAM       UT08-1-001
  OBJECT        myplanet
  INSTRUMENT    HRS
  RES           30k
  ECHELLE       central
  XD            316g5936
  FIBER         2as
  SKYFIBER      0
  SLICER        0
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
  SKYTRANS      S
  EXP           1200           # this is the exposure time per frame
  NUMEXP        1              # this is the number of exposures to take for each action
  VISITS        1
  MOVING        N
  SYNFREQ       RAND15-30
  SYNDATE       >20071215
  STDCALS       Y              # now means do standard cals in addition to other requests
  FLUX          N
  RV            N
  TELL          N
  SKYCALS       N
TRACK
  RA            12:12:12.12
  DEC           +12:12:12.1
  EQUINOX       2000.0
  MAG           12.0
  PA            par
  PRI           2
  NOTES         "My first visit"
ACTION
  GASCELL       0
  COMMENT       "This is the gas cell out exposure"
ACTION
  GASCELL       1
  COMMENT       "This is the gas cell in exposure"
```

```
# Example 1c:
#
# A simplified first visit for a planet search program.
#
# Note:  An ACTION_LIST is still more compact than Example 1b.
# Note:  Can still use the CRSPLIT concept for backward compatibility.
#
COMMON
  PROGRAM       UT08-1-001
  OBJECT        myplanet
  INSTRUMENT    HRS
  RES           30k
  ECHELLE       central
  XD            316g5936
  FIBER         2as
  SKYFIBER      0
  SLICER        0
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
  SKYTRANS      S
  EXP           1200           # now this is the total exposure time per action
  CRSPLIT       1              # instead of NUMEXP and an exposure time per frame
  VISITS        1
  MOVING        N
  SYNFREQ       RAND15-30
  SYNDATE       >20071215
  STDCALS       Y              # now means do standard cals in addition to other requests
  FLUX          N
  RV            N
  TELL          N
  SKYCALS       N
TRACK
  RA            12:12:12.12
  DEC           +12:12:12.1
  EQUINOX       2000.0
  MAG           12.0
  PA            par
  PRI           2
  NOTES         "My first visit"
ACTION_LIST
  GASCELL    COMMENT
    0        "This is the gas cell out exposure"
    1        "This is the gas cell in exposure"
```

```
# Example 1d:
#
# A simplified first visit for a planet search program.
#
# Note:  While this is not necessarily recommended, many keywords can be
# left out, and defaults used instead.  This script produces the same
# output as previous examples.
#
COMMON
  PROGRAM       UT08-1-001
  OBJECT        myplanet
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
  EXP           1200
  SYNFREQ       RAND15-30
  SYNDATE       >20071215
TRACK
  RA            12:12:12.12
  DEC           +12:12:12.1
  MAG           12.0
  PRI           2
  NOTES         "My first visit"
ACTION_LIST
  GASCELL    COMMENT
    0        "This is the gas cell out exposure"
    1        "This is the gas cell in exposure"
```

```
# Example 1e:
#
# A simplified first visit for a planet search program.
#
# Note:  Instrument configurations can still be written as a single string.
#
COMMON
  PROGRAM       UT08-1-001
  OBJECT        myplanet
  INSTCONFIG    HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1
  SEEING        2.0
  SKYBRIGHT     18.0
  EXP           1200
  SYNFREQ       RAND15-30
  SYNDATE       >20071215
TRACK
  RA            12:12:12.12
  DEC           +12:12:12.1
  MAG           12.0
  PRI           2
  NOTES         "My first visit"
ACTION_LIST
  GASCELL    COMMENT
    0        "This is the gas cell out exposure"
    1        "This is the gas cell in exposure"
```

```
# Example 1f:
#
# A simplified first visit for a planet search program.
#
# Note:  GASCELL can accept more human-readable values.
#
COMMON
  PROGRAM       UT08-1-001
  OBJECT        myplanet
  INSTCONFIG    HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1
  SEEING        2.0
  SKYBRIGHT     18.0
  EXP           1200
  SYNFREQ       RAND15-30
  SYNDATE       >20071215
TRACK
  RA            12:12:12.12
  DEC           +12:12:12.1
  MAG           12.0
  PRI           2
  NOTES         "My first visit"
ACTION_LIST
  GASCELL    COMMENT
    Out      "This is the gas cell out exposure"
    In       "This is the gas cell in exposure"



# Example 2a:
#
# Subsequent visits for a planet search program.
#
# Note:  1 action per track, multiple tracks.
# Note:  Several keywords left out and defaults assumed.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  GASCELL       1
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
TRACK
  OBJECT        myplanet1
  RA            12:12:12.12
  DEC           +12:12:12.1
  MAG           12.0
  PRI           2
  EXP           1200
  VISITS        2
TRACK
  OBJECT        myplanet2
  RA            13:13:13.13
  DEC           +13:13:13.1
  MAG           13.0
  PRI           3
  EXP           1300
  VISITS        3
```

```
# Example 2b:
#
# Subsequent visits for a planet search program.
#
# Note:  More efficient version of Example 2a.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  GASCELL       1
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
TRACK_LIST
  OBJECT    RA          DEC         MAG  PRI EXP   VISITS
  myplanet1 12:12:12.12 +12:12:12.1 12.0  2  1200    2
  myplanet2 13:13:13.13 +13:13:13.1 13.0  3  1300    3



# Example 2c:
#
# Subsequent visits for a planet search program.
#
# Note:  Instrument configurations can still be written as a single string.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTCONFIG    HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1
  SEEING        2.0
  SKYBRIGHT     18.0
TRACK_LIST
  OBJECT    RA          DEC         MAG  PRI EXP   VISITS
  myplanet1 12:12:12.12 +12:12:12.1 12.0  2  1200    2
  myplanet2 13:13:13.13 +13:13:13.1 13.0  3  1300    3



# Example 3a:
#
# Compare to Example 2b.  There we described tracks for two different
# targets.  Here we specify a single target with gas cell in and gas cell
# out exposures.
#
# Note:  These exposures are again described using the TRACK_LIST syntax.
# This means that the two tracks can be independent, with the exposures
# executed in different tracks, possibly on different nights.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
TRACK_LIST
  OBJECT       RA          DEC         MAG  PRI GASCELL EXP   VISITS
  myplanet1_I2 12:12:12.12 +12:12:12.1 12.0  2     1    1200    2
  myplanet1    12:12:12.12 +12:12:12.1 12.0  2     0    1200    2
```

```
# Example 3b:
#
# Contrast to Example 3a. Example 3a specified two, possibly independent,
# tracks. Here we specify two exposures to be taken in a single track.
#
# Note:  Use of ACTION_LIST following a TRACK specification forces these
# two exposures to be taken in the same track.
# Note:  We request 2 visits in the TRACK block, so both exposures from the
# ACTION_LIST will be repeated in each visit.
# Note:  The OBJECT keyword goes in the TRACK block, and not in the ACTION
# block, so we use an (optional) COMMENT to label the different exposures.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
TRACK
  OBJECT        myplanet1
  RA            12:12:12.12
  DEC           +12:12:12.1
  MAG           12.0
  PRI           2
  VISITS        2
ACTION_LIST
  GASCELL  EXP   COMMENT
    0      1200  "This is the gas cell out exposure"
    1      1300  "This is the gas cell in exposure"



# Example 3c:
#
# Multiple tracks, multiple actions per track.
#
# Note:  This special construction of a TRACK_LIST followed by an ACTION_LIST
# means that we do each set of actions in the list for each track in the list.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
TRACK_LIST
  OBJECT       RA          DEC         MAG  PRI VISITS
  myplanet1    12:12:12.12 +12:12:12.1 12.0  2    2
  myplanet2    13:13:13.13 +13:13:13.1 13.0  3    3
ACTION_LIST
  GASCELL  EXP   COMMENT
    0      1200  "This is the gas cell out exposure"
    1      1300  "This is the gas cell in exposure"
```

```
# Example 3d:
#
# Multiple sets of multiple tracks, with multiple actions per track.
#
# Note:  The ACTION_LIST for a given set of tracks immediately follows
# that track block.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
TRACK_LIST
  OBJECT       RA          DEC         MAG  PRI VISITS
  myplanet1    12:12:12.12 +12:12:12.1 12.0  2    2
  myplanet2    13:13:13.13 +13:13:13.1 13.0  3    3
ACTION_LIST
  GASCELL  EXP   COMMENT
    0      1200  "This is the gas cell out exposure"
    1      1300  "This is the gas cell in exposure"
TRACK_LIST
  OBJECT       RA          DEC         MAG  PRI VISITS
  myplanet3    14:14:14.14 +14:14:14.1 14.0  1    1
  myplanet4    15:15:15.15 -07:15:15.1 15.0  1    4
ACTION_LIST
  GASCELL  EXP   COMMENT
    0      900  "This is the gas cell out exposure"
    1      300  "This is the gas cell in exposure"



# Example 4a:
#
# An observation with non-standard calibration requests.
#
# There is a standard set of calibrations taken at the end of the night for
# each instrument configuration, but the PI can specify the number and type
# of any additional calibrations or standards required.
#
# Note:  We explicitly list the STDCALS keyword, even though 'Y' is the
# default, just to remind ourselves what will happen.  In addition to the
# standard calibrations, we request 5 Th-Ar lamps every night that one of
# our targets is done.  We also request a special flat field with the gas
# cell inserted, on each night the 'myplanet1_I2' visits take place.
# Note:  With this construction, there is no way to specify the exposure
# times of the Th-Ar lamps or the flat field.  These are left up to
# the RA to choose as she sees fit.  See Example 4d for an alternative.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
  STDCALS       Y       # now means do standard cals in addition to other requests
  THAR          5       # request 5 extra Th-Ar lamps at the end of each night
TRACK_LIST
  OBJECT       RA          DEC         MAG  PRI GASCELL EXP   VISITS  FF
  myplanet1_I2 12:12:12.12 +12:12:12.1 12.0  2     1    1200    3     1
  myplanet1    12:12:12.12 +12:12:12.1 12.0  2     0    1200    1     0
```

```
# Example 4b:
#
# More non-standard calibration requests.
#
# Note:  If a calibration frame needs to be taken during a track, and not at
# the end of the night, then it must be specified as an action, and the
# calibration frame will be charged to the PI.  Here is an example of a
# special flat to be taken right after normal science observations, while
# the telescope is still tracking.
#
COMMON
  PROGRAM       UT08-1-001
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
TRACK
  OBJECT        myplanet
  RA            12:12:12.12
  DEC           +12:12:12.1
  EQUINOX       2000.0
  MAG           12.0
  PRI           2
  NOTES         "My first visit"
ACTION_LIST
  GASCELL  TYPE    EXP   COMMENT
    0       sci    1200  "This is the gas cell out exposure"
    1       sci    1200  "This is the gas cell in exposure"
    1      hrsff     5   "This is a flat field with the gas cell in"
```

```
# Example 4c:
#
# More non-standard calibration requests.
#
# Note:  Here we add a request for a Radial Velocity standard of level 2 or
# better, in addition to the previous requests.
# Note:  Even though the standard is requested inside an ACTION_LIST
# construction, the request is interpreted to mean take this standard on
# any night that the rest of the actions are executed (and not somehow
# within this same track).
# Note:  Placing an "N" in the RV column of the ACTION_LIST means that this
# particular ACTION does not require that this standard be queued up.
# Note:  Even though we have requested a Radial Velocity standard for more
# than one entry on our ACTION_LIST, we would only get one such standard
# taken on any given night.
#
COMMON
  PROGRAM       UT08-1-001
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
TRACK
  OBJECT        myplanet
  RA            12:12:12.12
  DEC           +12:12:12.1
  EQUINOX       2000.0
  MAG           12.0
  PRI           2
  NOTES         "My first visit"
ACTION_LIST
  GASCELL  TYPE    EXP   RV  COMMENT
    0       sci    1200   2  "This is the gas cell out exposure"
    1       sci    1200   2  "This is the gas cell in exposure"
    1      hrsff     5    N  "This is a flat field with the gas cell in"


# Example 4d:
#
# More non-standard calibration requests.
#
# Compare to Example 4a.  There we requested additional calibration
# exposures, but with standard exposure times.  If more flexibility is
# needed, we can use the EXTRACALS keyword.  Here we request the standard
# calibrations, plus a long Neon lamp to be taken at the end of each night
# we get data.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    LRS
  GRISM         g2
  SLIT          1.5
  FILTER        GG385
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
  STDCALS       Y       # I want the standard cals, PLUS those listed in EXTRACALS
  EXTRACALS     1xcalNe@600s
TRACK_LIST
  OBJECT    RA          DEC         MAG  PRI EXP   VISITS
  myplanet1 12:12:12.12 +12:12:12.1 12.0  2  1200    2
  myplanet2 13:13:13.13 +13:13:13.1 13.0  3  1300    3
```

```
# Example 4e:
#
# More non-standard calibration requests.
#
# The EXTRACALS keyword can be used to specify the number and exposure time
# for a list of calibration frames to be obtained at the end of the night.
# Here we request our own set of calibration frames instead of the standard
# calibrations.
#
# Note:  Since our list for EXTRACALS contains spaces, it needs double quotes
# to make the parser happy.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    LRS
  GRISM         g2
  SLIT          1.5
  FILTER        GG385
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
  STDCALS       N       # Replace the standard cals with those listed in EXTRACALS
  EXTRACALS     "9xbias, 2xdark@1200s, 5xpfipff@89s, 1xcalCd@400s, 1xcalCd@40s, 1xcalNe@100s"
TRACK_LIST
  OBJECT    RA          DEC         MAG  PRI EXP   VISITS
  myplanet1 12:12:12.12 +12:12:12.1 12.0  2  1200    2
  myplanet2 13:13:13.13 +13:13:13.1 13.0  3  1300    3



# Example 4f:
#
# More non-standard calibration requests.
#
# EXTRACALS can be different for each target, as well.
#
# Note: There is no comment for the second target, but we need a place
# holder in the TRACK_LIST table to keep the parser happy.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    LRS
  GRISM         g2
  SLIT          1.5
  FILTER        GG385
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
  STDCALS       Y       # I want the standard cals, PLUS those listed in EXTRACALS
TRACK_LIST
  OBJECT    RA          DEC         MAG  PRI EXP   VISITS EXTRACALS     COMMENT
  bluestar  12:12:12.12 +12:12:12.1 12.0  2  1200    2    2xcalNe@600s  "make sure we have enough
lines in the blue"
  redstar   13:13:13.13 +13:13:13.1 13.0  3  1300    3    3xcalCd@10s   ""
```

```
# Example 4g:
#
# More non-standard calibration requests.
#
# Strictly speaking, one does not have to specify exposure times in EXTRACALS.
# These can be left up to the RA.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    LRS
  GRISM         g2
  SLIT          1.5
  FILTER        GG385
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
  STDCALS       Y       # I want the standard cals, PLUS those listed in EXTRACALS
TRACK_LIST
  OBJECT    RA          DEC         MAG  PRI EXP   VISITS EXTRACALS COMMENT
  bluestar  12:12:12.12 +12:12:12.1 12.0  2  1200    2    2xcalNe   "make sure we have enough lines
in the blue"
  redstar   13:13:13.13 +13:13:13.1 13.0  3  1300    3    3xcalCd   ""



# Example 5:
#
# Observations with two instruments in a single track.
#
# Note:  Accept most defaults.
# Note:  The HRS default is for the gas cell to be out.  Be sure that is
# what you want if you leave off the keyword.
#
TRACK
  PROGRAM       UT08-1-001
  OBJECT        myplanet
  RA            12:12:12.12
  DEC           +12:12:12.1
  EQUINOX       2000.0
  MAG           12.0
  PRI           2
  SEEING        2.0
  SKYBRIGHT     18.0
  NOTES         "This track will have both MRS and HRS observations"
ACTION
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  EXP           1200
  COMMENT       "This is the HRS observation"
ACTION
  INSTRUMENT    MRS
  FIBER         1.5Bs
  BINCOL        2
  BINROW        2
  EXP           1500
  COMMENT       "This is the MRS observation"
```

```
# Example 6a:
#
# Request a specific standard star to be observed on the same night as the
# primary science target.
#
# Note:  Uses a GROUP block of type AND.
# Note:  Not obvious it makes any sense to specify different priorities or
# number of visits in this case.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
GROUP
  GNAME         mygroup
  GTYPE         AND
TRACK_LIST
  OBJECT      RA          DEC         MAG  PRI EXP   VISITS
  mytarget    12:12:12.12 +12:12:12.1 12.0  2  1200    2
  mystandard  13:13:13.13 +13:13:13.1 13.0  2  1300    2



# Example 6b:
#
# Compare to Example 6a.  There we requested a specific standard star to be
# observed on the same night as the primary science target. Here we request
# that the standard star be observed immediately after the primary science
# target.  The order of the specified sequence of observations is preserved.
# Note that this is different from an ACTION_LIST, because the targets have
# different coordinates, and hence different TRACKs.
#
# Note:  Uses a GROUP block of type SEQ.
# Note:  Not obvious it makes any sense to specify different priorities or
# number of visits in this case.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
GROUP
  GNAME         mygroup
  GTYPE         SEQ
TRACK_LIST
  OBJECT      RA          DEC         MAG  PRI EXP   VISITS
  mytarget    12:12:12.12 +12:12:12.1 12.0  2  1200    2
  mystandard  13:13:13.13 +13:13:13.1 13.0  2  1300    2
```

```
# Example 6c:
#
# Multiple targets, each with a specific standard star to be observed on
# the same night as the primary science target.
#
# Note:  Uses a GROUP block of type AND.
# Note:  For each target we request 2 900s exposures, and for each standard
# we request a single 300s exposure, taken on the same night.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTCONFIG    LRS_g2_1.5_GG385
  SEEING        2.0
  SKYBRIGHT     20.5
  SKYTRANS      S
  PRI           1
  VISITS        2
  MOVING        N
  STDCALS       Y              # now means do standard cals in addition to other requests
  FLUX          N
  RV            N
  TELL          N
  SKYCALS       Y
GROUP
  GNAME         mygroup1
  GTYPE         AND
TRACK_LIST
  OBJECT      RA          DEC         MAG  PA    EXP NUMEXP COMMENT
  target1     12:12:12.12 +12:12:12.1 12.0 205.0 900 2      "These are the galaxy exposures"
  standard1   13:13:13.13 +13:13:13.1  9.1 205.0 300 1      "This is the standard exposure"
GROUP
  GNAME         mygroup2
  GTYPE         AND
TRACK_LIST
  OBJECT      RA          DEC         MAG  PA    EXP NUMEXP COMMENT
  target2     14:14:14.14 +14:14:14.1 14.0 111.0 900 2      "These are the galaxy exposures"
  standard2   15:15:15.15 +15:15:15.1  8.2 111.0 300 1      "This is the standard exposure"
GROUP
  GNAME         mygroup3
  GTYPE         AND
TRACK_LIST
  OBJECT      RA          DEC         MAG  PA   EXP NUMEXP COMMENT
  target3     16:16:16.16 +16:16:16.1 14.0 53.0 900 2      "These are the galaxy exposures"
  standard3   17:17:17.17 +17:17:17.1  7.9 53.0 300 1      "This is the standard exposure"
```

```
# Example 6d:
#
# Multiple targets, each with an associated calibration target (in this case
# a sky frame) to be observed immediately after the primary target.
#
# Note:  Uses a GROUP block of type SEQ.
# Note:  For each target we request 2 900s exposures, followed immediately by a
# single sky exposure.
# Note:  Here we used CRSPLIT and a total exposure time instead of NUMEXP and
# an individual exposure time.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTCONFIG    LRS_g2_1.5_GG385
  SEEING        2.0
  SKYBRIGHT     20.5
  SKYTRANS      S
  PRI           1
  VISITS        2
  MOVING        N
  STDCALS       Y              # now means do standard cals in addition to other requests
  FLUX          N
  RV            N
  TELL          N
  SKYCALS       N
GROUP
  GNAME         mygroup1
  GTYPE         SEQ
TRACK_LIST
  OBJECT      RA           DEC          MAG  PA    EXP  CRSPLIT COMMENT
  target1     12:12:12.12 +12:12:12.1 12.0 205.0 1800 2      "These are the galaxy exposures"
  target1sky  12:27:12.12 +12:12:12.1 12.0 205.0  300 1      "This is the sky exposure"
GROUP
  GNAME         mygroup2
  GTYPE         SEQ
TRACK_LIST
  OBJECT      RA           DEC          MAG  PA    EXP  CRSPLIT COMMENT
  target2     13:13:13.13 +13:13:13.1 13.0 111.0 1800 2      "These are the galaxy exposures"
  target2sky  13:28:13.13 +13:13:13.1 13.0 111.0  300 1      "This is the sky exposure"
GROUP
  GNAME         mygroup3
  GTYPE         SEQ
TRACK_LIST
  OBJECT      RA           DEC          MAG  PA    EXP  CRSPLIT COMMENT
  target3     14:14:14.14 +14:14:14.1 14.0 205.0 1800 2      "These are the galaxy exposures"
  target3sky  14:29:14.14 +14:14:14.1 14.0 205.0  300 1      "This is the sky exposure"
```

```
# Example 6e:
#
# Multiple targets, each with an associated sky frame to be observed
# immediately after the primary target, plus a standard star to be observed
# any time on the same night.
#
# Note:  Uses GROUP blocks of type SEQ, and of type AND, with identical
# group names to associate all of the related observations.
# Note:  It is a good idea to keep related group blocks (i.e. those with
# identical names) together in this file, but that is not strictly required
# by the parser.
# Note:  For each target we request 2 900s exposures, followed immediately by a
# single sky exposure.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTCONFIG    LRS_g2_1.5_GG385
  SEEING        2.0
  SKYBRIGHT     20.5
  SKYTRANS      S
  PRI           1
  VISITS        2
  MOVING        N
  STDCALS       Y              # now means do standard cals in addition to other requests
  FLUX          N
  RV            N
  TELL          N
  SKYCALS       N
#
GROUP
  GNAME         mygroup1
  GTYPE         SEQ
TRACK_LIST
  OBJECT      RA          DEC         MAG  PA    EXP NUMEXP COMMENT
  target1     12:12:12.12 +12:12:12.1 12.0 205.0 900 2      "These are the galaxy exposures"
  target1sky  12:27:12.12 +12:12:12.1 12.0 205.0 300 1      "This is the sky exposure"
GROUP
  GNAME         mygroup1
  GTYPE         AND
TRACK_LIST
  OBJECT      RA          DEC         MAG  PA    EXP NUMEXP COMMENT
  standard1   15:15:15.15 +15:15:15.1  9.9 205.0 300 1      "This is the standard exposure"
#
GROUP
  GNAME         mygroup2
  GTYPE         SEQ
TRACK_LIST
  OBJECT      RA          DEC         MAG  PA    EXP NUMEXP COMMENT
  target2     13:13:13.13 +13:13:13.1 13.0 111.0 900 2      "These are the galaxy exposures"
  target2sky  13:28:13.13 +13:13:13.1 13.0 111.0 300 1      "This is the sky exposure"
GROUP
  GNAME         mygroup2
  GTYPE         AND
TRACK_LIST
  OBJECT      RA          DEC         MAG  PA    EXP NUMEXP COMMENT
  standard2   16:16:16.16 +16:16:16.1  8.8 111.0 300 1      "This is the standard exposure"
#
GROUP
  GNAME         mygroup3
  GTYPE         SEQ
TRACK_LIST
  OBJECT      RA          DEC         MAG  PA   EXP NUMEXP COMMENT
  target3     14:14:14.14 +14:14:14.1 14.0 22.0 900 2      "These are the galaxy exposures"
  target3sky  14:29:14.14 +14:14:14.1 14.0 22.0 300 1      "This is the sky exposure"
GROUP
  GNAME         mygroup3
  GTYPE         AND
TRACK_LIST
  OBJECT      RA          DEC         MAG  PA   EXP NUMEXP COMMENT
  standard3   17:17:17.17 +17:17:17.1  9.3 22.0 300 1      "This is the standard exposure"
```

```
# Example 6f:
#
# Compare to Examples 6a and 6b.  In Example 6a we requested a specific
# standard star to be observed on the same night as the primary science
# target, using a GROUP of type AND. In Example 6b we requested that the
# standard star be observed immediately after the primary science target,
# using a GROUP of type SEQ.  Both of these examples apply to observations
# to be taken on the same night.  Here we illustrate another GROUP
# construction to specify the order in which a set of tracks are to be
# observed, even across different nights.
#
# Note:  Uses a GROUP block of type ORD.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
GROUP
  GNAME         mygroup
  GTYPE         ORD
TRACK_LIST
  OBJECT      RA          DEC         MAG  PRI EXP   VISITS
  mytarget1   12:12:12.12 +12:12:12.1 12.0  0  1200    2     # do these visits first
  mytarget1   12:12:12.12 +12:12:12.1 12.0  1  1300    3     # do these visits second
  mytarget2   14:14:14.14 +14:14:14.1 11.5  1   900    1     # do these visits third



 Example 6g:
#
# Compare to previous GROUP examples.  Sometimes it is more convenient to put
# the GROUP specifications inside the TRACK_LIST block.
#
# Note:  Uses a GROUP block of type ORD.
# Note:  I have two different targets, each requiring two set of tracks with
# slightly different properties.  I don't care in which order the two targets
# are observed.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
TRACK_LIST
  OBJECT      RA          DEC         MAG  PRI EXP   VISITS    GNAME   GTYPE
  mytarget1   12:12:12.12 +12:12:12.1 12.0  0  1200    2     mytarget1  ORD   # do these visits
first
  mytarget1   12:12:12.12 +12:12:12.1 12.0  1  1300    3     mytarget1  ORD   # do these visits
second
  mytarget2   14:14:14.14 +14:14:14.1 11.5  1   900    1     mytarget2  ORD   # do these visits
first
  mytarget2   14:14:14.14 +14:14:14.1 11.5  2   600    3     mytarget2  ORD   # do these visits
second
```

```
# Example 7:
#
# Specify a list of 10 targets from which the PI only needs 3 to be completed.
#
# Note:  Uses a GROUP block of type POOL.
# Note:  Once you start 3 targets, the rest are put on hold.  Allows the PI
# to specify many targets, and then concentrate on the first available.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
GROUP
  GNAME         mygroup
  GTYPE         POOL
  NUMTODO       3
TRACK_LIST
  OBJECT      RA          DEC         MAG  PRI EXP   VISITS
  mytarget1   12:12:12.12 +12:12:12.1 12.0  2  1000    2
  mytarget2   13:12:12.12 +13:01:12.1 13.1  3  1100    3
  mytarget3   13:13:12.12 +13:02:12.1 13.2  2  1200    4
  mytarget4   13:14:12.12 +13:03:12.1 13.3  2  1300    2
  mytarget5   13:15:12.12 +13:04:12.1 13.4  3  200     2
  mytarget6   13:16:12.12 +13:05:12.1 13.5  2  900     3
  mytarget7   13:17:12.12 +13:06:12.1 13.6  2  1200    2
  mytarget8   13:18:12.12 +13:07:12.1 13.7  3  1400    3
  mytarget9   13:19:12.12 +13:08:12.1 13.8  2  1500    3
  mytarget10  13:20:12.12 +13:09:12.1 13.9  2  1100    2



# Example 8:
#
# It is now possible to provide a S/N goal, along with a baseline exposure
# time.
#
# Note:  The reference wavelength in angstroms for the S/N goal is entered
# in SNWAVE.  If not specified for HRS, the S/N is measured on the blue CCD
# right at the junction between the two CCDs.  There is no default for LRS
# or MRS, and SNWAVE must be supplied for those instruments.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  GASCELL       1
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
  SNWAVE        5500
TRACK_LIST
  OBJECT    RA          DEC         MAG  PRI EXP  SNGOAL VISITS
  myplanet1 12:12:12.12 +12:12:12.1 12.0  2  1200  200     2
  myplanet2 13:13:13.13 +13:13:13.1 13.0  3  1300  300     3
```

```
# Example 9:
#
# There are new, non-standard instrumentation configuration possibilities
# to handle special cases.
#
# Note:  Since there is typically no filter specified for an HRS setup,
# the FILTER keyword comes out in the optional parameters section of
# plan.db.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  GASCELL       In
  BINCOL        2
  BINROW        1
  FILTER        R
  SEEING        2.0
  SKYBRIGHT     18.0
TRACK_LIST
  OBJECT    RA          DEC         MAG  PRI EXP   VISITS
  myplanet1 12:12:12.12 +12:12:12.1 12.0  2  1200    2
  myplanet2 13:13:13.13 +13:13:13.1 13.0  3  1300    3


# Example 10a:
#
# It is now possible to provide a URL for a web-accessible electronic
# finder chart, on a shared risk basis.  These charts will probably be
# collected at some point in the Phase II process so that a local copy
# resides on the mountain.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    MRS
  MODE          DF
  CAMERA        Vis
  ECHELLE       79
  XD            220
  WAVELENGTH    7000
  FIBER         1.5Bs
  SKYCHOP       1
  FILTER        0
  SLIT          0
  MASK          0
  BINCOL        2
  BINROW        2
  SEEING        2.0
  SKYBRIGHT     18.0
TRACK_LIST
  OBJECT    RA          DEC         MAG  PRI EXP   VISITS  PICHART
  mytarget1 12:12:12.12 +12:12:12.1 12.0  2  1200    2     http://puck.as.utexas.edu/HET/UT08-
1/chart1.jpg
  mytarget2 13:13:13.13 +13:13:13.1 13.0  3  1300    3     http://puck.as.utexas.edu/HET/UT08-
1/chart2.jpg
```

```
# Example 10b:
#
# Another example of electronic finding charts.
#
# Note:  You can provide more than one chart for an object by using
# SPACE separated URLs, enclosed in double quotes.  You can't use
# commas as separators, because commas are valid characters inside a
# URL.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    MRS
  MODE          DF
  CAMERA        Vis
  ECHELLE       79
  XD            220
  WAVELENGTH    7000
  FIBER         1.5Bs
  SKYCHOP       1
  FILTER        0
  SLIT          0
  MASK          0
  BINCOL        2
  BINROW        2
  SEEING        2.0
  SKYBRIGHT     18.0
TRACK_LIST
  OBJECT    RA          DEC         MAG  PRI EXP   VISITS  PICHART
  mytarget1 12:12:12.12 +12:12:12.1 12.0  2  1200    2     "http://puck.as.utexas.edu/HET/UT08-
1/chart1a.jpg http://puck.as.utexas.edu/HET/UT08-1/chart1b.jpg"
  mytarget2 13:13:13.13 +13:13:13.1 13.0  3  1300    3     http://puck.as.utexas.edu/HET/UT08-
1/chart2.jpg
```

PARAMETER KEYWORD TABLE

This section lists all parameter keywords for the language along with allowable values, default values, instrument dependencies and whether a parameter is required or not.

PARAMETER KEYWORD	REQ	PLAN.DB FIELD #	INST	DEFAULT	NEW DB DATA TYPE	ALLOWED VALUES
AR	N	99	all	undef	Int	{0..n}
AZRES	N	5	all	undef	String	{E,W,none,""}
BIAS	N	99	all	undef	Int	{0..n}
BINCOL	N	13	HRS	2	Int	{1,2}
BINCOL	N	13	LRS	2	Int	{1,2}
BINCOL	N	13	MRS	2	Int	2
BINROW	N	13	HRS	1	Int	{1..5}
BINROW	N	13	LRS	2	Int	{1..2}
BINROW	N	13	MRS	2	Int	2
CAMERA	N	13	MRS	Vis	String	{Vis,JCAM,both}
CD	N	99	all	undef	Int	{0..n}
COMMENT	N	30	all	""	String	String
CRSPLIT	N	18	all	1	Int	{1..n}
DARK	N	99	all	undef	Int	{0..n}
DEC	Y	7	all	undef	String	[+,-]dd:mm:ss[.ss]
ECHELLE	N	13	HRS	central	String	{central,red,blue}
ECHELLE	N	13	MRS	79	Int	{79,110}
EQUINOX	N	8	all	2000.0	Real	1900.0 to 2000.0
EXP	Y	17	all	undef	Real	Real
EXTRACALS	N	99	all	undef	String	String or Quoted string[1]
FF	N	99	all	undef	Int	{0..n}
FIBER	N	13	HRS	2as	String	{2as,3as}
FIBER	N	13	MRS	1.5Bs	String	{1.5Bs,1.5Rs,2.0B,2.0R}
FIBERTARGET	N	99	MRS	target	String	{sky,target}
FILTER	N	13	HRS	""	String	{default,String}
FILTER	Y[2]	13	LRS	Depends on GRISM setting: g1: undef g2: GG385 g3: OG515 e2: E2F none: undef	String	{B,V,R,I,z,GG385,OG515,GG475, E2F, none}
FILTER	N	13	MRS	0	Int	{0,1,2,3,4,5}
FLUX	N	26	all	N	String	{Y,N,1,2,3,4}
GASCELL	N	13	HRS	GC0	String	{GC0,GC1,0,1,In,Out}
GNAME	N	24	all	undef	String	String
GRISM	N	13	LRS	g1	String	{g1,g2,g3,e2,none}
GTYPE	N	99	all	AND	String	{AND,POOL,SEQ,ORD}
HG	N	99	all	undef	Int	{0..n}
INSTCONFIG	N[3]	13	all	undef	String	String[1]
INSTRUMENT	N[3]	13	all	undef	String	{HRS,MRS,LRS}

[1] See TSL Parameter Descriptions appendix.
[2] Required unless GRISM is set to 'g2', 'g3', or 'e2'.
[3] Either INSTRUMENT or INSTCONFIG must be declared, but not both.

PARAMETER KEYWORD	REQ	PLAN.DB FIELD #	INST	DEFAULT	NEW DB DATA TYPE	ALLOWED VALUES
MAG	Y	9	all	undef	Real	Real
MASK	N	13	MRS	0	String	{0,5.0U,15.0C,3.0C,5.5L}
MODE	N	13	MRS	DF	String	{DF,LS,MOS}
MOSCONFIG	N	13	LRS	none	String	Filename
MOVING	N	21	all	N	String	{Y,N}
NE	N	99	all	undef	Int	{0..n}
NOTES	N	99	all	""	String	Quoted string (quotes are only necessary if spaces are used)
NUMEXP	N	18	all	1	String	{1..n}
NUMTODO	N	99	all	1	Int	{1..n}
OBJECT	Y	4	all	undef	String	String
OFFSET	N	99	HRS	0	Real	Real [Arc seconds]
OFFSET	N	99	MRS	0	Real	Real [Arc seconds]
OFFSETDEC	N	99	all	undef	Real	Real [Arc seconds]
OFFSETRA	N	99	all	undef	Real	Real [Arc seconds]
PA	N	10	all	par	String	{par} or Real including one fractional place: [+/-]nnn.n
PICHART	N	0	all	undef	String	URL or multiple space-separated URLs in double quotes. URLs must include the http, https or ftp protocol prefix.
PIPRI	N	99	all	undef	Int	{1..n}
PRI	Y	11	all	undef	Real	{0..4}
PROGRAM	Y	3	all	undef	String	String
RA	Y	6	all	undef	String	hh:mm:ss.s[s]
RES	N	13	HRS	60k	String	{15k,30k,60k,120k}
RV	N	27	all	N	String	{Y,N,1,2,3,4}
SEEING	N	14	all	2.0	Real	Real
SKYBRIGHT	Y	15	all	undef	Real	{18.0 to 20.5}
SKYCALS	N	29	all	N	String	{Y,N}
SKYCHOP	N	13	MRS	1	Int	{0-9}
SKYFIBER	N	13	HRS	0sky	String	{0sky,1sky,2sky,0,1,2}
SKYTRANS	N	16	all	S	String	{P,S,N}
SLICER	N	13	HRS	IS0	String	{IS0,IS1,0,1}
SLIT	N	13	LRS	2.0	String	{pin,1.0,1.5,2.0,3.0,10.0,mos,none}
SLIT	N	13	MRS	0	Int	{0,100,200,300,600}
SNGOAL	N	99	all	undef	Real	Real
SNWAVE	N	99	all	undef	Real	Real
STATUS	N	2	all	""	String	{Hold,H,""}
STDCALS	N	25	all	Y	String	{Y,N}
SYNDATE	N	23	all	undef	String	sYYYYMMDD[,sYYYYMMDD] or sYYYYMMDD-YYYYMMDD where s is <, =, or >
SYNFREQ	N	22	all	undef	String	[RAND#-#' where #-# is an integer range such as 1-7]
TELL	N	28	all	N	String	{Y,N}
THAR	N	99	all	undef	Int	{0..n}
TYPE	N	99	HRS	sci	String	{sci,bias,dark,calff,calNe,calHg,calXe, calCd,calAr,pfipff,pfipthar,hrsff,hrsffg, hrsthar}

PARAMETER KEYWORD	REQ	PLAN.DB FIELD #	INST	DEFAULT	NEW DB DATA TYPE	ALLOWED VALUES
TYPE	N	99	LRS	sci	String	{sci,bias,dark,calff,calNe,calHg,calXe, calCd,calAr,pfipff,pfipthar}
TYPE	N	99	MRS	sci	String	{sci,bias,dark,calff,calNe,calHg,calXe, calCd,calAr,pfipff,pfipthar}
VISITS	N	19	all	1	Int	{1..n}
WAVELENGTH	N	13	MRS	7000	Int	Int
XD	N	13	HRS	316g5936	String	{316g4931, 316g4931K, 316g5936, 316g6948, 316g7940, 316g8991, 316g10022, 316g10917, 600g4739, 600g4739K, 600g5271, 600g5822, 600g6302, 600g6869, 600g7366, 600g7940, 600g8375, 600g8990, 600g9405}
XD	N	13	MRS	220	String	String
XE	N	99	all	undef	Int	{0..n}

TSL Parser

The TSL parser is a table-driven, top-down LL parser written in Perl version 5.8.0. The parser itself is a single executable file, with no required ancillary files. For an error-free TSL input file, the parser currently (October 2007) produces an extended plan.db style output where every ACTION defined in the TSL input file is mapped to a single plan.db entry.

Usage

The parser provides options for validating TSL input without creating plan.db output (or SQL database entries in the future), turning off warnings, specifying the input file as a command-line argument, usage help, checking for errors only and printing requested time usage information and dumping debugging information.

```
Usage:
  tsl.pl [-cdfhq] [<filename>]
            -c  check TSL input file for errors
                and print requested time usage
            -d  dump debugging output
            -f  parse <filename> instead of STDIN
            -h  print this help message
            -q  turn off warnings
            -v  print version information
```

Requested Time Usage Option

The parser provides the `'-c'` option that checks the input file for parser errors and allows the PI to check the requested time usage for a given submission file. Times totals are provided for each priority level and the overall total. For example:

```
$ tsl.pl -cf UT06-3-011.tsl

Your TSL input file is complete and error free.

Requested Time Usage Totals for Program UT06-3-011

                visits   time

    Priority 0:    0      0.00 hr
    Priority 1:    0      0.00 hr
    Priority 2:   16     13.31 hr
    Priority 3:   56     40.18 hr
    Priority 4:   45     37.68 hr
    ----------------------------
    Totals:      117     91.17 hr

Note that the above totals do not include any overhead or
instrument setup time (usually taken to be 15 minutes per visit).
```

Error Checking

The parse checks TSL syntax and parameter values and prints errors to STDERR. Most detected errors can be linked to a specific line number where the error is located so messages usually include a specific line number of the input file. For those errors whose exact line number cannot be determined, an indication of where to start looking is included in the message. Parameter value error messages include valid values and/or formats for given parameters. Here are few examples:

```
ERROR: Line 2: BOGUS is an invalid keyword.
WARNING: Line 2: Token '77' found where none expected. Value ignored.
ERROR: Line 5: Invalid value for BINCOL: '3'. Expecting '1' or '2'.
ERROR: Line 16: Parameter name NUMEXP already defined in this column
       heading.
ERROR: Prior to line 32: A value for DEC is required, but is not defined.
Your file had 4 errors.
```

Although most of the parameter value error checking is static, the parser also checks exposure and repetition values against available track length for the given declination. The algorithm used for track length calculation was taken directly from the check_plan program written by Ben Laws and maintained by Jim Fowler.

Extended plan.db Output

The 'extended' portion of the plan.db output is a presentation of a list of TSL parameter/value pairs appended to the plan.db comment field, Field 30, The list includes user declared parameter/value pairs that do no map into one of the original plan.db fields plus GROUP, TRACK and ACTION sequence information. The parameter/value pairs are written as a double back-slash delimited series of comma separated entries, e.g.,

```
\\TNUM=3,ASEQ=2,GTYPE=SEQ,TSEQ=2,FF=3\\
```

The following example TSL input file is followed by the comment field output from each of the plan.db records that would be created and illustrates the extended output format and resulting changes to the plan.db comment field.

```
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTCONFIG    LRS_g2_1.5_GG385
  SEEING        2.0
  SKYBRIGHT     20.5
  SKYTRANS      S
  PRI           1
  MOVING        N
  STDCALS       Y
  FLUX          N
  RV            N
  TELL          N
  SKYCALS       N
GROUP
  GNAME         mygroup1
  GTYPE         SEQ
TRACK_LIST
  OBJECT      RA          DEC         MAG  PA    NOTES
  target1     12:12:12.12 +12:12:12.1 12.0 205.0 "Galaxy exposure"
ACTION_LIST
  EXP   NUMEXP  COMMENT
  300     1     "1 short exposure"
  600     2     "2 med exposures"
  900     1     "1 long exposure"
TRACK_LIST
  OBJECT      RA          DEC         MAG  PA    EXP  NUMEXP NOTES
  target1sky  12:27:12.12 +12:12:12.1 12.0 205.0  300 1      "This is the sky exposure"
```

Comment field output:

```
"Galaxy exposure: 1 short exposure \\TNUM=1,ASEQ=1,GTYPE=SEQ,TSEQ=1\\"
"Galaxy exposure: 2 med exposures \\TNUM=1,ASEQ=2,GTYPE=SEQ,TSEQ=1\\"
"Galaxy exposure: 1 long exposure \\TNUM=1,ASEQ=3,GTYPE=SEQ,TSEQ=1\\"
"This is the sky exposure \\GTYPE=SEQ,TSEQ=2\\"
```

Source Code Repository

<TBD>

NOTE: Source code is currently available on astro.as.utexas.edu at:

/home/astro/mcd/cmason/public/tsl.pl

SQL Database Schema

<TBD>

Appendix A – plan.db Output for Language Examples

```
# Example 1a:
#
# A simplified first visit for a planet search program.
#
# Note:  2 actions in the same track.
# Note:  Notice how NOTES and COMMENT are combined in the TSL output.
# Note:  New optional keywords to describe instrument configuration.
# Note:  Instead of specifying CRSPLIT and a total exposure time, one can
# specify the number of exposures, NUMEXP, and an exposure time per frame.
#
TRACK
  PROGRAM       UT08-1-001
  OBJECT        myplanet
  RA            12:12:12.12
  DEC           +12:12:12.1
  EQUINOX       2000.0
  MAG           12.0
  PA            par
  PRI           2
  SEEING        2.0
  SKYBRIGHT     18.0
  SKYTRANS      S
  NUMEXP        1              # an alternative to CRSPLIT
  VISITS        1
  MOVING        N
  SYNFREQ       RAND15-30
  SYNDATE       >20071215
  STDCALS       Y              # now means do standard cals in addition to other requests
  FLUX          N
  RV            N
  TELL          N
  SKYCALS       N
  NOTES         "My first visit"
ACTION
  INSTRUMENT    HRS
  RES           30k
  ECHELLE       central
  XD            316g5936
  FIBER         2as
  SKYFIBER      0
  SLICER        0
  BINCOL        2
  BINROW        1
  EXP           1200
  GASCELL       0
  COMMENT       "This is the gas cell out exposure"
ACTION
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  SKYFIBER      0
  SLICER        0
  BINCOL        2
  BINROW        1
  EXP           1200
  GASCELL       1
  COMMENT       "This is the gas cell in exposure"


              UT08-1-001     myplanet              12:12:12.12    +12:12:12.1    2000.0  12.0
        par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
        1200    1       1      0       N       RAND15-30      >20071215           Y       N       N
        N       N
        "My first visit: This is the gas cell out exposure \\TNUM=1,ASEQ=1\\"
              UT08-1-001     myplanet              12:12:12.12    +12:12:12.1    2000.0  12.0
        par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.0     18.0    S
```

```
       1200    1       1       0       N       RAND15-30       >20071215               Y       N       N
       N       N
       "My first visit: This is the gas cell in exposure \\TNUM=1,ASEQ=2\\"



# Example 1b:
#
# A simplified first visit for a planet search program.
#
# Note:  a COMMON block is more efficient than Example 1a.
#
COMMON
  PROGRAM       UT08-1-001
  OBJECT        myplanet
  INSTRUMENT    HRS
  RES           30k
  ECHELLE       central
  XD            316g5936
  FIBER         2as
  SKYFIBER      0
  SLICER        0
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
  SKYTRANS      S
  EXP           1200            # this is the exposure time per frame
  NUMEXP        1               # this is the number of exposures to take for each action
  VISITS        1
  MOVING        N
  SYNFREQ       RAND15-30
  SYNDATE       >20071215
  STDCALS       Y               # now means do standard cals in addition to other requests
  FLUX          N
  RV            N
  TELL          N
  SKYCALS       N
TRACK
  RA            12:12:12.12
  DEC           +12:12:12.1
  EQUINOX       2000.0
  MAG           12.0
  PA            par
  PRI           2
  NOTES         "My first visit"
ACTION
  GASCELL       0
  COMMENT       "This is the gas cell out exposure"
ACTION
  GASCELL       1
  COMMENT       "This is the gas cell in exposure"


               UT08-1-001      myplanet                12:12:12.12     +12:12:12.1     2000.0  12.0
       par     2               HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1           2.0     18.0    S
       1200    1       1       0       N       RAND15-30       >20071215               Y       N       N
       N       N
       "My first visit: This is the gas cell out exposure \\TNUM=1,ASEQ=1\\"
               UT08-1-001      myplanet                12:12:12.12     +12:12:12.1     2000.0  12.0
       par     2               HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1           2.0     18.0    S
       1200    1       1       0       N       RAND15-30       >20071215               Y       N       N
       N       N
       "My first visit: This is the gas cell in exposure \\TNUM=1,ASEQ=2\\"
```

```
# Example 1c:
#
# A simplified first visit for a planet search program.
#
# Note:  An ACTION_LIST is still more compact than Example 1b.
# Note:  Can still use the CRSPLIT concept for backward compatibility.
#
COMMON
  PROGRAM       UT08-1-001
  OBJECT        myplanet
  INSTRUMENT    HRS
  RES           30k
  ECHELLE       central
  XD            316g5936
  FIBER         2as
  SKYFIBER      0
  SLICER        0
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
  SKYTRANS      S
  EXP           1200           # now this is the total exposure time per action
  CRSPLIT       1              # instead of NUMEXP and an exposure time per frame
  VISITS        1
  MOVING        N
  SYNFREQ       RAND15-30
  SYNDATE       >20071215
  STDCALS       Y              # now means do standard cals in addition to other requests
  FLUX          N
  RV            N
  TELL          N
  SKYCALS       N
TRACK
  RA            12:12:12.12
  DEC           +12:12:12.1
  EQUINOX       2000.0
  MAG           12.0
  PA            par
  PRI           2
  NOTES         "My first visit"
ACTION_LIST
  GASCELL    COMMENT
    0        "This is the gas cell out exposure"
    1        "This is the gas cell in exposure"


               UT08-1-001     myplanet              12:12:12.12    +12:12:12.1    2000.0  12.0
       par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1        2.0     18.0    S
       1200    1      1       0       N       RAND15-30      >20071215             Y       N       N
       N       N
       "My first visit: This is the gas cell out exposure \\TNUM=1,ASEQ=1\\"
               UT08-1-001     myplanet              12:12:12.12    +12:12:12.1    2000.0  12.0
       par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.0     18.0    S
       1200    1      1       0       N       RAND15-30      >20071215             Y       N       N
       N       N
       "My first visit: This is the gas cell in exposure \\TNUM=1,ASEQ=2\\"




# Example 1d:
#
# A simplified first visit for a planet search program.
#
# Note:  While this is not necessarily recommended, many keywords can be
# left out, and defaults used instead.  This script produces the same
# output as previous examples.
#
COMMON
  PROGRAM       UT08-1-001
  OBJECT        myplanet
```

```
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
  EXP           1200
  SYNFREQ       RAND15-30
  SYNDATE       >20071215
TRACK
  RA            12:12:12.12
  DEC           +12:12:12.1
  MAG           12.0
  PRI           2
  NOTES         "My first visit"
ACTION_LIST
  GASCELL    COMMENT
    0        "This is the gas cell out exposure"
    1        "This is the gas cell in exposure"


               UT08-1-001     myplanet              12:12:12.12    +12:12:12.1    2000.0  12.0
       par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
       1200    1       1      0       N       RAND15-30      >20071215           Y       N       N
       N       N
       "My first visit: This is the gas cell out exposure \\TNUM=1,ASEQ=1\\"
               UT08-1-001     myplanet              12:12:12.12    +12:12:12.1    2000.0  12.0
       par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.0     18.0    S
       1200    1       1      0       N       RAND15-30      >20071215           Y       N       N
       N       N
       "My first visit: This is the gas cell in exposure \\TNUM=1,ASEQ=2\\"




# Example 1e:
#
# A simplified first visit for a planet search program.
#
# Note:  Instrument configurations can still be written as a single string.
#
COMMON
  PROGRAM       UT08-1-001
  OBJECT        myplanet
  INSTCONFIG    HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1
  SEEING        2.0
  SKYBRIGHT     18.0
  EXP           1200
  SYNFREQ       RAND15-30
  SYNDATE       >20071215
TRACK
  RA            12:12:12.12
  DEC           +12:12:12.1
  MAG           12.0
  PRI           2
  NOTES         "My first visit"
ACTION_LIST
  GASCELL    COMMENT
    0        "This is the gas cell out exposure"
    1        "This is the gas cell in exposure"


               UT08-1-001     myplanet              12:12:12.12    +12:12:12.1    2000.0  12.0
       par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
       1200    1       1      0       N       RAND15-30      >20071215           Y       N       N
       N       N
       "My first visit: This is the gas cell out exposure \\TNUM=1,ASEQ=1\\"
               UT08-1-001     myplanet              12:12:12.12    +12:12:12.1    2000.0  12.0
       par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.0     18.0    S
```

```
        1200    1       1       0       N       RAND15-30       >20071215               Y       N       N
        N       N
        "My first visit: This is the gas cell in exposure \\TNUM=1,ASEQ=2\\"



# Example 1f:
#
# A simplified first visit for a planet search program.
#
# Note:  GASCELL can accept more human-readable values.
#
COMMON
  PROGRAM       UT08-1-001
  OBJECT        myplanet
  INSTCONFIG    HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1
  SEEING        2.0
  SKYBRIGHT     18.0
  EXP           1200
  SYNFREQ       RAND15-30
  SYNDATE       >20071215
TRACK
  RA            12:12:12.12
  DEC           +12:12:12.1
  MAG           12.0
  PRI           2
  NOTES         "My first visit"
ACTION_LIST
  GASCELL    COMMENT
    Out      "This is the gas cell out exposure"
    In       "This is the gas cell in exposure"


                UT08-1-001      myplanet                12:12:12.12     +12:12:12.1     2000.0  12.0
        par     2               HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1           2.0     18.0    S
        1200    1       1       0       N       RAND15-30       >20071215               Y       N       N
        N       N
        "My first visit: This is the gas cell out exposure \\TNUM=1,ASEQ=1\\"
                UT08-1-001      myplanet                12:12:12.12     +12:12:12.1     2000.0  12.0
        par     2               HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1           2.0     18.0    S
        1200    1       1       0       N       RAND15-30       >20071215               Y       N       N
        N       N
        "My first visit: This is the gas cell in exposure \\TNUM=1,ASEQ=2\\"



# Example 2a:
#
# Subsequent visits for a planet search program.
#
# Note:  1 action per track, multiple tracks.
# Note:  Several keywords left out and defaults assumed.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  GASCELL       1
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
TRACK
  OBJECT        myplanet1
  RA            12:12:12.12
  DEC           +12:12:12.1
  MAG           12.0
  PRI           2
```

```
  EXP           1200
  VISITS        2
TRACK
  OBJECT        myplanet2
  RA            13:13:13.13
  DEC           +13:13:13.1
  MAG           13.0
  PRI           3
  EXP           1300
  VISITS        3


              UT08-1-001     myplanet1             12:12:12.12    +12:12:12.1    2000.0  12.0
       par    2              HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.0     18.0    S
       1200   1      2       0       N                              Y       N       N       N       N

              UT08-1-001     myplanet2             13:13:13.13    +13:13:13.1    2000.0  13.0
       par    3              HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.0     18.0    S
       1300   1      3       0       N                              Y       N       N       N       N

# Example 2b:
#
# Subsequent visits for a planet search program.
#
# Note:  More efficient version of Example 2a.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  GASCELL       1
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
TRACK_LIST
  OBJECT    RA          DEC         MAG  PRI EXP   VISITS
  myplanet1 12:12:12.12 +12:12:12.1 12.0  2  1200    2
  myplanet2 13:13:13.13 +13:13:13.1 13.0  3  1300    3


              UT08-1-001     myplanet1             12:12:12.12    +12:12:12.1    2000.0  12.0
       par    2              HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.0     18.0    S
       1200   1      2       0       N                              Y       N       N       N       N

              UT08-1-001     myplanet2             13:13:13.13    +13:13:13.1    2000.0  13.0
       par    3              HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.0     18.0    S
       1300   1      3       0       N                              Y       N       N       N       N




# Example 2c:
#
# Subsequent visits for a planet search program.
#
# Note:  Instrument configurations can still be written as a single string.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTCONFIG    HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1
  SEEING        2.0
  SKYBRIGHT     18.0
TRACK_LIST
  OBJECT    RA          DEC         MAG  PRI EXP   VISITS
  myplanet1 12:12:12.12 +12:12:12.1 12.0  2  1200    2
  myplanet2 13:13:13.13 +13:13:13.1 13.0  3  1300    3
```

```
               UT08-1-001     myplanet1             12:12:12.12    +12:12:12.1    2000.0  12.0
       par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.0     18.0    S
       1200    1      2       0      N                              Y      N       N       N       N

               UT08-1-001     myplanet2             13:13:13.13    +13:13:13.1    2000.0  13.0
       par     3              HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.0     18.0    S
       1300    1      3       0      N                              Y      N       N       N       N
```

```
# Example 3a:
#
# Compare to Example 2b.  There we described tracks for two different
# targets.  Here we specify a single target with gas cell in and gas cell
# out exposures.
#
# Note:  These exposures are again described using the TRACK_LIST syntax.
# This means that the two tracks can be independent, with the exposures
# executed in different tracks, possibly on different nights.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
TRACK_LIST
  OBJECT       RA          DEC         MAG  PRI GASCELL EXP   VISITS
  myplanet1_I2 12:12:12.12 +12:12:12.1 12.0  2     1    1200    2
  myplanet1    12:12:12.12 +12:12:12.1 12.0  2     0    1200    2
```

```
               UT08-1-001     myplanet1_I2          12:12:12.12    +12:12:12.1    2000.0  12.0
       par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.0     18.0    S
       1200    1      2       0      N                              Y      N       N       N       N

               UT08-1-001     myplanet1             12:12:12.12    +12:12:12.1    2000.0  12.0
       par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1        2.0     18.0    S
       1200    1      2       0      N                              Y      N       N       N       N
```

```
# Example 3b:
#
# Contrast to Example 3a. Example 3a specified two, possibly independent,
# tracks. Here we specify two exposures to be taken in a single track.
#
# Note:  Use of ACTION_LIST following a TRACK specification forces these
# two exposures to be taken in the same track.
# Note:  We request 2 visits in the TRACK block, so both exposures from the
# ACTION_LIST will be repeated in each visit.
# Note:  The OBJECT keyword goes in the TRACK block, and not in the ACTION
# block, so we use an (optional) COMMENT to label the different exposures.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
```

```
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
TRACK
  OBJECT        myplanet1
  RA            12:12:12.12
  DEC           +12:12:12.1
  MAG           12.0
  PRI           2
  VISITS        2
ACTION_LIST
  GASCELL  EXP   COMMENT
    0      1200  "This is the gas cell out exposure"
    1      1300  "This is the gas cell in exposure"


               UT08-1-001     myplanet1             12:12:12.12    +12:12:12.1    2000.0  12.0
       par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
       1200    1      2       0      N                                Y       N       N       N       N
       "This is the gas cell out exposure \\TNUM=1,ASEQ=1\\"
               UT08-1-001     myplanet1             12:12:12.12    +12:12:12.1    2000.0  12.0
       par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.0     18.0    S
       1300    1      2       0      N                                Y       N       N       N       N
       "This is the gas cell in exposure \\TNUM=1,ASEQ=2\\"


# Example 3c:
#
# Multiple tracks, multiple actions per track.
#
# Note:  This special construction of a TRACK_LIST followed by an ACTION_LIST
# means that we do each set of actions in the list for each track in the list.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
TRACK_LIST
  OBJECT       RA          DEC         MAG  PRI VISITS
  myplanet1    12:12:12.12 +12:12:12.1 12.0  2    2
  myplanet2    13:13:13.13 +13:13:13.1 13.0  3    3
ACTION_LIST
  GASCELL  EXP   COMMENT
    0      1200  "This is the gas cell out exposure"
    1      1300  "This is the gas cell in exposure"


               UT08-1-001     myplanet1             12:12:12.12    +12:12:12.1    2000.0  12.0
       par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
       1200    1      2       0      N                                Y       N       N       N       N
       "This is the gas cell out exposure \\TNUM=1,ASEQ=1\\"
               UT08-1-001     myplanet1             12:12:12.12    +12:12:12.1    2000.0  12.0
       par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.0     18.0    S
       1300    1      2       0      N                                Y       N       N       N       N
       "This is the gas cell in exposure \\TNUM=1,ASEQ=2\\"
               UT08-1-001     myplanet2             13:13:13.13    +13:13:13.1    2000.0  13.0
       par     3              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
       1200    1      3       0      N                                Y       N       N       N       N
       "This is the gas cell out exposure \\TNUM=2,ASEQ=1\\"
               UT08-1-001     myplanet2             13:13:13.13    +13:13:13.1    2000.0  13.0
       par     3              HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.0     18.0    S
```

```
       1300   1      3      0      N                              Y      N      N      N      N
       "This is the gas cell in exposure \\TNUM=2,ASEQ=2\\"



# Example 3d:
#
# Multiple sets of multiple tracks, with multiple actions per track.
#
# Note:  The ACTION_LIST for a given set of tracks immediately follows
# that track block.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
TRACK_LIST
  OBJECT       RA          DEC         MAG  PRI VISITS
  myplanet1    12:12:12.12 +12:12:12.1 12.0  2    2
  myplanet2    13:13:13.13 +13:13:13.1 13.0  3    3
ACTION_LIST
  GASCELL  EXP   COMMENT
    0      1200  "This is the gas cell out exposure"
    1      1300  "This is the gas cell in exposure"
TRACK_LIST
  OBJECT       RA          DEC         MAG  PRI VISITS
  myplanet3    14:14:14.14 +14:14:14.1 14.0  1    1
  myplanet4    15:15:15.15 -07:15:15.1 15.0  1    4
ACTION_LIST
  GASCELL  EXP   COMMENT
    0      900  "This is the gas cell out exposure"
    1      300  "This is the gas cell in exposure"


              UT08-1-001     myplanet1             12:12:12.12    +12:12:12.1    2000.0  12.0
       par    2              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
       1200   1      2       0      N                              Y      N      N      N      N
       "This is the gas cell out exposure \\TNUM=1,ASEQ=1\\"
              UT08-1-001     myplanet1             12:12:12.12    +12:12:12.1    2000.0  12.0
       par    2              HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.0     18.0    S
       1300   1      2       0      N                              Y      N      N      N      N
       "This is the gas cell in exposure \\TNUM=1,ASEQ=2\\"
              UT08-1-001     myplanet2             13:13:13.13    +13:13:13.1    2000.0  13.0
       par    3              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
       1200   1      3       0      N                              Y      N      N      N      N
       "This is the gas cell out exposure \\TNUM=2,ASEQ=1\\"
              UT08-1-001     myplanet2             13:13:13.13    +13:13:13.1    2000.0  13.0
       par    3              HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.0     18.0    S
       1300   1      3       0      N                              Y      N      N      N      N
       "This is the gas cell in exposure \\TNUM=2,ASEQ=2\\"
              UT08-1-001     myplanet3             14:14:14.14    +14:14:14.1    2000.0  14.0
       par    1              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
       900    1      1       0      N                              Y      N      N      N      N
       "This is the gas cell out exposure \\TNUM=3,ASEQ=1\\"
              UT08-1-001     myplanet3             14:14:14.14    +14:14:14.1    2000.0  14.0
       par    1              HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.0     18.0    S
       300    1      1       0      N                              Y      N      N      N      N
       "This is the gas cell in exposure \\TNUM=3,ASEQ=2\\"
              UT08-1-001     myplanet4             15:15:15.15    -07:15:15.1    2000.0  15.0
       par    1              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
       900    1      4       0      N                              Y      N      N      N      N
       "This is the gas cell out exposure \\TNUM=4,ASEQ=1\\"
              UT08-1-001     myplanet4             15:15:15.15    -07:15:15.1    2000.0  15.0
       par    1              HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.0     18.0    S
```

```
        300     1       4       0       N                               Y       N       N       N       N
        "This is the gas cell in exposure \\TNUM=4,ASEQ=2\\"




# Example 4a:
#
# An observation with non-standard calibration requests.
#
# There is a standard set of calibrations taken at the end of the night for
# each instrument configuration, but the PI can specify the number and type
# of any additional calibrations or standards required.
#
# Note:  We explicitly list the STDCALS keyword, even though 'Y' is the
# default, just to remind ourselves what will happen.  In addition to the
# standard calibrations, we request 5 Th-Ar lamps every night that one of
# our targets is done.  We also request a special flat field with the gas
# cell inserted, on each night the 'myplanet1_I2' visits take place.
# Note:  With this construction, there is no way to specify the exposure
# times of the Th-Ar lamps or the flat field.  These are left up to
# the RA to choose as she sees fit.  See Example 4d for an alternative.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
  STDCALS       Y       # now means do standard cals in addition to other requests
  THAR          5       # request 5 extra Th-Ar lamps at the end of each night
TRACK_LIST
  OBJECT       RA          DEC         MAG  PRI GASCELL EXP   VISITS  FF
  myplanet1_I2 12:12:12.12 +12:12:12.1 12.0  2     1    1200    3     1
  myplanet1    12:12:12.12 +12:12:12.1 12.0  2     0    1200    1     0


               UT08-1-001     myplanet1_I2          12:12:12.12    +12:12:12.1    2000.0  12.0
        par    2              HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.0     18.0    S
        1200   1       3      0       N                               Y       N       N       N       N
        "\\FF=1,THAR=5\\"
               UT08-1-001     myplanet1             12:12:12.12    +12:12:12.1    2000.0  12.0
        par    2              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
        1200   1       1      0       N                               Y       N       N       N       N
        "\\FF=0,THAR=5\\"




# Example 4b:
#
# More non-standard calibration requests.
#
# Note:  If a calibration frame needs to be taken during a track, and not at
# the end of the night, then it must be specified as an action, and the
# calibration frame will be charged to the PI.  Here is an example of a
# special flat to be taken right after normal science observations, while
# the telescope is still tracking.
#
COMMON
  PROGRAM       UT08-1-001
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
```

```
  FIBER         2as
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
TRACK
  OBJECT        myplanet
  RA            12:12:12.12
  DEC           +12:12:12.1
  EQUINOX       2000.0
  MAG           12.0
  PRI           2
  NOTES         "My first visit"
ACTION_LIST
  GASCELL  TYPE    EXP   COMMENT
    0       sci    1200  "This is the gas cell out exposure"
    1       sci    1200  "This is the gas cell in exposure"
    1      hrsff     5   "This is a flat field with the gas cell in"


               UT08-1-001     myplanet              12:12:12.12    +12:12:12.1    2000.0  12.0
       par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1        2.0     18.0    S
       1200    1      1       0      N                                Y      N       N       N       N
       "My first visit: This is the gas cell out exposure \\TNUM=1,ASEQ=1\\"
               UT08-1-001     myplanet              12:12:12.12    +12:12:12.1    2000.0  12.0
       par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.0     18.0    S
       1200    1      1       0      N                                Y      N       N       N       N
       "My first visit: This is the gas cell in exposure \\TNUM=1,ASEQ=2\\"
               UT08-1-001     hrsff          12:12:12.12    +12:12:12.1    2000.0  12.0    par     2
               HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.0     18.0    S       5       1
       1       0       N                              Y      N       N       N       N       "My first
visit: This is a flat field with the gas cell in \\TNUM=1,ASEQ=3\\"
```

```
# Example 4c:
#
# More non-standard calibration requests.
#
# Note:  Here we add a request for a Radial Velocity standard of level 2 or
# better, in addition to the previous requests.
# Note:  Even though the standard is requested inside an ACTION_LIST
# construction, the request is interpreted to mean take this standard on
# any night that the rest of the actions are executed (and not somehow
# within this same track).
# Note:  Placing an "N" in the RV column of the ACTION_LIST means that this
# particular ACTION does not require that this standard be queued up.
# Note:  Even though we have requested a Radial Velocity standard for more
# than one entry on our ACTION_LIST, we would only get one such standard
# taken on any given night.
#
COMMON
  PROGRAM       UT08-1-001
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
TRACK
  OBJECT        myplanet
  RA            12:12:12.12
  DEC           +12:12:12.1
  EQUINOX       2000.0
  MAG           12.0
  PRI           2
```

```
  NOTES         "My first visit"
ACTION_LIST
  GASCELL  TYPE    EXP   RV  COMMENT
    0       sci    1200   2  "This is the gas cell out exposure"
    1       sci    1200   2  "This is the gas cell in exposure"
    1      hrsff     5    N  "This is a flat field with the gas cell in"


               UT08-1-001     myplanet              12:12:12.12    +12:12:12.1    2000.0  12.0
       par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1        2.0     18.0    S
       1200    1      1       0      N                                 Y       N       2       N       N
       "My first visit: This is the gas cell out exposure \\TNUM=1,ASEQ=1\\"
               UT08-1-001     myplanet              12:12:12.12    +12:12:12.1    2000.0  12.0
       par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.0     18.0    S
       1200    1      1       0      N                                 Y       N       2       N       N
       "My first visit: This is the gas cell in exposure \\TNUM=1,ASEQ=2\\"
               UT08-1-001     hrsff          12:12:12.12    +12:12:12.1    2000.0  12.0    par     2
               HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.0     18.0    S       5       1
       1       0       N                                 Y       N       N       N       N       "My first
visit: This is a flat field with the gas cell in \\TNUM=1,ASEQ=3\\"



# Example 4d:
#
# More non-standard calibration requests.
#
# Compare to Example 4a.  There we requested additional calibration
# exposures, but with standard exposure times.  If more flexibility is
# needed, we can use the EXTRACALS keyword.  Here we request the standard
# calibrations, plus a long Neon lamp to be taken at the end of each night
# we get data.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    LRS
  GRISM         g2
  SLIT          1.5
  FILTER        GG385
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
  STDCALS       Y       # I want the standard cals, PLUS those listed in EXTRACALS
  EXTRACALS     1xcalNe@600s
TRACK_LIST
  OBJECT    RA          DEC         MAG  PRI EXP   VISITS
  myplanet1 12:12:12.12 +12:12:12.1 12.0  2  1200    2
  myplanet2 13:13:13.13 +13:13:13.1 13.0  3  1300    3


               UT08-1-001     myplanet1             12:12:12.12    +12:12:12.1    2000.0  12.0
       par     2              LRS_g2_1.5_GG385_2x1  2.0     18.0    S       1200    1       2       0
       N                              Y       N       N       N       N
       "\\EXTRACALS=1xcalNe@600s\\"
               UT08-1-001     myplanet2             13:13:13.13    +13:13:13.1    2000.0  13.0
       par     3              LRS_g2_1.5_GG385_2x1  2.0     18.0    S       1300    1       3       0
       N                              Y       N       N       N       N
       "\\EXTRACALS=1xcalNe@600s\\"



# Example 4e:
#
# More non-standard calibration requests.
#
# The EXTRACALS keyword can be used to specify the number and exposure time
# for a list of calibration frames to be obtained at the end of the night.
# Here we request our own set of calibration frames instead of the standard
# calibrations.
```

```
#
# Note:  Since our list for EXTRACALS contains spaces, it needs double quotes
# to make the parser happy.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    LRS
  GRISM         g2
  SLIT          1.5
  FILTER        GG385
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
  STDCALS       N       # Replace the standard cals with those listed in EXTRACALS
  EXTRACALS     "9xbias, 2xdark@1200s, 5xpfipff@89s, 1xcalCd@400s, 1xcalCd@40s, 1xcalNe@100s"
TRACK_LIST
  OBJECT    RA          DEC         MAG  PRI EXP   VISITS
  myplanet1 12:12:12.12 +12:12:12.1 12.0  2  1200    2
  myplanet2 13:13:13.13 +13:13:13.1 13.0  3  1300    3


               UT08-1-001     myplanet1             12:12:12.12    +12:12:12.1    2000.0  12.0
       par     2              LRS_g2_1.5_GG385_2x1  2.0     18.0    S       1200    1       2       0
       N                            N       N       N       N       N       "\\EXTRACALS='9xbias,
2xdark@1200s, 5xpfipff@89s, 1xcalCd@400s, 1xcalCd@40s, 1xcalNe@100s'\\"
               UT08-1-001     myplanet2             13:13:13.13    +13:13:13.1    2000.0  13.0
       par     3              LRS_g2_1.5_GG385_2x1  2.0     18.0    S       1300    1       3       0
       N                            N       N       N       N       N       "\\EXTRACALS='9xbias,
2xdark@1200s, 5xpfipff@89s, 1xcalCd@400s, 1xcalCd@40s, 1xcalNe@100s'\\"




# Example 4f:
#
# More non-standard calibration requests.
#
# EXTRACALS can be different for each target, as well.
#
# Note: There is no comment for the second target, but we need a place
# holder in the TRACK_LIST table to keep the parser happy.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    LRS
  GRISM         g2
  SLIT          1.5
  FILTER        GG385
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
  STDCALS       Y       # I want the standard cals, PLUS those listed in EXTRACALS
TRACK_LIST
  OBJECT    RA          DEC         MAG  PRI EXP   VISITS EXTRACALS     COMMENT
  bluestar  12:12:12.12 +12:12:12.1 12.0  2  1200    2    2xcalNe@600s  "make sure we have enough
lines in the blue"
  redstar   13:13:13.13 +13:13:13.1 13.0  3  1300    3    3xcalCd@10s   ""


               UT08-1-001     bluestar              12:12:12.12    +12:12:12.1    2000.0  12.0
       par     2              LRS_g2_1.5_GG385_2x1  2.0     18.0    S       1200    1       2       0
       N                            Y       N       N       N       N       "make sure we have
enough lines in the blue \\EXTRACALS=2xcalNe@600s\\"
               UT08-1-001     redstar         13:13:13.13    +13:13:13.1    2000.0  13.0    par     3
               LRS_g2_1.5_GG385_2x1   2.0     18.0    S       1300    1       3       0       N
                       Y       N       N       N       N       "\\EXTRACALS=3xcalCd@10s\\"
```

```
# Example 4g:
#
# More non-standard calibration requests.
#
# Strictly speaking, one does not have to specify exposure times in EXTRACALS.
# These can be left up to the RA.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    LRS
  GRISM         g2
  SLIT          1.5
  FILTER        GG385
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
  STDCALS       Y       # I want the standard cals, PLUS those listed in EXTRACALS
TRACK_LIST
  OBJECT    RA          DEC         MAG  PRI EXP   VISITS EXTRACALS COMMENT
  bluestar  12:12:12.12 +12:12:12.1 12.0  2  1200    2    2xcalNe   "make sure we have enough lines
in the blue"
  redstar   13:13:13.13 +13:13:13.1 13.0  3  1300    3    3xcalCd   ""


               UT08-1-001     bluestar              12:12:12.12    +12:12:12.1    2000.0  12.0
        par    2              LRS_g2_1.5_GG385_2x1  2.0     18.0    S       1200    1       2       0
        N                           Y       N       N       N       N       "make sure we have
enough lines in the blue \\EXTRACALS=2xcalNe\\"
               UT08-1-001     redstar        13:13:13.13    +13:13:13.1    2000.0  13.0    par     3
               LRS_g2_1.5_GG385_2x1  2.0     18.0    S       1300    1       3       0       N
                       Y       N       N       N       N       "\\EXTRACALS=3xcalCd\\"




# Example 5:
#
# Observations with two instruments in a single track.
#
# Note:  Accept most defaults.
# Note:  The HRS default is for the gas cell to be out.  Be sure that is
# what you want if you leave off the keyword.
#
TRACK
  PROGRAM       UT08-1-001
  OBJECT        myplanet
  RA            12:12:12.12
  DEC           +12:12:12.1
  EQUINOX       2000.0
  MAG           12.0
  PRI           2
  SEEING        2.0
  SKYBRIGHT     18.0
  NOTES         "This track will have both MRS and HRS observations"
ACTION
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  EXP           1200
  COMMENT       "This is the HRS observation"
ACTION
  INSTRUMENT    MRS
  FIBER         1.5Bs
  BINCOL        2
  BINROW        2
```

```
  EXP           1500
  COMMENT       "This is the MRS observation"


               UT08-1-001     myplanet              12:12:12.12    +12:12:12.1    2000.0  12.0
       par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1        2.0     18.0    S
       1200    1       1      0       N                              Y       N       N       N       N

       "This track will have both MRS and HRS observations: This is the HRS observation
\\TNUM=1,ASEQ=1\\"
               UT08-1-001     myplanet              12:12:12.12    +12:12:12.1    2000.0  12.0
       par     2              MRS_DF_Vis_79_220_7000_1.5Bs_1_0_0_0_2x2_none        2.0     18.0    S
       1500    1       1      0       N                              Y       N       N       N       N

       "This track will have both MRS and HRS observations: This is the MRS observation
\\TNUM=1,ASEQ=2\\"







# Example 6a:
#
# Request a specific standard star to be observed on the same night as the
# primary science target.
#
# Note:  Uses a GROUP block of type AND.
# Note:  Not obvious it makes any sense to specify different priorities or
# number of visits in this case.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
GROUP
  GNAME         mygroup
  GTYPE         AND
TRACK_LIST
  OBJECT      RA          DEC         MAG  PRI EXP   VISITS
  mytarget    12:12:12.12 +12:12:12.1 12.0  2  1200    2
  mystandard  13:13:13.13 +13:13:13.1 13.0  2  1300    2


               UT08-1-001     mytarget              12:12:12.12    +12:12:12.1    2000.0  12.0
       par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1        2.0     18.0    S
       1200    1       2      0       N                      mygroup Y       N       N       N       N
       "\\GTYPE=AND\\"
               UT08-1-001     mystandard            13:13:13.13    +13:13:13.1    2000.0  13.0
       par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1        2.0     18.0    S
       1300    1       2      0       N                      mygroup Y       N       N       N       N
       "\\GTYPE=AND\\"



# Example 6b:
#
# Compare to Example 6a.  There we requested a specific standard star to be
# observed on the same night as the primary science target. Here we request
# that the standard star be observed immediately after the primary science
# target.  The order of the specified sequence of observations is preserved.
# Note that this is different from an ACTION_LIST, because the targets have
# different coordinates, and hence different TRACKs.
#
```

```
# Note:  Uses a GROUP block of type SEQ.
# Note:  Not obvious it makes any sense to specify different priorities or
# number of visits in this case.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
GROUP
  GNAME         mygroup
  GTYPE         SEQ
TRACK_LIST
  OBJECT      RA          DEC         MAG  PRI EXP   VISITS
  mytarget    12:12:12.12 +12:12:12.1 12.0  2  1200    2
  mystandard  13:13:13.13 +13:13:13.1 13.0  2  1300    2


         UT08-1-001     mytarget              12:12:12.12    +12:12:12.1    2000.0  12.0
  par    2              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
  1200   1      2       0      N                     mygroup Y      N       N       N       N
  "\\GTYPE=SEQ,TSEQ=1\\"
         UT08-1-001     mystandard            13:13:13.13    +13:13:13.1    2000.0  13.0
  par    2              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
  1300   1      2       0      N                     mygroup Y      N       N       N       N
  "\\GTYPE=SEQ,TSEQ=2\\"



# Example 6c:
#
# Multiple targets, each with a specific standard star to be observed on
# the same night as the primary science target.
#
# Note:  Uses a GROUP block of type AND.
# Note:  For each target we request 2 900s exposures, and for each standard
# we request a single 300s exposure, taken on the same night.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTCONFIG    LRS_g2_1.5_GG385
  SEEING        2.0
  SKYBRIGHT     20.5
  SKYTRANS      S
  PRI           1
  VISITS        2
  MOVING        N
  STDCALS       Y              # now means do standard cals in addition to other requests
  FLUX          N
  RV            N
  TELL          N
  SKYCALS       Y
GROUP
  GNAME         mygroup1
  GTYPE         AND
TRACK_LIST
  OBJECT      RA          DEC         MAG  PA    EXP NUMEXP COMMENT
  target1     12:12:12.12 +12:12:12.1 12.0 205.0 900 2      "These are the galaxy exposures"
  standard1   13:13:13.13 +13:13:13.1  9.1 205.0 300 1      "This is the standard exposure"
GROUP
  GNAME         mygroup2
  GTYPE         AND
TRACK_LIST
  OBJECT      RA          DEC         MAG  PA    EXP NUMEXP COMMENT
  target2     14:14:14.14 +14:14:14.1 14.0 111.0 900 2      "These are the galaxy exposures"
```

```
  standard2   15:15:15.15 +15:15:15.1  8.2 111.0 300 1      "This is the standard exposure"
GROUP
  GNAME         mygroup3
  GTYPE         AND
TRACK_LIST
  OBJECT      RA          DEC         MAG  PA   EXP NUMEXP COMMENT
  target3     16:16:16.16 +16:16:16.1 14.0 53.0 900 2      "These are the galaxy exposures"
  standard3   17:17:17.17 +17:17:17.1  7.9 53.0 300 1      "This is the standard exposure"


               UT08-1-001     target1        12:12:12.12    +12:12:12.1    2000.0  12.0    205.0   1
               LRS_g2_1.5_GG385_2x2  2.0     20.5    S       1800    2       2       0       N
               mygroup1       Y       N       N       N       Y       "These are the galaxy exposures
\\GTYPE=AND\\"
               UT08-1-001     standard1              13:13:13.13    +13:13:13.1    2000.0  9.1
       205.0   1              LRS_g2_1.5_GG385_2x2   2.0     20.5    S       300     1       2       0
       N                      mygroup1       Y       N       N       N       Y       "This is the
standard exposure \\GTYPE=AND\\"
               UT08-1-001     target2        14:14:14.14    +14:14:14.1    2000.0  14.0    111.0   1
               LRS_g2_1.5_GG385_2x2  2.0     20.5    S       1800    2       2       0       N
               mygroup2       Y       N       N       N       Y       "These are the galaxy exposures
\\GTYPE=AND\\"
               UT08-1-001     standard2              15:15:15.15    +15:15:15.1    2000.0  8.2
       111.0   1              LRS_g2_1.5_GG385_2x2   2.0     20.5    S       300     1       2       0
       N                      mygroup2       Y       N       N       N       Y       "This is the
standard exposure \\GTYPE=AND\\"
               UT08-1-001     target3        16:16:16.16    +16:16:16.1    2000.0  14.0    53.0    1
               LRS_g2_1.5_GG385_2x2  2.0     20.5    S       1800    2       2       0       N
               mygroup3       Y       N       N       N       Y       "These are the galaxy exposures
\\GTYPE=AND\\"
               UT08-1-001     standard3              17:17:17.17    +17:17:17.1    2000.0  7.9
       53.0    1              LRS_g2_1.5_GG385_2x2   2.0     20.5    S       300     1       2       0
       N                      mygroup3       Y       N       N       N       Y       "This is the
standard exposure \\GTYPE=AND\\"
```

```
# Example 6d:
#
# Multiple targets, each with an associated calibration target (in this case
# a sky frame) to be observed immediately after the primary target.
#
# Note:  Uses a GROUP block of type SEQ.
# Note:  For each target we request 2 900s exposures, followed immediately by a
# single sky exposure.
# Note:  Here we used CRSPLIT and a total exposure time instead of NUMEXP and
# an individual exposure time.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTCONFIG    LRS_g2_1.5_GG385
  SEEING        2.0
  SKYBRIGHT     20.5
  SKYTRANS      S
  PRI           1
  VISITS        2
  MOVING        N
  STDCALS       Y              # now means do standard cals in addition to other requests
  FLUX          N
  RV            N
  TELL          N
  SKYCALS       N
GROUP
  GNAME         mygroup1
  GTYPE         SEQ
TRACK_LIST
```

```
  OBJECT      RA          DEC         MAG  PA    EXP  CRSPLIT COMMENT
  target1     12:12:12.12 +12:12:12.1 12.0 205.0 1800 2      "These are the galaxy exposures"
  target1sky  12:27:12.12 +12:12:12.1 12.0 205.0  300 1      "This is the sky exposure"
GROUP
  GNAME         mygroup2
  GTYPE         SEQ
TRACK_LIST
  OBJECT      RA          DEC         MAG  PA    EXP  CRSPLIT COMMENT
  target2     13:13:13.13 +13:13:13.1 13.0 111.0 1800 2      "These are the galaxy exposures"
  target2sky  13:28:13.13 +13:13:13.1 13.0 111.0  300 1      "This is the sky exposure"
GROUP
  GNAME         mygroup3
  GTYPE         SEQ
TRACK_LIST
  OBJECT      RA          DEC         MAG  PA    EXP  CRSPLIT COMMENT
  target3     14:14:14.14 +14:14:14.1 14.0 205.0 1800 2      "These are the galaxy exposures"
  target3sky  14:29:14.14 +14:14:14.1 14.0 205.0  300 1      "This is the sky exposure"


               UT08-1-001     target1        12:12:12.12    +12:12:12.1    2000.0 12.0   205.0  1
               LRS_g2_1.5_GG385_2x2  2.0     20.5    S       1800    2       2       0       N
               mygroup1       Y       N       N       N       "These are the galaxy exposures
\\GTYPE=SEQ,TSEQ=1\\"
               UT08-1-001     target1sky             12:27:12.12    +12:12:12.1    2000.0 12.0
       205.0   1              LRS_g2_1.5_GG385_2x2   2.0     20.5    S       300     1       2       0
       N                      mygroup1       Y       N       N       N       N       "This is the sky
exposure \\GTYPE=SEQ,TSEQ=2\\"
               UT08-1-001     target2        13:13:13.13    +13:13:13.1    2000.0 13.0   111.0  1
               LRS_g2_1.5_GG385_2x2  2.0     20.5    S       1800    2       2       0       N
               mygroup2       Y       N       N       N       N       "These are the galaxy exposures
\\GTYPE=SEQ,TSEQ=1\\"
               UT08-1-001     target2sky             13:28:13.13    +13:13:13.1    2000.0 13.0
       111.0   1              LRS_g2_1.5_GG385_2x2   2.0     20.5    S       300     1       2       0
       N                      mygroup2       Y       N       N       N       N       "This is the sky
exposure \\GTYPE=SEQ,TSEQ=2\\"
               UT08-1-001     target3        14:14:14.14    +14:14:14.1    2000.0 14.0   205.0  1
               LRS_g2_1.5_GG385_2x2  2.0     20.5    S       1800    2       2       0       N
               mygroup3       Y       N       N       N       N       "These are the galaxy exposures
\\GTYPE=SEQ,TSEQ=1\\"
               UT08-1-001     target3sky             14:29:14.14    +14:14:14.1    2000.0 14.0
       205.0   1              LRS_g2_1.5_GG385_2x2   2.0     20.5    S       300     1       2       0
       N                      mygroup3       Y       N       N       N       N       "This is the sky
exposure \\GTYPE=SEQ,TSEQ=2\\"



# Example 6e:
#
# Multiple targets, each with an associated sky frame to be observed
# immediately after the primary target, plus a standard star to be observed
# any time on the same night.
#
# Note:  Uses GROUP blocks of type SEQ, and of type AND, with identical
# group names to associate all of the related observations.
# Note:  It is a good idea to keep related group blocks (i.e. those with
# identical names) together in this file, but that is not strictly required
# by the parser.
# Note:  For each target we request 2 900s exposures, followed immediately by a
# single sky exposure.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTCONFIG    LRS_g2_1.5_GG385
  SEEING        2.0
  SKYBRIGHT     20.5
  SKYTRANS      S
  PRI           1
  VISITS        2
  MOVING        N
  STDCALS       Y              # now means do standard cals in addition to other requests
  FLUX          N
```

```
  RV            N
  TELL          N
  SKYCALS       N
#
GROUP
  GNAME         mygroup1
  GTYPE         SEQ
TRACK_LIST
  OBJECT      RA          DEC         MAG  PA    EXP NUMEXP COMMENT
  target1     12:12:12.12 +12:12:12.1 12.0 205.0 900 2      "These are the galaxy exposures"
  target1sky  12:27:12.12 +12:12:12.1 12.0 205.0 300 1      "This is the sky exposure"
GROUP
  GNAME         mygroup1
  GTYPE         AND
TRACK_LIST
  OBJECT      RA          DEC         MAG  PA    EXP NUMEXP COMMENT
  standard1   15:15:15.15 +15:15:15.1  9.9 205.0 300 1      "This is the standard exposure"
#
GROUP
  GNAME         mygroup2
  GTYPE         SEQ
TRACK_LIST
  OBJECT      RA          DEC         MAG  PA    EXP NUMEXP COMMENT
  target2     13:13:13.13 +13:13:13.1 13.0 111.0 900 2      "These are the galaxy exposures"
  target2sky  13:28:13.13 +13:13:13.1 13.0 111.0 300 1      "This is the sky exposure"
GROUP
  GNAME         mygroup2
  GTYPE         AND
TRACK_LIST
  OBJECT      RA          DEC         MAG  PA    EXP NUMEXP COMMENT
  standard2   16:16:16.16 +16:16:16.1  8.8 111.0 300 1      "This is the standard exposure"
#
GROUP
  GNAME         mygroup3
  GTYPE         SEQ
TRACK_LIST
  OBJECT      RA          DEC         MAG  PA   EXP NUMEXP COMMENT
  target3     14:14:14.14 +14:14:14.1 14.0 22.0 900 2      "These are the galaxy exposures"
  target3sky  14:29:14.14 +14:14:14.1 14.0 22.0 300 1      "This is the sky exposure"
GROUP
  GNAME         mygroup3
  GTYPE         AND
TRACK_LIST
  OBJECT      RA          DEC         MAG  PA   EXP NUMEXP COMMENT
  standard3   17:17:17.17 +17:17:17.1  9.3 22.0 300 1      "This is the standard exposure"


               UT08-1-001     target1        12:12:12.12    +12:12:12.1    2000.0 12.0   205.0  1
               LRS_g2_1.5_GG385_2x2  2.0     20.5   S      1800   2      2      0      N
               mygroup1       Y      N      N      N      "These are the galaxy exposures
\\GTYPE=SEQ,TSEQ=1\\"
               UT08-1-001     target1sky             12:27:12.12    +12:12:12.1    2000.0 12.0
       205.0   1              LRS_g2_1.5_GG385_2x2  2.0     20.5   S      300    1      2      0
       N                      mygroup1       Y      N      N      N      N      "This is the sky
exposure \\GTYPE=SEQ,TSEQ=2\\"
               UT08-1-001     standard1              15:15:15.15    +15:15:15.1    2000.0 9.9
       205.0   1              LRS_g2_1.5_GG385_2x2  2.0     20.5   S      300    1      2      0
       N                      mygroup1       Y      N      N      N      N      "This is the
standard exposure \\GTYPE=AND\\"
               UT08-1-001     target2        13:13:13.13    +13:13:13.1    2000.0 13.0   111.0  1
               LRS_g2_1.5_GG385_2x2  2.0     20.5   S      1800   2      2      0      N
               mygroup2       Y      N      N      N      "These are the galaxy exposures
\\GTYPE=SEQ,TSEQ=1\\"
               UT08-1-001     target2sky             13:28:13.13    +13:13:13.1    2000.0 13.0
       111.0   1              LRS_g2_1.5_GG385_2x2  2.0     20.5   S      300    1      2      0
       N                      mygroup2       Y      N      N      N      N      "This is the sky
exposure \\GTYPE=SEQ,TSEQ=2\\"
               UT08-1-001     standard2              16:16:16.16    +16:16:16.1    2000.0 8.8
       111.0   1              LRS_g2_1.5_GG385_2x2  2.0     20.5   S      300    1      2      0
       N                      mygroup2       Y      N      N      N      N      "This is the
standard exposure \\GTYPE=AND\\"
               UT08-1-001     target3        14:14:14.14    +14:14:14.1    2000.0 14.0   22.0   1
               LRS_g2_1.5_GG385_2x2  2.0     20.5   S      1800   2      2      0      N
```

```
               mygroup3       Y      N      N      N      N      "These are the galaxy exposures
\\GTYPE=SEQ,TSEQ=1\\"
               UT08-1-001     target3sky             14:29:14.14    +14:14:14.1    2000.0  14.0
       22.0    1              LRS_g2_1.5_GG385_2x2   2.0     20.5   S      300     1      2      0
       N                      mygroup3       Y      N      N      N      N      "This is the sky
exposure \\GTYPE=SEQ,TSEQ=2\\"
               UT08-1-001     standard3              17:17:17.17    +17:17:17.1    2000.0  9.3
       22.0    1              LRS_g2_1.5_GG385_2x2   2.0     20.5   S      300     1      2      0
       N                      mygroup3       Y      N      N      N      N      "This is the
standard exposure \\GTYPE=AND\\"



# Example 6f:
#
# Compare to Examples 6a and 6b.  In Example 6a we requested a specific
# standard star to be observed on the same night as the primary science
# target, using a GROUP of type AND. In Example 6b we requested that the
# standard star be observed immediately after the primary science target,
# using a GROUP of type SEQ.  Both of these examples apply to observations
# to be taken on the same night.  Here we illustrate another GROUP
# construction to specify the order in which a set of tracks are to be
# observed, even across different nights.
#
# Note:  Uses a GROUP block of type ORD.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
GROUP
  GNAME         mygroup
  GTYPE         ORD
TRACK_LIST
  OBJECT      RA          DEC         MAG  PRI EXP   VISITS
  mytarget1   12:12:12.12 +12:12:12.1 12.0  0  1200    2     # do these visits first
  mytarget1   12:12:12.12 +12:12:12.1 12.0  1  1300    3     # do these visits second
  mytarget2   14:14:14.14 +14:14:14.1 11.5  1   900    1     # do these visits third


               UT08-1-001     mytarget1              12:12:12.12    +12:12:12.1    2000.0  12.0
       par     0              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1        2.0     18.0    S
       1200    1      2       0      N                      mygroup Y      N       N       N       N
       "\\GTYPE=ORD,TORD=1\\"
               UT08-1-001     mytarget1              12:12:12.12    +12:12:12.1    2000.0  12.0
       par     1              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1        2.0     18.0    S
       1300    1      3       0      N                      mygroup Y      N       N       N       N
       "\\GTYPE=ORD,TORD=2\\"
               UT08-1-001     mytarget2              14:14:14.14    +14:14:14.1    2000.0  11.5
       par     1              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1        2.0     18.0    S
       900     1      1       0      N                      mygroup Y      N       N       N       N
       "\\GTYPE=ORD,TORD=3\\"




# Example 6g:
#
# Compare to previous GROUP examples.  Sometimes it is more convenient to put
# the GROUP specifications inside the TRACK_LIST block.
#
# Note:  Uses a GROUP block of type ORD.
```

```
# Note:  I have two different targets, each requiring two set of tracks with
# slightly different properties.  I don't care in which order the two targets
# are observed.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
TRACK_LIST
  OBJECT      RA          DEC         MAG  PRI EXP   VISITS    GNAME   GTYPE
  mytarget1   12:12:12.12 +12:12:12.1 12.0  0  1200    2     mytarget1  ORD   # do these visits
first
  mytarget1   12:12:12.12 +12:12:12.1 12.0  1  1300    3     mytarget1  ORD   # do these visits
second
  mytarget2   14:14:14.14 +14:14:14.1 11.5  1   900    1     mytarget2  ORD   # do these visits
first
  mytarget2   14:14:14.14 +14:14:14.1 11.5  2   600    3     mytarget2  ORD   # do these visits
second


               UT08-1-001     mytarget1             12:12:12.12    +12:12:12.1    2000.0  12.0
       par     0              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
       1200    1      2       0      N                     mytarget1      Y       N       N       N
       N       "\\GTYPE=ORD,TORD=1\\"
               UT08-1-001     mytarget1             12:12:12.12    +12:12:12.1    2000.0  12.0
       par     1              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
       1300    1      3       0      N                     mytarget1      Y       N       N       N
       N       "\\GTYPE=ORD,TORD=2\\"
               UT08-1-001     mytarget2             14:14:14.14    +14:14:14.1    2000.0  11.5
       par     1              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
       900     1      1       0      N                     mytarget2      Y       N       N       N
       N       "\\GTYPE=ORD,TORD=1\\"
               UT08-1-001     mytarget2             14:14:14.14    +14:14:14.1    2000.0  11.5
       par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
       600     1      3       0      N                     mytarget2      Y       N       N       N
       N       "\\GTYPE=ORD,TORD=2\\"



# Example 7:
#
# Specify a list of 10 targets from which the PI only needs 3 to be completed.
#
# Note:  Uses a GROUP block of type POOL.
# Note:  Once you start 3 targets, the rest are put on hold.  Allows the PI
# to specify many targets, and then concentrate on the first available.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
GROUP
  GNAME         mygroup
  GTYPE         POOL
  NUMTODO       3
TRACK_LIST
  OBJECT      RA          DEC         MAG  PRI EXP   VISITS
  mytarget1   12:12:12.12 +12:12:12.1 12.0  2  1000    2
```

```
  mytarget2   13:12:12.12 +13:01:12.1 13.1  3  1100    3
  mytarget3   13:13:12.12 +13:02:12.1 13.2  2  1200    4
  mytarget4   13:14:12.12 +13:03:12.1 13.3  2  1300    2
  mytarget5   13:15:12.12 +13:04:12.1 13.4  3  200     2
  mytarget6   13:16:12.12 +13:05:12.1 13.5  2  900     3
  mytarget7   13:17:12.12 +13:06:12.1 13.6  2  1200    2
  mytarget8   13:18:12.12 +13:07:12.1 13.7  3  1400    3
  mytarget9   13:19:12.12 +13:08:12.1 13.8  2  1500    3
  mytarget10  13:20:12.12 +13:09:12.1 13.9  2  1100    2


          UT08-1-001     mytarget1             12:12:12.12    +12:12:12.1    2000.0  12.0
      par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
      1000    1       2      0       N                      mygroup Y       N       N       N       N
      "\\GTYPE=POOL,NUMTODO=3\\"
          UT08-1-001     mytarget2             13:12:12.12    +13:01:12.1    2000.0  13.1
      par     3              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
      1100    1       3      0       N                      mygroup Y       N       N       N       N
      "\\GTYPE=POOL,NUMTODO=3\\"
          UT08-1-001     mytarget3             13:13:12.12    +13:02:12.1    2000.0  13.2
      par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
      1200    1       4      0       N                      mygroup Y       N       N       N       N
      "\\GTYPE=POOL,NUMTODO=3\\"
          UT08-1-001     mytarget4             13:14:12.12    +13:03:12.1    2000.0  13.3
      par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
      1300    1       2      0       N                      mygroup Y       N       N       N       N
      "\\GTYPE=POOL,NUMTODO=3\\"
          UT08-1-001     mytarget5             13:15:12.12    +13:04:12.1    2000.0  13.4
      par     3              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
      200     1       2      0       N                      mygroup Y       N       N       N       N
      "\\GTYPE=POOL,NUMTODO=3\\"
          UT08-1-001     mytarget6             13:16:12.12    +13:05:12.1    2000.0  13.5
      par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
      900     1       3      0       N                      mygroup Y       N       N       N       N
      "\\GTYPE=POOL,NUMTODO=3\\"
          UT08-1-001     mytarget7             13:17:12.12    +13:06:12.1    2000.0  13.6
      par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
      1200    1       2      0       N                      mygroup Y       N       N       N       N
      "\\GTYPE=POOL,NUMTODO=3\\"
          UT08-1-001     mytarget8             13:18:12.12    +13:07:12.1    2000.0  13.7
      par     3              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
      1400    1       3      0       N                      mygroup Y       N       N       N       N
      "\\GTYPE=POOL,NUMTODO=3\\"
          UT08-1-001     mytarget9             13:19:12.12    +13:08:12.1    2000.0  13.8
      par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
      1500    1       3      0       N                      mygroup Y       N       N       N       N
      "\\GTYPE=POOL,NUMTODO=3\\"
          UT08-1-001     mytarget10            13:20:12.12    +13:09:12.1    2000.0  13.9
      par     2              HRS_30k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.0     18.0    S
      1100    1       2      0       N                      mygroup Y       N       N       N       N
      "\\GTYPE=POOL,NUMTODO=3\\"



# Example 8:
#
# It is now possible to provide a S/N goal, along with a baseline exposure
# time.
#
# Note:  The reference wavelength in angstroms for the S/N goal is entered
# in SNWAVE.  If not specified for HRS, the S/N is measured on the blue CCD
# right at the junction between the two CCDs.  There is no default for LRS
# or MRS, and SNWAVE must be supplied for those instruments.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  GASCELL       1
```

```
  BINCOL        2
  BINROW        1
  SEEING        2.0
  SKYBRIGHT     18.0
  SNWAVE        5500
TRACK_LIST
  OBJECT    RA          DEC         MAG  PRI EXP  SNGOAL VISITS
  myplanet1 12:12:12.12 +12:12:12.1 12.0  2  1200  200     2
  myplanet2 13:13:13.13 +13:13:13.1 13.0  3  1300  300     3


              UT08-1-001     myplanet1             12:12:12.12    +12:12:12.1    2000.0  12.0
       par    2              HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.0     18.0    S
       1200   1      2       0       N                                Y       N       N       N       N
       "\\SNGOAL=200,SNWAVE=5500\\"
              UT08-1-001     myplanet2             13:13:13.13    +13:13:13.1    2000.0  13.0
       par    3              HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.0     18.0    S
       1300   1      3       0       N                                Y       N       N       N       N
       "\\SNGOAL=300,SNWAVE=5500\\"



# Example 9:
#
# There are new, non-standard instrumentation configuration possibilities
# to handle special cases.
#
# Note:  Since there is typically no filter specified for an HRS setup,
# the FILTER keyword comes out in the optional parameters section of
# plan.db.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           30k
  XD            316g5936
  FIBER         2as
  GASCELL       In
  BINCOL        2
  BINROW        1
  FILTER        R
  SEEING        2.0
  SKYBRIGHT     18.0
TRACK_LIST
  OBJECT    RA          DEC         MAG  PRI EXP   VISITS
  myplanet1 12:12:12.12 +12:12:12.1 12.0  2  1200    2
  myplanet2 13:13:13.13 +13:13:13.1 13.0  3  1300    3


              UT08-1-001     myplanet1             12:12:12.12    +12:12:12.1    2000.0  12.0
       par    2              HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.0     18.0    S
       1200   1      2       0       N                                Y       N       N       N       N
       "\\FILTER=R\\"
              UT08-1-001     myplanet2             13:13:13.13    +13:13:13.1    2000.0  13.0
       par    3              HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.0     18.0    S
       1300   1      3       0       N                                Y       N       N       N       N
       "\\FILTER=R\\"



# Example 10a:
#
# It is now possible to provide a URL for a web-accessible electronic
# finder chart, on a shared risk basis.  These charts will probably be
# collected at some point in the Phase II process so that a local copy
# resides on the mountain.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
```

```
  INSTRUMENT    MRS
  MODE          DF
  CAMERA        Vis
  ECHELLE       79
  XD            220
  WAVELENGTH    7000
  FIBER         1.5Bs
  SKYCHOP       1
  FILTER        0
  SLIT          0
  MASK          0
  BINCOL        2
  BINROW        2
  SEEING        2.0
  SKYBRIGHT     18.0
TRACK_LIST
  OBJECT    RA          DEC         MAG  PRI EXP   VISITS  PICHART
  mytarget1 12:12:12.12 +12:12:12.1 12.0  2  1200    2     http://puck.as.utexas.edu/HET/UT08-
1/chart1.jpg
  mytarget2 13:13:13.13 +13:13:13.1 13.0  3  1300    3     http://puck.as.utexas.edu/HET/UT08-
1/chart2.jpg


              UT08-1-001     mytarget1             12:12:12.12    +12:12:12.1    2000.0  12.0
       par    2              MRS_DF_Vis_79_220_7000_1.5Bs_1_0_0_0_2x2_none       2.0    18.0    S
       1200   1      2       0      N                                Y      N       N       N       N
       "\\PICHART=http://puck.as.utexas.edu/HET/UT08-1/chart1.jpg\\"
              UT08-1-001     mytarget2             13:13:13.13    +13:13:13.1    2000.0  13.0
       par    3              MRS_DF_Vis_79_220_7000_1.5Bs_1_0_0_0_2x2_none       2.0    18.0    S
       1300   1      3       0      N                                Y      N       N       N       N
       "\\PICHART=http://puck.as.utexas.edu/HET/UT08-1/chart2.jpg\\"
```

```
# Example 10b:
#
# Another example of electronic finding charts.
#
# Note:  You can provide more than one chart for an object by using
# SPACE separated URLs, enclosed in double quotes.  You can't use
# commas as separators, because commas are valid characters inside a
# URL.
#
COMMON
  PROGRAM       UT08-1-001
  EQUINOX       2000.0
  INSTRUMENT    MRS
  MODE          DF
  CAMERA        Vis
  ECHELLE       79
  XD            220
  WAVELENGTH    7000
  FIBER         1.5Bs
  SKYCHOP       1
  FILTER        0
  SLIT          0
  MASK          0
  BINCOL        2
  BINROW        2
  SEEING        2.0
  SKYBRIGHT     18.0
TRACK_LIST
  OBJECT    RA          DEC         MAG  PRI EXP   VISITS  PICHART
  mytarget1 12:12:12.12 +12:12:12.1 12.0  2  1200    2     "http://puck.as.utexas.edu/HET/UT08-
1/chart1a.jpg http://puck.as.utexas.edu/HET/UT08-1/chart1b.jpg"
```

```
  mytarget2 13:13:13.13 +13:13:13.1 13.0  3  1300    3     http://puck.as.utexas.edu/HET/UT08-
1/chart2.jpg


               UT08-1-001     mytarget1             12:12:12.12    +12:12:12.1    2000.0  12.0
       par     2              MRS_DF_Vis_79_220_7000_1.5Bs_1_0_0_0_2x2_none        2.0     18.0    S
       1200    1      2       0       N                                Y       N       N       N       N

       "\\PICHART='http://puck.as.utexas.edu/HET/UT08-1/chart1a.jpg
http://puck.as.utexas.edu/HET/UT08-1/chart1b.jpg'\\"
               UT08-1-001     mytarget2             13:13:13.13    +13:13:13.1    2000.0  13.0
       par     3              MRS_DF_Vis_79_220_7000_1.5Bs_1_0_0_0_2x2_none        2.0     18.0    S
       1300    1      3       0       N                                Y       N       N       N       N

       "\\PICHART=http://puck.as.utexas.edu/HET/UT08-1/chart2.jpg\\"
```

Appendix B – Real Examples

```
# PPSS07exopa.tsl:
#
# Example Benedict program.
#
# Created from PPSS07exop.txt, dated 3/27/07.
#
# A simple planet search program, consisting only of "OLD" targets and one
# instrumental setup (all science data taken with the gas cell in).
#
# This version groups the related visits of the targets, but leaves out
# group definitions where the SYNDATE specs actually prevent the visits
# from being executed out of order.
#
# Note: Uses a GROUP block of type ORD, specifying that the visits must be
# carried out in the order listed.
#
# 02AUG07  Modified from PPSS07exop.tsl by M. E. Cornell.
#
COMMON
  PROGRAM       UT07-2-009
  EQUINOX       2000.0
  INSTRUMENT    HRS
  RES           60k
  ECHELLE       central
  XD            316g5936
  FIBER         2as
  SKYFIBER      0sky
  SLICER        0
  GASCELL       In
  BINCOL        2
  BINROW        1
  PA            par
  SEEING        2.5
  SKYBRIGHT     17.0
  SKYTRANS      S
  CRSPLIT       3
  MOVING        N
  STDCALS       N
  FLUX          N
  RV            N
  TELL          N
  SKYCALS       N
  EXTRACALS     "5xhrsff@5s, 5xbias, 1xhrsthar@20s, 1xhrsffg@5s"
#
# The above list specifies that every night we get data, take 5 normal
# flats, 5 bias frames, 1 Th-Ar lamp, and 1 flat with the gas cell in.
# Here I specified the exposure times commonly used.
#
# Only 1 visit specified.  No GROUP required here:
#
TRACK_LIST
  OBJECT       RA          DEC            MAG   PRI  EXP  VISITS  SYNDATE             COMMENT
  HD12661      02:04:34.3  +25:24:51.5   7.44    0   540    1     >20070701-20070731  "OLD target,
visit 1, to be done in July 2007."
#
# SYNDATE entries effectively specify the order in which to execute these
# tracks.  No GROUP required here:
#
TRACK_LIST
  OBJECT       RA          DEC            MAG   PRI  EXP  VISITS  SYNDATE             COMMENT
  HD74156      08:42:25.1  +04:34:41.2   7.62    0   540    1     >20070401-20070425  "OLD target,
visit 1, to be done in April 2007."
  HD74156      08:42:25.1  +04:34:41.2   7.62    1   540    1     >20070501-20070531  "OLD target,
visit 2, to be done in May 2007."
  HD136118     15:18:55.5  -01:35:32.6   6.94    0   360    1     >20070401-20070425  "OLD target,
visit 1, to be done in April 2007."
  HD136118     15:18:55.5  -01:35:32.6   6.94    1   360    1     >20070501-20070531  "OLD target,
visit 2, to be done in May 2007."
```

```
  HD136118     15:18:55.5  -01:35:32.6   6.94    1   360    1     >20070601-20070630  "OLD target,
visit 3, to be done in June 2007."
  HD136118     15:18:55.5  -01:35:32.6   6.94    2   360    1     >20070701-20070731  "OLD target,
visit 4, to be done in July 2007."
  HD145675     16:10:24.3  +43:49:03.5   6.67    0   270    1     >20070401-20070425  "OLD target,
visit 1, to be done in April 2007."
  HD145675     16:10:24.3  +43:49:03.5   6.67    0   270    1     >20070501-20070531  "OLD target,
visit 2, to be done in May 2007."
  HD145675     16:10:24.3  +43:49:03.5   6.67    1   270    2     >20070601-20070630  "OLD target,
visit 3, to be done in June 2007."
  HD145675     16:10:24.3  +43:49:03.5   6.67    1   270    2     >20070701-20070731  "OLD target,
visit 4, to be done in July 2007."
#
# Use a GROUP block to enforce execution order:
#
GROUP
  GNAME         HD128311
  GTYPE         ORD
TRACK_LIST
  OBJECT       RA          DEC            MAG   PRI  EXP  VISITS  SYNFREQ  COMMENT
  HD128311     14:36:00.6  +09:44:47.5   7.51    1   540    1     RAND1-3  "OLD target, visit 1"
  HD128311     14:36:00.6  +09:44:47.5   7.51    2   540   17     RAND1-3  "OLD target, visit 2-18"
  HD128311     14:36:00.6  +09:44:47.5   7.51    3   540    3     RAND1-3  "OLD target, visit 19-
21"

               UT07-2-009     HD12661               02:04:34.3     +25:24:51.5    2000.0  7.44
       par     0              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.5     17.0    S
       540     3      1       0       N
       >20070701-20070731             N       N       N       N       N
       "OLD target, visit 1, to be done in July 2007. \\EXTRACALS='5xhrsff@5s, 5xbias,
1xhrsthar@20s, 1xhrsffg@5s'\\"
               UT07-2-009     HD74156               08:42:25.1     +04:34:41.2    2000.0  7.62
       par     0              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.5     17.0    S
       540     3      1       0       N
       >20070401-20070425             N       N       N       N       N
       "OLD target, visit 1, to be done in April 2007. \\EXTRACALS='5xhrsff@5s, 5xbias,
1xhrsthar@20s, 1xhrsffg@5s'\\"
               UT07-2-009     HD74156               08:42:25.1     +04:34:41.2    2000.0  7.62
       par     1              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.5     17.0    S
       540     3      1       0       N
       >20070501-20070531             N       N       N       N       N
       "OLD target, visit 2, to be done in May 2007. \\EXTRACALS='5xhrsff@5s, 5xbias,
1xhrsthar@20s, 1xhrsffg@5s'\\"
               UT07-2-009     HD136118              15:18:55.5     -01:35:32.6    2000.0  6.94
       par     0              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.5     17.0    S
       360     3      1       0       N
       >20070401-20070425             N       N       N       N       N
       "OLD target, visit 1, to be done in April 2007. \\EXTRACALS='5xhrsff@5s, 5xbias,
1xhrsthar@20s, 1xhrsffg@5s'\\"
               UT07-2-009     HD136118              15:18:55.5     -01:35:32.6    2000.0  6.94
       par     1              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.5     17.0    S
       360     3      1       0       N
       >20070501-20070531             N       N       N       N       N
       "OLD target, visit 2, to be done in May 2007. \\EXTRACALS='5xhrsff@5s, 5xbias,
1xhrsthar@20s, 1xhrsffg@5s'\\"
               UT07-2-009     HD136118              15:18:55.5     -01:35:32.6    2000.0  6.94
       par     1              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.5     17.0    S
       360     3      1       0       N
       >20070601-20070630             N       N       N       N       N
       "OLD target, visit 3, to be done in June 2007.      \\EXTRACALS='5xhrsff@5s, 5xbias,
1xhrsthar@20s, 1xhrsffg@5s'\\"
               UT07-2-009     HD136118              15:18:55.5     -01:35:32.6    2000.0  6.94
       par     2              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.5     17.0    S
       360     3      1       0       N
       >20070701-20070731             N       N       N       N       N
       "OLD target, visit 4, to be done in July 2007.      \\EXTRACALS='5xhrsff@5s, 5xbias,
1xhrsthar@20s, 1xhrsffg@5s'\\"
               UT07-2-009     HD145675              16:10:24.3     +43:49:03.5    2000.0  6.67
       par     0              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.5     17.0    S
       270     3      1       0       N
       >20070401-20070425             N       N       N       N       N
       "OLD target, visit 1, to be done in April 2007.     \\EXTRACALS='5xhrsff@5s, 5xbias,
1xhrsthar@20s, 1xhrsffg@5s'\\"
```

```
              UT07-2-009     HD145675              16:10:24.3     +43:49:03.5    2000.0  6.67
       par    0              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.5     17.0    S
       270    3      1       0       N
       >20070501-20070531            N       N       N       N       N
       "OLD target, visit 2, to be done in May 2007.       \\EXTRACALS='5xhrsff@5s, 5xbias,
1xhrsthar@20s, 1xhrsffg@5s'\\"
              UT07-2-009     HD145675              16:10:24.3     +43:49:03.5    2000.0  6.67
       par    1              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.5     17.0    S
       270    3      2       0       N
       >20070601-20070630            N       N       N       N       N
       "OLD target, visit 3, to be done in June 2007.      \\EXTRACALS='5xhrsff@5s, 5xbias,
1xhrsthar@20s, 1xhrsffg@5s'\\"
              UT07-2-009     HD145675              16:10:24.3     +43:49:03.5    2000.0  6.67
       par    1              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.5     17.0    S
       270    3      2       0       N
       >20070701-20070731            N       N       N       N       N
       "OLD target, visit 4, to be done in July 2007.      \\EXTRACALS='5xhrsff@5s, 5xbias,
1xhrsthar@20s, 1xhrsffg@5s'\\"
              UT07-2-009     HD128311              14:36:00.6     +09:44:47.5    2000.0  7.51
       par    1              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.5     17.0    S
       540    3      1       0       N
       RAND1-3        HD128311       N       N       N       N       N
       "OLD target, visit 1 \\GTYPE=ORD,TORD=1,EXTRACALS='5xhrsff@5s, 5xbias, 1xhrsthar@20s,
1xhrsffg@5s'\\"
              UT07-2-009     HD128311              14:36:00.6     +09:44:47.5    2000.0  7.51
       par    2              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.5     17.0    S
       540    3      17      0       N
       RAND1-3        HD128311       N       N       N       N       N
       "OLD target, visit 2-18 \\GTYPE=ORD,TORD=2,EXTRACALS='5xhrsff@5s, 5xbias, 1xhrsthar@20s,
1xhrsffg@5s'\\"
              UT07-2-009     HD128311              14:36:00.6     +09:44:47.5    2000.0  7.51
       par    3              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.5     17.0    S
       540    3      3       0       N
       RAND1-3        HD128311       N       N       N       N       N
       "OLD target, visit 19-21 \\GTYPE=ORD,TORD=3,EXTRACALS='5xhrsff@5s, 5xbias, 1xhrsthar@20s,
1xhrsffg@5s'\\"
```

```
# PPW07exopv2b.tsl:
#
# Example Benedict program.
#
# Created from PPW07exopv2.txt, dated 3/28/07.
#
# A planet search program, slightly complicated by two kinds of
# observations, "template" and "OLD", plus two different instrument
# resolutions.
#
# This version groups the related visits of the OLD targets, using GROUP
# specifications inside the TRACK_LISTs.
#
# Note: Uses a GROUP block of type ORD, specifying that the visits must be
# carried out in the order listed.
#
# 02AUG07  Modified from PPW07exopv2a.tsl by M. E. Cornell.
#
COMMON
  PROGRAM       UT07-1-003
  EQUINOX       2000.0
  INSTRUMENT    HRS
  ECHELLE       central
  XD            316g5936
  FIBER         2as
  SKYFIBER      0sky
  SLICER        0
  BINCOL        2
  BINROW        1
  PA            par
  SEEING        2.5
  SKYBRIGHT     17.0
  SKYTRANS      S
  MOVING        N
  STDCALS       N
  FLUX          N
  RV            N
  TELL          N
  SKYCALS       N
  EXTRACALS     "5xhrsff, 5xbias, 1xhrsthar, 1xhrsffg"
#
# The above list specifies that every night we get data, take 5 normal
# flats, 5 bias frames, 1 Th-Ar lamp, and 1 flat with the gas cell in.  All
# frames are taken with default, resolution-dependent, exposure times.
# These exposure times could have been specified explicitly, but that would
# have made this file more complicated, since there are different exposure
# times for each resolution setting.  We would have needed additional
# COMMON blocks, or separate EXTRACALS entries for each track or action.
#
# Template observations (lamp, science exposure, special flat):
#
TRACK_LIST
  OBJECT        RA            DEC             MAG   PRI  RES VISITS COMMENT
  GJ82          01:59:24.0    +58:31:16.1   12.21    2   60k   1    "Template"
ACTION_LIST
  GASCELL  TYPE    EXP  CRSPLIT
    0     hrsthar   20     1    # This is the Th-Ar calibration lamp with the gas cell out
    0       sci   1800     3    # This is the gas cell out science exposure
    1      hrsff     5     1    # This is the flat field with gas cell in exposure"
#
TRACK_LIST
  OBJECT        RA            DEC             MAG   PRI  RES VISITS COMMENT
  HD12661       02:04:34.29   +25:24:51.5    7.44    1  120k   1    "Template"
  HD33636       05:11:46.45   +04:24:12.74   7.06    1  120k   1    "Template"
  HD74156       08:42:25.12   +04:34:41.2    7.62    1  120k   1    "Template"
  ...
ACTION_LIST
  GASCELL  TYPE    EXP  CRSPLIT
    0     hrsthar   40     1    # This is the Th-Ar calibration lamp with the gas cell out
    0       sci   1800     3    # This is the gas cell out science exposure
    1      hrsff    10     1    # This is the flat field with gas cell in exposure"
#
# OLD targets (all with gas cell in):
```

```
#
TRACK_LIST
  OBJECT       RA            DEC             MAG   PRI  RES GASCELL  EXP  CRSPLIT VISITS  SYNFREQ
  GJ82         01:59:24.0    +58:31:16.1   12.21    2   60k    1    1800     3      1     RAND10-30
#
TRACK_LIST
  OBJECT       RA            DEC             MAG   PRI  RES GASCELL  EXP  CRSPLIT VISITS  SYNFREQ
GNAME    GTYPE COMMENT
  HD12661      02:04:34.29   +25:24:51.5    7.44    1   60k    1     450     3      1     RAND1-3
HD12661   ORD  "OLD target, visit 1-2"
  HD12661      02:04:34.29   +25:24:51.5    7.44    2   60k    1     390     3      3     RAND1-3
HD12661   ORD  "OLD target, visit 3-9"
  HD12661      02:04:34.29   +25:24:51.5    7.44    3   60k    1     390     3      7     RAND1-3
HD12661   ORD  "OLD target, visit 10-16"
  HD12661      02:04:34.29   +25:24:51.5    7.44    4   60k    1     390     3      3     RAND1-3
HD12661   ORD  "OLD target, visit 17-19"
  HD33636      05:11:46.45   +04:24:12.7    7.06    1   60k    1     360     3      1     RAND1-3
HD33636   ORD  "OLD target, visit 1-2"
  HD33636      05:11:46.45   +04:24:12.74   7.06    2   60k    1     360     3      5     RAND1-3
HD33636   ORD  "OLD target, visit 3-7"
  HD33636      05:11:46.45   +04:24:12.74   7.06    3   60k    1     360     3      3     RAND1-3
HD33636   ORD  "OLD target, visit 8-10"
  HD33636      05:11:46.45   +04:24:12.74   7.06    4   60k    1     360     3      4     RAND1-3
HD33636   ORD  "OLD target, visit 11-14"
  ...
  HD145675     16:10:24.31   +43:49:03.5    6.67    1   60k    1     270     3      2     RAND1-3
HD145675  ORD  "OLD target, visit 1-2"
  HD145675     16:10:24.31   +43:49:03.52   6.67    2   60k    1     270     3      5     RAND1-3
HD145675  ORD  "OLD target, visit 3-7"
  HD145675     16:10:24.31   +43:49:03.52   6.67    3   60k    1     270     3      7     RAND1-3
HD145675  ORD  "OLD target, visit 8-14"
  HD145675     16:10:24.31   +43:49:03.521  6.67    4   60k    1     270     3      4     RAND1-3
HD145675  ORD  "OLD target, visit 15-18"


               UT07-1-003     hrsthar        01:59:24.0     +58:31:16.1    2000.0  12.21   par     2
               HRS_60k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.5     17.0    S       20      1
       1       0       N
       N       N       N       N       N       "Template \\TNUM=1,ASEQ=1,EXTRACALS='5xhrsff, 5xbias,
1xhrsthar, 1xhrsffg'\\"
               UT07-1-003     GJ82           01:59:24.0     +58:31:16.1    2000.0  12.21   par     2
               HRS_60k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.5     17.0    S       1800    3
       1       0       N
       N       N       N       N       N       "Template \\TNUM=1,ASEQ=2,EXTRACALS='5xhrsff, 5xbias,
1xhrsthar, 1xhrsffg'\\"
               UT07-1-003     hrsff          01:59:24.0     +58:31:16.1    2000.0  12.21   par     2
               HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.5     17.0    S       5       1
       1       0       N
       N       N       N       N       N       "Template \\TNUM=1,ASEQ=3,EXTRACALS='5xhrsff, 5xbias,
1xhrsthar, 1xhrsffg'\\"
               UT07-1-003     hrsthar        02:04:34.29    +25:24:51.5    2000.0  7.44    par     1
               HRS_120k_central_316g5936_2as_0sky_IS0_GC0_2x1      2.5     17.0    S       40      1
       1       0       N
       N       N       N       N       N       "Template \\TNUM=2,ASEQ=1,EXTRACALS='5xhrsff, 5xbias,
1xhrsthar, 1xhrsffg'\\"
               UT07-1-003     HD12661        02:04:34.29    +25:24:51.5    2000.0  7.44    par     1
               HRS_120k_central_316g5936_2as_0sky_IS0_GC0_2x1      2.5     17.0    S       1800    3
       1       0       N
       N       N       N       N       N       "Template \\TNUM=2,ASEQ=2,EXTRACALS='5xhrsff, 5xbias,
1xhrsthar, 1xhrsffg'\\"
               UT07-1-003     hrsff          02:04:34.29    +25:24:51.5    2000.0  7.44    par     1
               HRS_120k_central_316g5936_2as_0sky_IS0_GC1_2x1      2.5     17.0    S       10      1
       1       0       N
       N       N       N       N       N       "Template \\TNUM=2,ASEQ=3,EXTRACALS='5xhrsff, 5xbias,
1xhrsthar, 1xhrsffg'\\"
               UT07-1-003     hrsthar        05:11:46.45    +04:24:12.74   2000.0  7.06    par     1
               HRS_120k_central_316g5936_2as_0sky_IS0_GC0_2x1      2.5     17.0    S       40      1
       1       0       N
       N       N       N       N       N       "Template \\TNUM=3,ASEQ=1,EXTRACALS='5xhrsff, 5xbias,
1xhrsthar, 1xhrsffg'\\"
               UT07-1-003     HD33636        05:11:46.45    +04:24:12.74   2000.0  7.06    par     1
               HRS_120k_central_316g5936_2as_0sky_IS0_GC0_2x1      2.5     17.0    S       1800    3
       1       0       N
```

```
       N       N       N       N       N       "Template \\TNUM=3,ASEQ=2,EXTRACALS='5xhrsff, 5xbias,
1xhrsthar, 1xhrsffg'\\"
               UT07-1-003     hrsff           05:11:46.45    +04:24:12.74   2000.0  7.06    par     1
               HRS_120k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.5     17.0    S       10      1
       1       0       N
       N       N       N       N       N       "Template \\TNUM=3,ASEQ=3,EXTRACALS='5xhrsff, 5xbias,
1xhrsthar, 1xhrsffg'\\"
               UT07-1-003     hrsthar         08:42:25.12    +04:34:41.2    2000.0  7.62    par     1
               HRS_120k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.5     17.0    S       40      1
       1       0       N
       N       N       N       N       N       "Template \\TNUM=4,ASEQ=1,EXTRACALS='5xhrsff, 5xbias,
1xhrsthar, 1xhrsffg'\\"
               UT07-1-003     HD74156         08:42:25.12    +04:34:41.2    2000.0  7.62    par     1
               HRS_120k_central_316g5936_2as_0sky_IS0_GC0_2x1       2.5     17.0    S       1800    3
       1       0       N
       N       N       N       N       N       "Template \\TNUM=4,ASEQ=2,EXTRACALS='5xhrsff, 5xbias,
1xhrsthar, 1xhrsffg'\\"
               UT07-1-003     hrsff           08:42:25.12    +04:34:41.2    2000.0  7.62    par     1
               HRS_120k_central_316g5936_2as_0sky_IS0_GC1_2x1       2.5     17.0    S       10      1
       1       0       N
       N       N       N       N       N       "Template \\TNUM=4,ASEQ=3,EXTRACALS='5xhrsff, 5xbias,
1xhrsthar, 1xhrsffg'\\"
       ...
               UT07-1-003     GJ82            01:59:24.0     +58:31:16.1    2000.0  12.21   par     2
               HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       1800    3
       1       0       N       RAND10-30                       N       N       N       N       N
       "\\EXTRACALS='5xhrsff, 5xbias, 1xhrsthar, 1xhrsffg'\\"
               UT07-1-003     HD12661         02:04:34.29    +25:24:51.5    2000.0  7.44    par     1
               HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       450     3
       1       0       N       RAND1-3         HD12661
       N       N       N       N       N       "OLD target, visit 1-2
\\GTYPE=ORD,TORD=1,EXTRACALS='5xhrsff, 5xbias, 1xhrsthar, 1xhrsffg'\\"
               UT07-1-003     HD12661         02:04:34.29    +25:24:51.5    2000.0  7.44    par     2
               HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       390     3
       3       0       N       RAND1-3         HD12661
       N       N       N       N       N       "OLD target, visit 3-9
\\GTYPE=ORD,TORD=2,EXTRACALS='5xhrsff, 5xbias, 1xhrsthar, 1xhrsffg'\\"
               UT07-1-003     HD12661         02:04:34.29    +25:24:51.5    2000.0  7.44    par     3
               HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       390     3
       7       0       N       RAND1-3         HD12661
       N       N       N       N       N       "OLD target, visit 10-16
\\GTYPE=ORD,TORD=3,EXTRACALS='5xhrsff, 5xbias, 1xhrsthar, 1xhrsffg'\\"
               UT07-1-003     HD12661         02:04:34.29    +25:24:51.5    2000.0  7.44    par     4
               HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       390     3
       3       0       N       RAND1-3         HD12661
       N       N       N       N       N       "OLD target, visit 17-19
\\GTYPE=ORD,TORD=4,EXTRACALS='5xhrsff, 5xbias, 1xhrsthar, 1xhrsffg'\\"
               UT07-1-003     HD33636         05:11:46.45    +04:24:12.7    2000.0  7.06    par     1
               HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       360     3
       1       0       N       RAND1-3         HD33636
       N       N       N       N       N       "OLD target, visit 1-2
\\GTYPE=ORD,TORD=1,EXTRACALS='5xhrsff, 5xbias, 1xhrsthar, 1xhrsffg'\\"
               UT07-1-003     HD33636         05:11:46.45    +04:24:12.74   2000.0  7.06    par     2
               HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       360     3
       5       0       N       RAND1-3         HD33636
       N       N       N       N       N       "OLD target, visit 3-7
\\GTYPE=ORD,TORD=2,EXTRACALS='5xhrsff, 5xbias, 1xhrsthar, 1xhrsffg'\\"
               UT07-1-003     HD33636         05:11:46.45    +04:24:12.74   2000.0  7.06    par     3
               HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       360     3
       3       0       N       RAND1-3         HD33636
       N       N       N       N       N       "OLD target, visit 8-10
\\GTYPE=ORD,TORD=3,EXTRACALS='5xhrsff, 5xbias, 1xhrsthar, 1xhrsffg'\\"
               UT07-1-003     HD33636         05:11:46.45    +04:24:12.74   2000.0  7.06    par     4
               HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       360     3
       4       0       N       RAND1-3         HD33636
       N       N       N       N       N       "OLD target, visit 11-14
\\GTYPE=ORD,TORD=4,EXTRACALS='5xhrsff, 5xbias, 1xhrsthar, 1xhrsffg'\\"
       ...
               UT07-1-003     HD145675                16:10:24.31    +43:49:03.5    2000.0  6.67
       par     1              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S
       270     3       2       0       N       RAND1-3         HD145675        N       N       N       N
       N       "OLD target, visit 1-2 \\GTYPE=ORD,TORD=1,EXTRACALS='5xhrsff, 5xbias, 1xhrsthar,
1xhrsffg'\\"
```

```
               UT07-1-003     HD145675              16:10:24.31    +43:49:03.52   2000.0  6.67
       par     2              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S
       270     3       5      0       N       RAND1-3        HD145675       N       N       N       N
       N       "OLD target, visit 3-7 \\GTYPE=ORD,TORD=2,EXTRACALS='5xhrsff, 5xbias, 1xhrsthar,
1xhrsffg'\\"
               UT07-1-003     HD145675              16:10:24.31    +43:49:03.52   2000.0  6.67
       par     3              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S
       270     3       7      0       N       RAND1-3        HD145675       N       N       N       N
       N       "OLD target, visit 8-14 \\GTYPE=ORD,TORD=3,EXTRACALS='5xhrsff, 5xbias, 1xhrsthar,
1xhrsffg'\\"
               UT07-1-003     HD145675              16:10:24.31    +43:49:03.521  2000.0  6.67
       par     4              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S
       270     3       4      0       N       RAND1-3        HD145675       N       N       N       N
       N       "OLD target, visit 15-18 \\GTYPE=ORD,TORD=4,EXTRACALS='5xhrsff, 5xbias, 1xhrsthar,
1xhrsffg'\\"
```

```
# UT06-3-011.tsl:
#
# Example Allende Prieto program.
#
# Created from UT06-3-011-object_list, dated 3/28/07.
#
# A program to measure stellar parameters of a test sample of stars from SEQUE.
#
# Note:  Demonstrates the use of electronic finding charts.
#
# 03AUG07  Written by M. E. Cornell.
#
COMMON
  PROGRAM       UT06-3-011
  EQUINOX       2000.0
  INSTRUMENT    HRS
  ECHELLE       central
  XD            316g5936
  FIBER         3as
  SKYFIBER      0sky
  SLICER        0
  GASCELL       0
  BINCOL        2
  BINROW        5
  PA            par
  SEEING        3.0
  SKYBRIGHT     18.0
  SKYTRANS      S
  MOVING        N
  STDCALS       Y
  FLUX          N
  RV            N
  TELL          N
  SKYCALS       N
  SNGOAL        100
  SNWAVE        5800
TRACK_LIST
  OBJECT         RA          DEC          MAG   PRI  EXP  VISITS  PICHART
  SEG2038-154    0:44:16.5   24:42:46.0   14.7   3   3299   1
http://hebe.as.utexas.edu/het/mycharts/UT06-3-011/SEG2038-154.gif
  sp1-0421-439   0:58:26.1   15:1:53.6    14.6   4   2998   1
http://hebe.as.utexas.edu/het/mycharts/UT06-3-011/sp1-0421-439.gif
  SEG1898-119    1:49:34.4   13:50:58.0   14.3   4   2335   1
http://hebe.as.utexas.edu/het/mycharts/UT06-3-011/SEG1898-119.gif
  SEG2040-116    1:18:46.8   25:42:53.0   14.4   4   2496   1
http://hebe.as.utexas.edu/het/mycharts/UT06-3-011/SEG2040-116.gif
  SEG2040-152    1:18:14.9   25:36:52.0   14.4   4   2554   1
http://hebe.as.utexas.edu/het/mycharts/UT06-3-011/SEG2040-152.gif
  SEG2040-179    1:16:54.6   25:41:31.0   14.4   4   2496   1
http://hebe.as.utexas.edu/het/mycharts/UT06-3-011/SEG2040-179.gif
  SEG2040-534    1:17:42.4   26:57:48.0   14.2   4   2154   1
http://hebe.as.utexas.edu/het/mycharts/UT06-3-011/SEG2040-534.gif
  ...
```

```
#
# For each target, take the science exposures, then a ThAr lamp.
#
ACTION
  TYPE     SCI
  CRSPLIT  2
ACTION
  TYPE     hrsthar
  EXP      1
  CRSPLIT  1


               UT06-3-011     SEG2038-154           0:44:16.5      24:42:46.0     2000.0  14.7
       par     3              HRS_60k_central_316g5936_3as_0sky_IS0_GC0_2x5        3.0     18.0    S
       3299    2       1      0       N
       Y       N       N      N       N
       "\\TNUM=1,ASEQ=1,PICHART=http://hebe.as.utexas.edu/het/mycharts/UT06-3-011/SEG2038-
154.gif,SNGOAL=100,SNWAVE=5800\\"
               UT06-3-011     hrsthar        0:44:16.5      24:42:46.0     2000.0  14.7    par     3
               HRS_60k_central_316g5936_3as_0sky_IS0_GC0_2x5        3.0     18.0    S       1       1
       1       0       N
       Y       N       N      N       N
       "\\TNUM=1,ASEQ=2,PICHART=http://hebe.as.utexas.edu/het/mycharts/UT06-3-011/SEG2038-
154.gif,SNGOAL=100,SNWAVE=5800\\"
               UT06-3-011     sp1-0421-439          0:58:26.1      15:1:53.6      2000.0  14.6
       par     4              HRS_60k_central_316g5936_3as_0sky_IS0_GC0_2x5        3.0     18.0    S
       2998    2       1      0       N
       Y       N       N      N       N
       "\\TNUM=2,ASEQ=1,PICHART=http://hebe.as.utexas.edu/het/mycharts/UT06-3-011/sp1-0421-
439.gif,SNGOAL=100,SNWAVE=5800\\"
               UT06-3-011     hrsthar        0:58:26.1      15:1:53.6      2000.0  14.6    par     4
               HRS_60k_central_316g5936_3as_0sky_IS0_GC0_2x5        3.0     18.0    S       1       1
       1       0       N
       Y       N       N      N       N
       "\\TNUM=2,ASEQ=2,PICHART=http://hebe.as.utexas.edu/het/mycharts/UT06-3-011/sp1-0421-
439.gif,SNGOAL=100,SNWAVE=5800\\"
               UT06-3-011     SEG1898-119           1:49:34.4      13:50:58.0     2000.0  14.3
       par     4              HRS_60k_central_316g5936_3as_0sky_IS0_GC0_2x5        3.0     18.0    S
       2335    2       1      0       N
       Y       N       N      N       N
       "\\TNUM=3,ASEQ=1,PICHART=http://hebe.as.utexas.edu/het/mycharts/UT06-3-011/SEG1898-
119.gif,SNGOAL=100,SNWAVE=5800\\"
               UT06-3-011     hrsthar        1:49:34.4      13:50:58.0     2000.0  14.3    par     4
               HRS_60k_central_316g5936_3as_0sky_IS0_GC0_2x5        3.0     18.0    S       1       1
       1       0       N
       Y       N       N      N       N
       "\\TNUM=3,ASEQ=2,PICHART=http://hebe.as.utexas.edu/het/mycharts/UT06-3-011/SEG1898-
119.gif,SNGOAL=100,SNWAVE=5800\\"
               UT06-3-011     SEG2040-116           1:18:46.8      25:42:53.0     2000.0  14.4
       par     4              HRS_60k_central_316g5936_3as_0sky_IS0_GC0_2x5        3.0     18.0    S
       2496    2       1      0       N
       Y       N       N      N       N
       "\\TNUM=4,ASEQ=1,PICHART=http://hebe.as.utexas.edu/het/mycharts/UT06-3-011/SEG2040-
116.gif,SNGOAL=100,SNWAVE=5800\\"
               UT06-3-011     hrsthar        1:18:46.8      25:42:53.0     2000.0  14.4    par     4
               HRS_60k_central_316g5936_3as_0sky_IS0_GC0_2x5        3.0     18.0    S       1       1
       1       0       N
       Y       N       N      N       N
       "\\TNUM=4,ASEQ=2,PICHART=http://hebe.as.utexas.edu/het/mycharts/UT06-3-011/SEG2040-
116.gif,SNGOAL=100,SNWAVE=5800\\"
               UT06-3-011     SEG2040-152           1:18:14.9      25:36:52.0     2000.0  14.4
       par     4              HRS_60k_central_316g5936_3as_0sky_IS0_GC0_2x5        3.0     18.0    S
       2554    2       1      0       N
       Y       N       N      N       N
       "\\TNUM=5,ASEQ=1,PICHART=http://hebe.as.utexas.edu/het/mycharts/UT06-3-011/SEG2040-
152.gif,SNGOAL=100,SNWAVE=5800\\"
               UT06-3-011     hrsthar        1:18:14.9      25:36:52.0     2000.0  14.4    par     4
               HRS_60k_central_316g5936_3as_0sky_IS0_GC0_2x5        3.0     18.0    S       1       1
       1       0       N
       Y       N       N      N       N
       "\\TNUM=5,ASEQ=2,PICHART=http://hebe.as.utexas.edu/het/mycharts/UT06-3-011/SEG2040-
152.gif,SNGOAL=100,SNWAVE=5800\\"
```

```
               UT06-3-011     SEG2040-179           1:16:54.6      25:41:31.0     2000.0  14.4
       par     4              HRS_60k_central_316g5936_3as_0sky_IS0_GC0_2x5        3.0     18.0    S
       2496    2       1      0       N
       Y       N       N      N       N
       "\\TNUM=6,ASEQ=1,PICHART=http://hebe.as.utexas.edu/het/mycharts/UT06-3-011/SEG2040-
179.gif,SNGOAL=100,SNWAVE=5800\\"
               UT06-3-011     hrsthar        1:16:54.6      25:41:31.0     2000.0  14.4    par     4
               HRS_60k_central_316g5936_3as_0sky_IS0_GC0_2x5        3.0     18.0    S       1       1
       1       0       N
       Y       N       N      N       N
       "\\TNUM=6,ASEQ=2,PICHART=http://hebe.as.utexas.edu/het/mycharts/UT06-3-011/SEG2040-
179.gif,SNGOAL=100,SNWAVE=5800\\"
               UT06-3-011     SEG2040-534           1:17:42.4      26:57:48.0     2000.0  14.2
       par     4              HRS_60k_central_316g5936_3as_0sky_IS0_GC0_2x5        3.0     18.0    S
       2154    2       1      0       N
       Y       N       N      N       N
       "\\TNUM=7,ASEQ=1,PICHART=http://hebe.as.utexas.edu/het/mycharts/UT06-3-011/SEG2040-
534.gif,SNGOAL=100,SNWAVE=5800\\"
               UT06-3-011     hrsthar        1:17:42.4      26:57:48.0     2000.0  14.2    par     4
               HRS_60k_central_316g5936_3as_0sky_IS0_GC0_2x5        3.0     18.0    S       1       1
       1       0       N
       Y       N       N      N       N
       "\\TNUM=7,ASEQ=2,PICHART=http://hebe.as.utexas.edu/het/mycharts/UT06-3-011/SEG2040-
534.gif,SNGOAL=100,SNWAVE=5800\\"
       ...
```

```
# UT07-2-002a.ob:
#
# Example Cochran program.
#
# Created from UT07-2-002, dated 5/22/07.
#
# A planet search program, slightly complicated by two kinds of
# observations, "old" and "new".
#
# This version groups the related visits of the new targets, but uses
# GROUP keywords inside a TRACK_LIST to do so.
#
# Note: Uses a GROUP block of type ORD, specifying that the visits must be
# carried out in the order listed.
#
# 01AUG07  Modified by M. E. Cornell from UT07-2-002.tsl.
# 30AUG07  Obfuscated version.
#
COMMON
  PROGRAM       UT07-2-002
  EQUINOX       2000.0
  INSTRUMENT    HRS
  ECHELLE       central
  XD            316g5936
  FIBER         2as
  SKYFIBER      0sky
  SLICER        0
  BINCOL        2
  BINROW        1
  PA            par
  SEEING        2.5
  SKYBRIGHT     17.0
  SKYTRANS      S
  MOVING        N
  STDCALS       Y            # Please do the standard calibration exposures
  EXTRACALS     "1xhrsffg"   # plus a flat field with the gas cell in
  FLUX          N
  RV            N
  TELL          N
  SKYCALS       N
  NOTES         "See_general_comment_in_folder"
#
# Old targets (all with gas cell in):
```

```
#
TRACK_LIST
  OBJECT    RA          DEC         MAG   PRI GASCELL EXP CRSPLIT VISITS SYNFREQ     SYNDATE
COMMENT
  TPS0002   00:00:06.8  +47:16:28  8.73    3     1    740    1      5    RAND15-30   >20070603
"old target"
  TPS0003   00:06:19.5  +20:12:09  6.50    4     1    360    1      2    RAND10-20   >20070606
"old target"
  TPS0004   00:13:03.0  +14:24:39  3.72    4     1    900    1      4    RAND2-5     >20070707
"old target"
  TPS0007   00:20:25.5  +00:49:36  8.55    3     1    900    1      5    RAND3-5     >20070702
"old target"
  ...
  TPS0032   01:54:03.7  +14:54:34  9.64    4     1    700    1      1    ""          ""
"old target"
  TPS0063   01:58:03.0  +03:22:10  4.19    4     1    340    1      1    ""          <20070414
"old target"
  TPS0064   02:02:12.0  -01:06:00  6.47    4     1    630    1      2    RAND5-10    <20070419
"old target"
  TPS0065   02:06:19.4  +09:13:37  4.33    4     1    175    1      3    RAND1-5     <20070417
"old target"
  TPS0069   02:11:23.8  +15:57:17  3.21    3     1    210    1      3    RAND4-10    <20070419
"NOTE SYN DATES, old target"
  TPS0070   02:17:36.0  +12:30:00  5.83    3     1    440    1      3    RAND2-10    <20070516
"NOTE SYN DATES, old target"
  TPS0074   02:23:30.9  +27:19:29  6.41    1     1    440    1      1    ""          <20070412
"NOTE SYN DATES, old target"
  TPS0075   02:27:32.5  +25:40:05  5.92    3     1    620    1      3    RAND5-10    <20070507
"NOTE SYN DATES, old target"
  ...
#
# For observations of the same target, but with different priorities, we
# want to do the higher priority observations first.  Therefore, each
# target's visits are organized into GROUPs of type ORD:
#
TRACK_LIST
  OBJECT    RA          DEC        MAG    PRI GASCELL EXP CRSPLIT VISITS   GNAME  GTYPE  SYNFREQ
COMMENT
  TPS0152   14:42:07.5  +35:26:09  8.68    1     1    400    1      5     TPS0152  ORD   RAND1-5
"old target"
  TPS0152   14:42:07.5  +35:26:09  8.68    2     1    400    1      5     TPS0152  ORD   RAND5-20
"old target"
  TPS0172   17:19:54.0  +60:09:00  5.32    1     1    760    1      4     TPS0172  ORD   RAND2-5
"old target"
  TPS0172   17:19:54.0  +60:09:00  5.32    3     1    760    1      4     TPS0172  ORD   RAND20-30
"old target"
#
# New targets, with visits organized into groups to enforce execution order:
#
# First visits:
#
TRACK_LIST
  OBJECT    RA          DEC         MAG   PRI  EXP CRSPLIT VISITS   GNAME  GTYPE COMMENT
  TPS0237   00:01:36.1  +33:33:45  9.57    4   900    1      1     TPS0237  ORD  "new target, visit
1"
  TPS0238   01:16:30.0  +01:12:00  4.85    4   510    1      1     TPS0238  ORD  "new target, visit
1"
  TPS0239   02:12:12.0  +42:23:00  3.01    4   900    1      1     TPS0239  ORD  "new target, visit
1"
  ...
ACTION
  GASCELL  1     # This is the gas cell in science exposure
ACTION
  GASCELL  0     # This is the gas cell out science exposure
ACTION
  GASCELL  1     # This is the flat field with gas cell in"
  TYPE     hrsff
  EXP      5
#
# Subsequent visits:
#
TRACK_LIST
  OBJECT    RA          DEC         MAG   PRI GASCELL EXP CRSPLIT VISITS  SYNFREQ    GNAME  GTYPE
COMMENT
```

```
  TPS0237   00:01:36.1  +33:33:45  9.57    4     1    900    1      4     RAND2-4   TPS0237  ORD
"new target, visit 2-4"
  TPS0238   01:16:30.0  +01:12:00  4.85    4     1    510    1      4     RAND2-4   TPS0238  ORD
"new target, visit 2-4"
  TPS0239   02:12:12.0  +42:23:00  3.01    4     1    900    1      4     RAND2-4   TPS0239  ORD
"new target, visit 2-4"
  ...
#
# Odd man out (visit 1 completed previously, no GROUP needed):
#
TRACK_LIST
  OBJECT    RA          DEC         MAG   PRI GASCELL EXP CRSPLIT VISITS  SYNDATE   COMMENT
  TPS0262   23:58:30.0  +09:57:00   6.14   3     1    900    1      1    >20070710  "new target,
visit 2-4"


          UT07-2-002     TPS0002        00:00:06.8     +47:16:28      2000.0  8.73   par     3
          HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       740     1
      5       0       N       RAND15-30       >20070603       Y       N       N       N       N
      "See_general_comment_in_folder: old target \\EXTRACALS='1xhrsffg'\\"
          UT07-2-002     TPS0003        00:06:19.5     +20:12:09      2000.0  6.50   par     4
          HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       360     1
      2       0       N       RAND10-20       >20070606       Y       N       N       N       N
      "See_general_comment_in_folder: old target \\EXTRACALS='1xhrsffg'\\"
          UT07-2-002     TPS0004        00:13:03.0     +14:24:39      2000.0  3.72   par     4
          HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       900     1
      4       0       N       RAND2-5         >20070707       Y       N       N       N       N
      "See_general_comment_in_folder: old target \\EXTRACALS='1xhrsffg'\\"
          UT07-2-002     TPS0007        00:20:25.5     +00:49:36      2000.0  8.55   par     3
          HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       900     1
      5       0       N       RAND3-5         >20070702       Y       N       N       N       N
      "See_general_comment_in_folder: old target \\EXTRACALS='1xhrsffg'\\"
      ...
          UT07-2-002     TPS0032        01:54:03.7     +14:54:34      2000.0  9.64   par     4
          HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       700     1
      1       0       N       ""              ""              Y       N       N       N       N
      "See_general_comment_in_folder: old target \\EXTRACALS='1xhrsffg'\\"
          UT07-2-002     TPS0063        01:58:03.0     +03:22:10      2000.0  4.19   par     4
          HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       340     1
      1       0       N       ""              <20070414       Y       N       N       N       N
      "See_general_comment_in_folder: old target \\EXTRACALS='1xhrsffg'\\"
          UT07-2-002     TPS0064        02:02:12.0     -01:06:00      2000.0  6.47   par     4
          HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       630     1
      2       0       N       RAND5-10        <20070419       Y       N       N       N       N
      "See_general_comment_in_folder: old target \\EXTRACALS='1xhrsffg'\\"
          UT07-2-002     TPS0065        02:06:19.4     +09:13:37      2000.0  4.33   par     4
          HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       175     1
      3       0       N       RAND1-5         <20070417       Y       N       N       N       N
      "See_general_comment_in_folder: old target \\EXTRACALS='1xhrsffg'\\"
          UT07-2-002     TPS0069        02:11:23.8     +15:57:17      2000.0  3.21   par     3
          HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       210     1
      3       0       N       RAND4-10        <20070419       Y       N       N       N       N
      "See_general_comment_in_folder: NOTE SYN DATES, old target \\EXTRACALS='1xhrsffg'\\"
          UT07-2-002     TPS0070        02:17:36.0     +12:30:00      2000.0  5.83   par     3
          HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       440     1
      3       0       N       RAND2-10        <20070516       Y       N       N       N       N
      "See_general_comment_in_folder: NOTE SYN DATES, old target \\EXTRACALS='1xhrsffg'\\"
          UT07-2-002     TPS0074        02:23:30.9     +27:19:29      2000.0  6.41   par     1
          HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       440     1
      1       0       N       ""              <20070412       Y       N       N       N       N
      "See_general_comment_in_folder: NOTE SYN DATES, old target \\EXTRACALS='1xhrsffg'\\"
          UT07-2-002     TPS0075        02:27:32.5     +25:40:05      2000.0  5.92   par     3
          HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       620     1
      3       0       N       RAND5-10        <20070507       Y       N       N       N       N
      "See_general_comment_in_folder: NOTE SYN DATES, old target \\EXTRACALS='1xhrsffg'\\"
      ...
          UT07-2-002     TPS0152        14:42:07.5     +35:26:09      2000.0  8.68   par     1
          HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       400     1
      5       0       N       RAND1-5         TPS0152         Y       N       N       N       N
      "See_general_comment_in_folder: old target \\GTYPE=ORD,TORD=1,EXTRACALS='1xhrsffg'\\"
          UT07-2-002     TPS0152        14:42:07.5     +35:26:09      2000.0  8.68   par     2
          HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       400     1
      5       0       N       RAND5-20        TPS0152         Y       N       N       N       N
      "See_general_comment_in_folder: old target \\GTYPE=ORD,TORD=2,EXTRACALS='1xhrsffg'\\"
```

```
              UT07-2-002     TPS0172        17:19:54.0     +60:09:00      2000.0  5.32    par     1
              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       760     1
       4      0      N      RAND2-5        TPS0172        Y      N      N       N       N
       "See_general_comment_in_folder: old target \\GTYPE=ORD,TORD=1,EXTRACALS='1xhrsffg'\\"
              UT07-2-002     TPS0172        17:19:54.0     +60:09:00      2000.0  5.32    par     3
              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       760     1
       4      0      N      RAND20-30      TPS0172        Y      N      N       N       N
       "See_general_comment_in_folder: old target \\GTYPE=ORD,TORD=2,EXTRACALS='1xhrsffg'\\"
              UT07-2-002     TPS0237        00:01:36.1     +33:33:45      2000.0  9.57    par     4
              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       900     1
       1      0      N                     TPS0237        Y      N      N       N       N

       "See_general_comment_in_folder: new target, visit 1
\\TNUM=166,ASEQ=1,GTYPE=ORD,TORD=1,EXTRACALS='1xhrsffg'\\"
              UT07-2-002     TPS0237        00:01:36.1     +33:33:45      2000.0  9.57    par     4
              HRS_60k_central_316g5936_2as_0sky_IS0_GC0_2x1        2.5     17.0    S       900     1
       1      0      N                     TPS0237        Y      N      N       N       N

       "See_general_comment_in_folder: new target, visit 1
\\TNUM=166,ASEQ=2,GTYPE=ORD,TORD=1,EXTRACALS='1xhrsffg'\\"
              UT07-2-002     hrsff          00:01:36.1     +33:33:45      2000.0  9.57    par     4
              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       5       1
       1      0      N                     TPS0237        Y      N      N       N       N

       "See_general_comment_in_folder: new target, visit 1
\\TNUM=166,ASEQ=3,GTYPE=ORD,TORD=1,EXTRACALS='1xhrsffg'\\"
              UT07-2-002     TPS0238        01:16:30.0     +01:12:00      2000.0  4.85    par     4
              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       510     1
       1      0      N                     TPS0238        Y      N      N       N       N

       "See_general_comment_in_folder: new target, visit 1
\\TNUM=167,ASEQ=1,GTYPE=ORD,TORD=1,EXTRACALS='1xhrsffg'\\"
              UT07-2-002     TPS0238        01:16:30.0     +01:12:00      2000.0  4.85    par     4
              HRS_60k_central_316g5936_2as_0sky_IS0_GC0_2x1        2.5     17.0    S       510     1
       1      0      N                     TPS0238        Y      N      N       N       N

       "See_general_comment_in_folder: new target, visit 1
\\TNUM=167,ASEQ=2,GTYPE=ORD,TORD=1,EXTRACALS='1xhrsffg'\\"
              UT07-2-002     hrsff          01:16:30.0     +01:12:00      2000.0  4.85    par     4
              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       5       1
       1      0      N                     TPS0238        Y      N      N       N       N

       "See_general_comment_in_folder: new target, visit 1
\\TNUM=167,ASEQ=3,GTYPE=ORD,TORD=1,EXTRACALS='1xhrsffg'\\"
              UT07-2-002     TPS0239        02:12:12.0     +42:23:00      2000.0  3.01    par     4
              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       900     1
       1      0      N                     TPS0239        Y      N      N       N       N

       "See_general_comment_in_folder: new target, visit 1
\\TNUM=168,ASEQ=1,GTYPE=ORD,TORD=1,EXTRACALS='1xhrsffg'\\"
              UT07-2-002     TPS0239        02:12:12.0     +42:23:00      2000.0  3.01    par     4
       HRS_60k_central_316g5936_2as_0sky_IS0_GC0_2x1        2.5     17.0    S       900     1       1
              0      N                     TPS0239
       Y      N      N      N      N       "See_general_comment_in_folder: new target, visit 1
       \\TNUM=168,ASEQ=2,GTYPE=ORD,TORD=1,EXTRACALS='1xhrsffg'\\"
              UT07-2-002     hrsff          02:12:12.0     +42:23:00      2000.0  3.01    par     4
              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       5       1
       1      0      N                     TPS0239
       Y      N      N      N      N       "See_general_comment_in_folder: new target, visit 1
       \\TNUM=168,ASEQ=3,GTYPE=ORD,TORD=1,EXTRACALS='1xhrsffg'\\"
       ...
              UT07-2-002     TPS0237        00:01:36.1     +33:33:45      2000.0  9.57    par     4
              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       900     1
       4      0      N      RAND2-4        TPS0237
       Y      N      N      N      N       "See_general_comment_in_folder: new target, visit 2-4
\\GTYPE=ORD,TORD=2,EXTRACALS='1xhrsffg'\\"
              UT07-2-002     TPS0238        01:16:30.0     +01:12:00      2000.0  4.85    par     4
              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       510     1
       4      0      N      RAND2-4        TPS0238
       Y      N      N      N      N       "See_general_comment_in_folder: new target, visit 2-4
\\GTYPE=ORD,TORD=2,EXTRACALS='1xhrsffg'\\"
              UT07-2-002     TPS0239        02:12:12.0     +42:23:00      2000.0  3.01    par     4
              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       900     1
       4      0      N      RAND2-4        TPS0239
```

```
       Y       N       N       N       N       "See_general_comment_in_folder: new target, visit 2-4
\\GTYPE=ORD,TORD=2,EXTRACALS='1xhrsffg'\\"
       ...
              UT07-2-002     TPS0262        23:58:30.0     +09:57:00      2000.0  6.14    par     3
              HRS_60k_central_316g5936_2as_0sky_IS0_GC1_2x1        2.5     17.0    S       900     1
       1      0       N              >20070710              Y       N       N       N       N
       "See_general_comment_in_folder: new target, visit 2-4 \\EXTRACALS='1xhrsffg'\\"
```

```
# UT07-2-005.tsl:
#
# Example Allende Prieto program.
#
# Created from UT07-2-005-object_list, dated 3/28/07.
#
# A program to look for white dwarfs in binaries.
#
# Note:  Demonstrates the use of multiple electronic finding charts.
#
# 03AUG07  Written by M. E. Cornell.
# 30AUG07  The Neon lamp is now called "calne".
#
COMMON
  PROGRAM       UT07-2-005
  EQUINOX       2000.0
  INSTRUMENT    LRS
  GRISM         g2
  SLIT          1.0
  FILTER        GG385
  PA            par
  SEEING        2.0
  SKYTRANS      S
  VISITS        3
  MOVING        N
  SYNFREQ       RAND1-10
  STDCALS       Y
  FLUX          N
  RV            2
  TELL          N
  SKYCALS       Y
  SNGOAL        30
  SNWAVE        6000
TRACK_LIST
  OBJECT         RA           DEC          MAG   PRI  SKYBRIGHT  EXP    PICHART
  J0923+3028     09:23:45.60  +30:28:05.0  15.7   2     19.0     600
"http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J0923+3028.gif,http://hebe.as.utexas.edu/het/mycharts/UT07-2-005/J0923+3028.sdss.jpeg"
  J1053+5200     10:53:53.89  +52:00:31.0  18.9   2     20.4     3300
"http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J1053+5200.gif,http://hebe.as.utexas.edu/het/mycharts/UT07-2-005/J1053+5200.sdss.jpeg"
  J1234-0228     12:34:10.36  -02:28:02.8  17.7   2     19.7     1080
"http://hebe.as.utexas.edu/het/mycharts/UT07-2-005/J1234-
0228.gif,http://hebe.as.utexas.edu/het/mycharts/UT07-2-005/J1234-0228.sdss.jpeg"
  J1436+5010     14:36:33.29  +50:10:26.8  18.2   2     20.2     1740
"http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J1436+5010.gif,http://hebe.as.utexas.edu/het/mycharts/UT07-2-005/J1436+5010.sdss.jpeg"
  J1439+1002     14:39:48.40  +10:02:21.7  18.2   2     20.2     1740
"http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J1439+1002.gif,http://hebe.as.utexas.edu/het/mycharts/UT07-2-005/J1439+1002.sdss.jpeg"
  J1512+2615     15:12:25.70  +26:15:38.5  19.5   2     20.9     3642
"http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J1512+2615.gif,http://hebe.as.utexas.edu/het/mycharts/UT07-2-005/J1512+2615.sdss.jpeg"
  J1625+3632     16:25:42.10  +36:32:19.1  19.3   2     20.8     3642
"http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J1625+3632.gif,http://hebe.as.utexas.edu/het/mycharts/UT07-2-005/J1625+3632.sdss.jpeg"
#
# For each target, take the science exposures, then a Neon wavelength calibration lamp.
#
ACTION
```

```
  TYPE     SCI
  CRSPLIT  3
ACTION
  TYPE     calne
  EXP      40
  CRSPLIT  1


               UT07-2-005     J0923+3028            09:23:45.60    +30:28:05.0    2000.0  15.7
       par     2              LRS_g2_1.0_GG385_2x2  2.0     19.0    S       600     3       3       0
       N       RAND1-10                     Y       N       2       N       Y
       "\\TNUM=1,ASEQ=1,PICHART='http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J0923+3028.gif,http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J0923+3028.sdss.jpeg',SNGOAL=30,SNWAVE=6000\\"
               UT07-2-005     calne          09:23:45.60    +30:28:05.0    2000.0  15.7    par     2
               LRS_g2_1.0_GG385_2x2   2.0     19.0    S       40      1       3       0       N
       RAND1-10                     Y       N       2       N       Y
       "\\TNUM=1,ASEQ=2,PICHART='http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J0923+3028.gif,http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J0923+3028.sdss.jpeg',SNGOAL=30,SNWAVE=6000\\"
               UT07-2-005     J1053+5200            10:53:53.89    +52:00:31.0    2000.0  18.9
       par     2              LRS_g2_1.0_GG385_2x2  2.0     20.4    S       3300    3       3       0
       N       RAND1-10                     Y       N       2       N       Y
       "\\TNUM=2,ASEQ=1,PICHART='http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J1053+5200.gif,http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J1053+5200.sdss.jpeg',SNGOAL=30,SNWAVE=6000\\"
               UT07-2-005     calne          10:53:53.89    +52:00:31.0    2000.0  18.9    par     2
               LRS_g2_1.0_GG385_2x2   2.0     20.4    S       40      1       3       0       N
       RAND1-10                     Y       N       2       N       Y
       "\\TNUM=2,ASEQ=2,PICHART='http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J1053+5200.gif,http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J1053+5200.sdss.jpeg',SNGOAL=30,SNWAVE=6000\\"
               UT07-2-005     J1234-0228            12:34:10.36    -02:28:02.8    2000.0  17.7
       par     2              LRS_g2_1.0_GG385_2x2  2.0     19.7    S       1080    3       3       0
       N       RAND1-10                     Y       N       2       N       Y
       "\\TNUM=3,ASEQ=1,PICHART='http://hebe.as.utexas.edu/het/mycharts/UT07-2-005/J1234-
0228.gif,http://hebe.as.utexas.edu/het/mycharts/UT07-2-005/J1234-
0228.sdss.jpeg',SNGOAL=30,SNWAVE=6000\\"
               UT07-2-005     calne          12:34:10.36    -02:28:02.8    2000.0  17.7    par     2
               LRS_g2_1.0_GG385_2x2   2.0     19.7    S       40      1       3       0       N
       RAND1-10                     Y       N       2       N       Y
       "\\TNUM=3,ASEQ=2,PICHART='http://hebe.as.utexas.edu/het/mycharts/UT07-2-005/J1234-
0228.gif,http://hebe.as.utexas.edu/het/mycharts/UT07-2-005/J1234-
0228.sdss.jpeg',SNGOAL=30,SNWAVE=6000\\"
               UT07-2-005     J1436+5010            14:36:33.29    +50:10:26.8    2000.0  18.2
       par     2              LRS_g2_1.0_GG385_2x2  2.0     20.2    S       1740    3       3       0
       N       RAND1-10                     Y       N       2       N       Y
       "\\TNUM=4,ASEQ=1,PICHART='http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J1436+5010.gif,http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J1436+5010.sdss.jpeg',SNGOAL=30,SNWAVE=6000\\"
               UT07-2-005     calne          14:36:33.29    +50:10:26.8    2000.0  18.2    par     2
               LRS_g2_1.0_GG385_2x2   2.0     20.2    S       40      1       3       0       N
       RAND1-10                     Y       N       2       N       Y
       "\\TNUM=4,ASEQ=2,PICHART='http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J1436+5010.gif,http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J1436+5010.sdss.jpeg',SNGOAL=30,SNWAVE=6000\\"
               UT07-2-005     J1439+1002            14:39:48.40    +10:02:21.7    2000.0  18.2
       par     2              LRS_g2_1.0_GG385_2x2  2.0     20.2    S       1740    3       3       0
       N       RAND1-10                     Y       N       2       N       Y
       "\\TNUM=5,ASEQ=1,PICHART='http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J1439+1002.gif,http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J1439+1002.sdss.jpeg',SNGOAL=30,SNWAVE=6000\\"
               UT07-2-005     calne          14:39:48.40    +10:02:21.7    2000.0  18.2    par     2
               LRS_g2_1.0_GG385_2x2   2.0     20.2    S       40      1       3       0       N
       RAND1-10                     Y       N       2       N       Y
       "\\TNUM=5,ASEQ=2,PICHART='http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J1439+1002.gif,http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J1439+1002.sdss.jpeg',SNGOAL=30,SNWAVE=6000\\"
               UT07-2-005     J1512+2615            15:12:25.70    +26:15:38.5    2000.0  19.5
       par     2              LRS_g2_1.0_GG385_2x2  2.0     20.9    S       3642    3       3       0
       N       RAND1-10                     Y       N       2       N       Y
       "\\TNUM=6,ASEQ=1,PICHART='http://hebe.as.utexas.edu/het/mycharts/UT07-2-
```

```
005/J1512+2615.gif,http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J1512+2615.sdss.jpeg',SNGOAL=30,SNWAVE=6000\\"
              UT07-2-005     calne          15:12:25.70    +26:15:38.5    2000.0  19.5    par     2
              LRS_g2_1.0_GG385_2x2   2.0     20.9    S       40      1       3       0       N
       RAND1-10                      Y       N       2       N       Y
       "\\TNUM=6,ASEQ=2,PICHART='http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J1512+2615.gif,http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J1512+2615.sdss.jpeg',SNGOAL=30,SNWAVE=6000\\"
              UT07-2-005     J1625+3632             16:25:42.10    +36:32:19.1    2000.0  19.3
       par    2              LRS_g2_1.0_GG385_2x2   2.0     20.8    S       3642    3       3       0
       N      RAND1-10                      Y       N       2       N       Y
       "\\TNUM=7,ASEQ=1,PICHART='http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J1625+3632.gif,http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J1625+3632.sdss.jpeg',SNGOAL=30,SNWAVE=6000\\"
              UT07-2-005     calne          16:25:42.10    +36:32:19.1    2000.0  19.3    par     2
              LRS_g2_1.0_GG385_2x2   2.0     20.8    S       40      1       3       0       N
       RAND1-10                      Y       N       2       N       Y
       "\\TNUM=7,ASEQ=2,PICHART='http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J1625+3632.gif,http://hebe.as.utexas.edu/het/mycharts/UT07-2-
005/J1625+3632.sdss.jpeg',SNGOAL=30,SNWAVE=6000\\"
```

```
# Example TSL script with typical Kormendy program.
#
# Interesting elements include grouped observations, sky exposures, extra
# calibrations.
#
# 27JUL07 Written by M. E. Cornell.
#
COMMON
  PROGRAM       UT07-2-020
  INSTCONFIG    LRS_g2_1.5_GG385
  SKYBRIGHT     20.5
  SKYTRANS      S
  MOVING        N
  STDCALS       Y         # note that I mean take standard cals in addition to other requests below
  FLUX          N
  RV            N
  TELL          N
  SKYCALS       N
  EXTRACALS     1xcalNe@600s
TRACK_LIST
  OBJECT          RA         DEC     EQUINOX   MAG    PA    PRI  SEEING   EXP NUMEXP VISITS
COMMENT
  NGC0508     01:23:40.6  +33:16:49   2000.0  13.87   65.0   1     2.0    900    2     1
"Galaxy exposure, center on slit"
  ABELL0586   07:32:20.3  +31:38:01   2000.0  15.40  159.0   1     1.8    900    2     1
"Galaxy exposure, offset slit so galaxy is 1 arcmin from end"
  ABELL0963   10:17:03.6  +39:02:49   2000.0  17.50  176.0   1     1.8    900    2     1
"Galaxy exposure, offset slit so galaxy is 1 arcmin from end"
GROUP
  GNAME         JKgroup49
  GTYPE         SEQ
TRACK_LIST
  OBJECT          RA         DEC     EQUINOX   MAG    PA    PRI  SEEING   EXP NUMEXP VISITS
COMMENT
  NGC7647     23:23:57.4  +16:46:38   2000.0  14.56  180.0   1     2.0    900    2     1
"Galaxy exposure, center on slit"
  NGC7647sky  23:38:57.4  +16:46:38   2000.0  14.56  180.0   1     2.0    300    1     1     "Sky
exposure for NGC7647, do not autoguide"
GROUP
  GNAME         JKgroup53
  GTYPE         SEQ
TRACK_LIST
  OBJECT       AZRES      RA         DEC     EQUINOX   MAG    PA    PRI  SEEING   EXP NUMEXP VISITS
COMMENT
  NGC6166alt     W    16:28:38.5  +39:33:06   2000.0  12.66  205.0   1     2.0    900    2     8
"Galaxy exposure, offset slit so galaxy is 20 arcsec from end"
  NGC6166altsky  W    16:43:38.5  +39:34:36   2000.0  12.66  205.0   1     2.0    300    1     8
"Sky exposure for NGC6166, do not autoguide"



               UT07-2-020     NGC0508        01:23:40.6     +33:16:49      2000.0  13.87   65.0   1
               LRS_g2_1.5_GG385_2x2   2.0     20.5    S       1800    2       1       0       N
                        Y       N       N       N       N       "Galaxy exposure, center on slit
\\EXTRACALS=1xcalNe@600s\\"
               UT07-2-020     ABELL0586              07:32:20.3     +31:38:01      2000.0  15.40
       159.0   1              LRS_g2_1.5_GG385_2x2   1.8     20.5    S       1800    2       1       0
       N                       Y       N       N       N       N       "Galaxy exposure, offset
slit so galaxy is 1 arcmin from end \\EXTRACALS=1xcalNe@600s\\"
               UT07-2-020     ABELL0963              10:17:03.6     +39:02:49      2000.0  17.50
       176.0   1              LRS_g2_1.5_GG385_2x2   1.8     20.5    S       1800    2       1       0
       N                       Y       N       N       N       N       "Galaxy exposure, offset
slit so galaxy is 1 arcmin from end \\EXTRACALS=1xcalNe@600s\\"
               UT07-2-020     NGC7647        23:23:57.4     +16:46:38      2000.0  14.56   180.0   1
               LRS_g2_1.5_GG385_2x2   2.0     20.5    S       1800    2       1       0       N
               JKgroup49      Y       N       N       N       N       "Galaxy exposure, center on slit
\\GTYPE=SEQ,TSEQ=1,EXTRACALS=1xcalNe@600s\\"
               UT07-2-020     NGC7647sky             23:38:57.4     +16:46:38      2000.0  14.56
       180.0   1              LRS_g2_1.5_GG385_2x2   2.0     20.5    S       300     1       1       0
       N                       JKgroup49      Y       N       N       N       N       "Sky exposure for
NGC7647, do not autoguide \\GTYPE=SEQ,TSEQ=2,EXTRACALS=1xcalNe@600s\\"
               UT07-2-020     NGC6166alt     W       16:28:38.5     +39:33:06      2000.0  12.66
       205.0   1              LRS_g2_1.5_GG385_2x2   2.0     20.5    S       1800    2       8       0
```

```
       N                    JKgroup53      Y      N      N      N      "Galaxy exposure,
offset slit so galaxy is 20 arcsec from end \\GTYPE=SEQ,TSEQ=1,EXTRACALS=1xcalNe@600s\\"
              UT07-2-020     NGC6166altsky  W      16:43:38.5     +39:34:36      2000.0  12.66
       205.0   1             LRS_g2_1.5_GG385_2x2   2.0    20.5    S      300     1      8      0
       N                    JKgroup53      Y      N      N      N      N      "Sky exposure for
NGC6166, do not autoguide \\GTYPE=SEQ,TSEQ=2,EXTRACALS=1xcalNe@600s\\"
```

Appendix C – TSL PARAMETER DESCRIPTIONS

This section lists all parameter keywords for the language along with allowed values, default values, instrument dependencies, whether a parameter is required or not, plus some discussion and examples.

PARAMETER KEYWORD	DESCRIPTION	REQ	INST	DEFAULT	ALLOWED VALUES
AR	Argon Lamps	N	all	undef	{0..n}
• Number of argon wavelength calibration lamps to be taken at the end of the night. • This number of lamps is assumed to be *in addition to* any standard calibrations or EXTRACALS. • Default exposure time for the current setup is assumed. If this is not sufficient, use EXTRACALS. • Example: `AR 5`					
AZRES	Azimuth Restriction	N	all	undef	{E,W,none,""}
• For tracks that should only be done at one specific Azimuth give an **E** or **W**. • If no AZ restriction is required leave out this keyword, or leave this field blank. • This parameter is used primarily for MOS, moving targets, and synoptic targets. • For MOS targets this parameter is required because the Tracker rho ring is limited to 180 degrees of rotation and thus East and West tracks will be flipped, requiring different configuration files. For tracks far north or far south the amount of rho angle rotation allows for similar East and West Tracks. • See the Position Angle Calculator (http://het.as.utexas.edu/HET/hetweb/instruments/LRS/rho.html) for more information about PA and Az restrictions. • Examples: `AZRES E` `AZRES ""`					
BIAS	Number of Bias frames	N	all	undef	{0..n}
• Number of bias frames to be taken at the end of the night. • This number of frames is assumed to be *in addition to* any standard calibrations or EXTRACALS. • The binning for the current setup is assumed. • Example: `BIAS 4`					
BINCOL	Number of columns to bin	N	HRS	2	{1,2}
BINCOL	Number of columns to bin	N	LRS	2	{1,2}
BINCOL	Number of columns to bin	N	MRS	2	2
• Column binning is in the cross dispersion dimension. • Example: `BINCOL 2`					
BINROW	Number of rows to bin	N	HRS	1	{1..5}
BINROW	Number of rows to bin	N	LRS	2	{1..2}
BINROW	Number of rows to bin	N	MRS	2	2

- Row binning is in the spectral dispersion dimension.
- Typical binnings for each HRS Resolving Power (keyword RES) are:

ResPower	Binnings	Recommended Binning(s)	(pixels per resolution element)
120k	1x1 or 2x1	2x1	(2.0)
60k	1x1, 1x2, 2x1, or 2x2	2x1 or 2x2	(4.0 or 2.0)
30k	1x2, 2x2, 1x3, or 2x3	2x3	(2.7)
15k	1x4, 2x4, 1x5, or 2x5	2x5	(3.2)

- The width of the orders as a function of fiber (keyword FIBER) is:
  - for fiber = 2as: 13 pixels for column binning = 1

PARAMETER KEYWORD	DESCRIPTION	REQ	INST	DEFAULT	ALLOWED VALUES
	○ for fiber = 3as: 20 pixels for column binning = 1 • The number of pixels per resolution element can be calculated as: ○ (240,000)/(Resolving power)/(row binning) • Note that this value varies along the orders. • For example: with 2x3 binning and ResPower=30k (30,000), there are approximately 2.7 pixels per resolution element. • Example: `BINROW 2`				
CAMERA	MRS Camera	N	MRS	Vis	{Vis,JCAM,both}
	• **Vis**: The visible beam only. • **JCAM**: The NIR beam only using the JCAM system with Hawaii I NIR array. • **both**: Simultaneously expose both Vis and JCAM. • Example: `CAMERA Vis`				
CD	Cadmium Lamps	N	all	undef	{0..n}
	• Number of cadmium wavelength calibration lamps to be taken at the end of the night. • This number of lamps is assumed to be *in addition to* any standard calibrations or EXTRACALS. • Default exposure time for the current setup is assumed. If this is not sufficient, use EXTRACALS. • Example: `CD 5`				
COMMENT	Comment string	N	all	""	String
	• If there are spaces, enclose in double quotes. • Keep it short, simple, and organized. • For blind offset setups, give the name of the .xy setup file. • For MOS setups, give the name of the .cfg setup file. • For MOS setups, also specify whether this is the West or East track. • Put longer comments in the program notes, rather than here. • Examples: `COMMENT "This is the gas cell in exposure"` `COMMENT This_is_the_science_exposure`				
CRSPLIT	Number of sub-exposures	N	all	1	{1..n}
	• Number of sub-exposures in which to split the exposure time for a given Action. • This is crucial for longer (>20 minutes) integration times, so that the centering of the target in the slit can be checked in the middle of the track. • A CRSPLIT of **1** means no sub-exposures, i.e. one single exposure. • For example, an exposure time of 1800 sec with a CRSPLIT of **2** means two 900 sec exposures. • Use either CRSPLIT or NUMEXP, but do not mix the two in a single TSL file. • Example: `CRSPLIT 3`				
DARK	Number of Dark frames	N	all	undef	{0..n}
	• Number of dark frames to be taken at the end of the night. • Darks are no longer included in the standard set of calibrations due to the extreme overhead required to provide a dark for each exposure time/setup. They may be included in a special calibrations request if a science and instrumental driver is supplied. • This number of frames is assumed to be *in addition to* any standard calibrations or EXTRACALS. • The binning for the current setup is assumed. • Example: `DARK 2`				
DEC	Declination of target	Y	all	undef	[+,-]dd:mm:ss[.ss]
	• Valid values fall between `-12:00:00 and +74:00:00`, exclusive. • Coordinates are assumed to be J2000, unless specified otherwise using the EQUINOX keyword.				

PARAMETER KEYWORD	DESCRIPTION	REQ	INST	DEFAULT	ALLOWED VALUES

• Examples: `DEC +13:12:12.34`
`DEC 13:23:23`
`DEC -10:35:59.9`					

ECHELLE	Echelle grating position	N	HRS	central	{central,red,blue}
• This value sets the echelle rotation angle for changing the position of the orders on the CCD, primarily to move spectral features of interest off CCD defects. o **central**: Default value. It is intended to center the orders on the CCD, and yield the (theoretical) wavelengths given below in the Cross Disperser table (see keyword XD). In practice, the blaze peaks are slightly to the red side of the CCD. o **blue**: Causes the wavelength approximately at the blue end of the orders to be moved to the center of the CCD. The blaze peak of the order (peak efficiency) moves near the red edge of the CCD. o **red**: Causes the wavelength approximately at the red end of the orders to be moved to the center of the CCD. The blaze peak of the order (peak efficiency) moves near the blue edge of the CCD. • Example: `ECHELLE red`					
ECHELLE	Echelle grating	N	MRS	79	{79,110}
• **79**: The 79 line/mm echelle. • **110**: The 110 line/mm echelle. • Example: `ECHELLE 79`					
EQUINOX	Equinox of coordinates	N	all	2000.0	1900.0 to 2000.0
• Equinox of object coordinates. • Assumed to be J2000, unless otherwise specified. • Example: `EQUINOX 1950.0`					
EXP	Exposure time in seconds	Y	all	undef	Real > 0
• If CRSPLIT is used, this is the total exposure time in seconds for the Action. • If NUMEXP is used instead, this is the exposure time per frame. • If neither is specified, this is the exposure time for the (single) frame. • Example: `EXP 900`					
EXTRACALS	Extra Calibrations	N	all	undef	String or Quoted string

• Used to specify the number (and optionally, exposure time) for a list of calibration frames to be obtained at the end of the night.
• These are assumed to be *in addition to* any standard calibrations (keyword STDCALS).
• The general format of an extra calibration is:
o `<number of exposures>x<calibration type>[@<exposure>s]`
• Exposure times are in seconds.
• If the exposure time is omitted, a default for the current setup is assumed.
• Multiple calibration types must separated by commas and placed in double quotes.
• Examples: `EXTRACALS 9xbias`
`EXTRACALS 2xdark@1200s`
`EXTRACALS "5xpfipff@89s, 1xcalCd@400s, 1xcalCd@40s, 1xcalNe@100s"`					

FF	Number of flat fields	N	all	undef	{0..n}
• Number of flat field continuum lamps to be taken at the end of the night. • This number of lamps is assumed to be *in addition to* any standard calibrations or EXTRACALS. • Default exposure time for the current setup is assumed. If this is not sufficient, use EXTRACALS. • Example: `FF 5`					

PARAMETER KEYWORD	DESCRIPTION	REQ	INST	DEFAULT	ALLOWED VALUES
FIBER	Fiber	N	HRS	2as	{2as,3as}
• Angular diameter on the sky in arcseconds of the fiber to be used for feeding light from the telescope to the spectrometer. • An important consideration for observing faint objects is that the **3as** fiber collects 225% more "sky" than the **2as** fibers. • Example: `FIBER 2as`					
FIBER	Fiber	N	MRS	1.5Bs	{1.5Bs,1.5Rs,2.0B,2.0R}
• For the Direct Feed mode there are four choices: • The two 1.5 arcsec modes yield R~7000 and the two 2.0 arcsec modes yield R~5000. • **1.5Rs**: An object-sky pair of 300 micron core (1.5 arcsec on sky) FIP fibers separated by about 10 arcsec. • **1.5Bs**: An object-sky pair of 300 micron core (1.5 arcsec on sky) FVP fibers separated by about 10 arcsec. • **2.0R**: A single (i.e. object only) 200 micron core (2 arcsec on sky) FIP fiber. • **2.0B**: A single (i.e. object only) 200 micron core (2 arcsec on sky) FVP fiber. • Example: `FIBER 1.5Rs`					
FIBERTARGET	Fiber Target	N	MRS	target	{sky,target}
• The MRS fiber arm has two axes of motion, so it is a very simple action to switch between the sky fiber and the object fiber. The desired fiber can be specified with this keyword. • The default is to always use the target fiber, but nodding between the two is possible. • Example: `FIBERTARGET sky`					
FILTER	Filter	N	HRS	""	{default,String}
• A filter is always used for rejecting the 2nd order of the cross disperser, and it is selected automatically. • However, this keyword enables the user to specify an (additional?) non-standard filter. • Example: `FILTER R`					
FILTER	Filter	N	LRS	Depends on GRISM setting: g1: undef g2: GG385 g3: OG515 e2: E2F none: undef	{B,V,R,I,z,GG385,OG515, GG475, E2F, none}
• For most grisms there is a default order-blocking filter, but others can be specified using this keyword. • Example: `FILTER GG475`					
FILTER	Filter	N	MRS	0	{0,1,2,3,4,5}

• **0**: For all Direct Feed exposures there is a hardwired filter. It is a Schott type OG455 for the "R" fibers and a WG305 for the "B" fibers. One should be aware that there will be XD second order overlap beyond 9000 Å for the "R" fibers. There is the potential for XD second order overlap beyond ~7500 Å for the "B" fibers depending on the blue spectral energy distribution of the target.
• There will be up to six filter options to be defined when in the LS or MOS mode:
  ○ **1**: TBD
  ○ **2**: TBD
  ○ **3**: TBD
  ○ **4**: TBD
  ○ **5**: TBD
• Example: `FILTER 3`					

PARAMETER KEYWORD	DESCRIPTION	REQ	INST	DEFAULT	ALLOWED VALUES
FLUX	Flux standard	N	all	N	{Y,N,1,2,3,4}
• Give the needed type of flux standard, according to the HET flux standard priority list. e.g. 3 for level three or better flux standards, or **Y** for any flux standard. • If no Flux standard is required, please enter **N**. • Examples: `FLUX 2` `FLUX N`					
GASCELL	Iodine Gas Cell	N	HRS	GC0	{GC0,GC1,0,1,In,Out}
• **GC0** = **0** = **Out** = don't use the iodine gas cell. • **GC1** = **1** = **In** = insert the iodine gas cell. • Examples: `GASCELL GC0` `GASCELL 1`					
GNAME	Group Name	N	all	undef	String
• Assign a name to related objects collected into a GROUP. • Group names must be unique within a given program. • Example: `GNAME JKgroup1`					
GRISM	LRS Grism	N	LRS	g1	{g1,g2,g3,e2,none}
• Specify the name of the LRS dispersing element or **none** for direct imaging. • Example: `GRISM g2`					
GTYPE	Group Type	N	all	AND	{AND,POOL,SEQ,ORD}
• Specify the relationship between the objects in a GROUP: • **AND** – Execute all tracks in the GROUP on the same night. • **POOL** – Execute NUMTODO number of tracks out of the total tracks listed in the GROUP. • **SEQ** – Execute all tracks in the GROUP on the same night in the specified sequence, with no other observations permitted in between. • **ORD** – Execute all tracks in the specified order across one or more nights, with other interleaved observations permitted. • Example: `GTYPE POOL`					
HG	Mercury Lamps	N	all	undef	{0..n}
• Number of mercury wavelength calibration lamps to be taken at the end of the night. • This number of lamps is assumed to be *in addition to* any standard calibrations or EXTRACALS. • Default exposure time for the current setup is assumed. If this is not sufficient, use EXTRACALS. • Example: `HG 2`					
INSTCONFIG	Instrument configuration	Y	all	undef	String
• Old-style instrument configuration string, included for backward compatibility. • Examples: `INSTCONFIG LRS_g2_1.5_GG385` `INSTCONFIG HRS_30k_central_316g5936_2as_0sky_IS0_GC1_2x1`					
INSTRUMENT	Short name for Instrument	N	all	undef	{HRS,MRS,LRS}
• **HRS** – High Resolution Spectrograph • **MRS** – Medium Resolution Spectrograph • **HRS** – Low Resolution Spectrograph • This keyword is required if INSTCONFIG is not supplied. • Example: `INSTRUMENT HRS`					

PARAMETER KEYWORD	DESCRIPTION	REQ	INST	DEFAULT	ALLOWED VALUES
MAG	V Magnitude of target	Y	all	undef	Real
• Example: `MAG 18.2`					
MASK	MRS Mask	N	MRS	0	{0,5.0U,15.0C,3.0C,5.5L}
• Specifies the slit height at the spectrograph input in mm in one of three positions: upper (U), center (C), lower (L) • Example: `MASK 3.0C`					
MODE	MRS Mode	N	MRS	DF	{DF,LS,MOS}
• **DF**: The direct feed model • **LS**: The Fiber synthetic long slit mode • **MOS**: The multi-object spectroscopy mode • Example: `MODE LS`					
MOSCONFIG	MOS configuration file	N	LRS	none	Filename
• Name of the MOS configuration file. • Example: `MOSCONFIG mysetup.cfg`					
MOVING	Moving Target	N	all	N	{Y,N}
• A boolean field **Y** or **N** specifying whether the target is a moving object. • Multiple sets of moving targets should be assigned a unique group name (GNAME) for each. • Each moving target entry should also include a SYN Date indicating when the coordinates apply. • If required, a AZRES entry can also be specified. • Example: `MOVING Y`					
NE	Neon Lamps	N	all	undef	{0..n}
• Number of neon wavelength calibration lamps to be taken at the end of the night. • This number of lamps is assumed to be *in addition to* any standard calibrations or EXTRACALS. • Default exposure time for the current setup is assumed. If this is not sufficient, use EXTRACALS • Example: `NE 5`					
NOTES	Program notes	N	all	""	Quoted string (quotes are only necessary if spaces are used)
• Notes that apply to all tracks, used in the COMMON section of the TSL file. • Example: `NOTES "My first visit."`					
NUMEXP	Number of Exposures	N	all	1	{1..n}
• Number of exposures to take at the given exposure time (EXP). • Cannot be used with CRSPLIT as they are mutually exclusive. • Example: `NUMEXP 4`					
NUMTODO	Number in Group to Execute	N	all	1	{1..n}
• Number of tracks to execute in a GROUP of type POOL. • Example: `NUMTODO 8`					
OBJECT	Object Name	Y	all	undef	String
• Avoid spaces, so for "NGC 3379" use NGC3379 or NGC_3379. • For MOS setups, please append "W" or "E" for West or East track. • Unique object names lead to fewer problems down the road.					

PARAMETER KEYWORD	DESCRIPTION	REQ	INST	DEFAULT	ALLOWED VALUES

• Examples: `OBJECT my_planet`
`OBJECT standard1`
`OBJECT NGC1905_W`
`OBJECT TPS0269`
`OBJECT TPS0269sky`					

OFFSET	Offset along fiber arm	N	HRS	0	Real [Arc seconds]
OFFSET	Offset along fiber arm	N	MRS	0	Real [Arc seconds]
• Allows the PI to specify a 1-d offset along fiber arm relative to the object coordinates. • Example: `OFFSET 2.75`					
OFFSETDEC	Offset in Declination	N	all	undef	Real [Arc seconds]
OFFSETRA	Offset in Right Ascension	N	all	undef	Real [Arc seconds]
• Allows the PI to specify a 2-d offset relative to the object coordinates. • Useful for blind offsets, etc. • Example: `OFFSETRA +2.75` `OFFSETDEC -5.43`					
PA	Astronomical Position Angle	N	all	par	{par, 0.1..360.0}
• Measured east from north, in degrees with at least 1 significant figure beyond the decimal point. • Use **par** for the parallactic angle or the default P.A. (Do not use 0 to request the default.) • See the Position Angle Calculator (http://het.as.utexas.edu/HET/hetweb/instruments/LRS/rho.html) for more information about PA and Azimuth restrictions. • Examples: `PA 22.5`					
PICHART	PI Finding Chart	N	all	undef	URL or multiple space-separate URLs in double quotes. URLs must include the http, https or ftp protocol prefix.
• Allows the PI to provide a URL for a finder chart for the target. Initially charts will be assumed to reside on the PI's website or ftp server, and will be retrieved automatically as part of the Phase II process. • Example: `PICHART http://puck.as.utexas.edu/HET/UT08-1/chart1a.jpg` `PICHART "ftp://data1/ChartA.jpg ftp://data1/ChartB.jpg"`					
PIPRI	PI Priority	N	all	undef	{1..n}
• Allows the PI to specify an order in which to observe her targets. • The PI priority only has meaning for objects that are clustered together closely on the sky. • Example: `PIPRI 2`					
PRI	Priority	Y	all	undef	{0..4}
• The target priority corresponding to the priority time allocation given to you by the TAC. • You may distribute your objects over the priorities assigned by the TAC, or you may "oversubscribe" your top priority. • When the TAC's assigned priority has been reached, all remaining targets will automatically receive lower priority. • Example: `PRI 1`					
PROGRAM	Program Number	Y	all	undef	String
• Program identifier in form of `IIYY-t-nnn` where:					

PARAMETER KEYWORD	DESCRIPTION	REQ	INST	DEFAULT	ALLOWED VALUES
	o II = UT, PSU, STA, M, or G o YY = the year o t = the trimester 1, 2, or 3 o nnn = the program number • NOAO programs have the form NYY[A|B]-nnnn where YY is the year, the semester is A or B, and the program number is nnnn. • Examples: PROGRAM UT01-1-001 PROGRAM PSU01-1-014 PROGRAM STA01-1-005 PROGRAM N07A-0436				
RA	Right Ascension of target	Y	all	undef	hh:mm:ss.s[s]
	• Right Ascension of target specified to at least 1/10th of a second of time. • Coordinates are assumed to be J2000, unless specified otherwise using the EQUINOX keyword. • Examples: RA 12:12:12.1 RA 12:12:12.75				
RES	HRS Resolving Power	N	HRS	60k	{15k,30k,60k,120k}
	• Example: RES 120k				
RV	Radial Velocity Standard	N	all	N	{Y,N,1,2,3,4}
	• Give the type of standard needed according to the HET Radial Velocity standard priority list. e.g. **2** for level two or better RV standards, or **Y** for any radial velocity standard. • A value of **N** requests no standard. • Specifying a value of **Y** is the same as specifying a value of **4 .** • Example: RV 3				
SEEING	Maximum Seeing	N	all	2.0	{0.9 – 5.0}
	• Expressed in arcseconds and denotes the maximum permitted image size (stack FWHM) on the sky. • Example: SEEING 2.8				
SKYBRIGHT	Sky Brightness limit	Y	all	undef	{18.0 to 20.5}
	• Please specify the highest permitted V-band sky brightness in magnitudes per square arcsec. • Values outside the range 18.0 to 20.5 will be truncated to the nearest limit. • Example: SKYBRIGHT 20.2				
SKYCALS	Sky Calibrations	N	all	N	{Y,N}
	• A boolean string **Y** or **N** indicating whether a twilight sky calibration frame is required. • The current setup is assumed. • Example: SKYCALS Y				
SKYCHOP	Object-Sky Switches	N	MRS	1	{0-9}
	• This is an integer number that specifies the number of object-sky switches to be done. • Each exposure will be the total exposure time in the Phase II exposure line divided by this number. o **1**: One exposure of specified length with object in default fiber. o **2**: If using 1.5R or 1.5B, do second exposure of specified length with object moved to sky fiber in first exposure. If using 2R or 2B, object moved off fiber for second sky-only exposure. o **3**: etc.				

PARAMETER KEYWORD	DESCRIPTION	REQ	INST	DEFAULT	ALLOWED VALUES
• Example: `SKYCHOP 5`					
SKYFIBER	Skyfibers	N	HRS	0sky	{0sky,1sky,2sky,0,1,2}
• Specify how many sky fibers are needed. • **0** = **0sky** = no sky fibers, **1** = **1sky** = 1 sky fiber, etc. • The maximum number of sky fibers that can be used without order overlap depends upon the values of **XD** and **FIBER**. The limiting wavelengths are: o * 316g and 2as: 4000+ for 0sky, 5880+ for 2sky o * 316g and 3as: 4000+ for 0sky, 5880+ for 1sky, 7100+ for 2sky o * 600g and 2as: 4000+ for 0sky, 4200+ for 2sky o * 600g and 3as: 4000+ for 0sky, 4200+ for 1sky, 5100+ for 2sky • Examples: `SKYFIBER 2sky` `SKYFIBER 0`					
SKYTRANS	Sky transmission	N	all	S	{P,S,N}
• Please specify the minimum acceptable sky transparency. • Use either **P** (photometric), **S** (spectroscopic), or **N** (not spectroscopic). • At the moment these correspond to transmissions of roughly: o **P**=100-95% transmission o **S**=95-50% transmission o **N**=<50% transmission • 95-100% should be clear with low dust count. • 50-95% should be loss of less than 1 magnitude in flux. • The current transmission will be determined from the guider flux and the DIMM flux measurements. • For **P** and **S,** exposure times will not be scaled. • For **N**, exposure times will be scaled to achieve the desired S/N but only the exposure time listed in the PI's Phase II file will be charged. • Example: `SKYTRANS P`					
SLICER	Image slicer	N	HRS	IS0	{IS0,IS1,0,1}
• **0** = **IS0** = no slicer • **1** = **IS1** = use image slicer • Available when FIBER=3as, SKYFIBERS=0sky, and RES is one of30k, 60k, or 120k. The increase in throughput versus the 3as fiber is 41%. Orders overlap depending upon XD as follows: o all 316g settings: orders overlap below 5880 Å o all 600g settings: orders overlap below 4200 Å • Examples : `SLICER IS1` `SLICER 0`					
SLIT	Slit	N	LRS	2.0	{pin,1.0,1.5,2.0,3.0,10.0,mos, none}

• Specify the LRS slit width in arcsec (or other spectrograph mode).
• Examples: `SLIT pin`
`SLIT mos`
`SLIT 2.0`					

SLIT	Slit	N	MRS	0	{0,100,200,300,600}

PARAMETER KEYWORD	DESCRIPTION	REQ	INST	DEFAULT	ALLOWED VALUES
• Specify the MRS slit width in microns. • Example: `SLIT 200`					
SNGOAL	Signal to Noise Goal	N	all	undef	Real > 0
• Specify the target signal-to-noise ratio of the observations. • Example: `SNGOAL 200`					
SNWAVE	S/N Reference Wavelength	N	all	undef	Real
• Wavelength in Angstroms at which to measure the S/N Goal. • Example: `SNWAVE 5500`					
STATUS	Object Status	N	all	""	{Hold,H,""}
• Allows the PI to submit targets as either active (blank) or on hold (**H** or **Hold**). • Example: `STATUS H`					
STDCALS	Standard Calibrations	N	all	Y	{Y,N}
• A boolean string **Y** or **N** to specify whether the standard calibration set should be taken st the end of the night.. • If **Y**, note that now any special calibrations specified elsewhere are taken in addition to the standard calibration set. This is a change in meaning from the previous usage of the standard cals question where any calibration requirements other than the standard set required an answer of no. • Special calibrations may be subject to time charge to the PI, if they consume science time. • Example: `STDCALS N`					
SYNDATE	Synoptic Date restrictions	N	all	undef	sYYYYMMDD[,sYYYYMMDD] or sYYYYMMDD-YYYYMMDD where s is <, =, or >

• For synoptic targets with visits required on or after specific UT dates.
• Format for dates should be sYYYYMMDD in UT dates, where s is either an = for only on this date, > for on or after this date, or < for before or on this day.
• Multiple specific dates should be separated by a comma with no space e.g. =20070412,=20070415. If your targets have different exposure times or Azimuth restrictions on these dates then you will have to make them separate entries.
• Date ranges may be given by using two different formats: >20070412,<20070420 or >20070412-20070420.
• Examples: `SYNDATE >20070912,<20070920`
`SYNDATE >20070912-20070920`
`SYNDATE =20071015,=20071018`					

SYNFREQ	Synoptic Frequency	N	all	undef	[RAND#-#' where #-# is an integer range such as 1-7]
• For synoptic targets the frequency of visits in days. • Use string RAND#-# for synoptic targets with random visits where the # is a number of days for a typical visit. • RAND1-7 would let us know that the targets should have between 1 to 7 days for a typical visit. • Examples: `SYNFREQ RAND1-5` `SYNFREQ RAND15-30`					
TELL	Telluric Standard	N	all	N	{Y,N}

PARAMETER KEYWORD	DESCRIPTION	REQ	INST	DEFAULT	ALLOWED VALUES
• A boolean string **Y** or **N** whether a telluric standard is required. • Example: `TELL Y`					
THAR	Thorium-Argon Lamps	N	all	undef	{0..n}
• Number of thorium-argon wavelength calibration lamps to be taken at the end of the night. • This number of lamps is assumed to be *in addition to* any standard calibrations or EXTRACALS. • Default exposure time for the current setup is assumed. If this is not sufficient, use EXTRACALS. • Example: `THAR 2`					
TYPE	Action Type	N	HRS	sci	{sci,bias,dark,calff,calNe, calHg,calXe,calCd,calAr, pfipff,pfipthar,hrsff,hrsffg, hrsthar}
• Type of exposure: either a science exposure, or one of the available calibration frames. • For HRS there is a special type of exposure, **hrsffg**, used to indicate a flat field with the gas cell in. • Examples `TYPE calNe` `TYPE sci`					
TYPE	Action Type	N	LRS	sci	{sci,bias,dark,calff,calNe, calHg,calXe,calCd,calAr, pfipff,pfipthar}
• Type of exposure: either a science exposure, or one of the available calibration frames. • Examples `TYPE calNe` `TYPE sci`					
TYPE	Action Type	N	MRS	sci	{sci,bias,dark,calff,calNe, calHg,calXe,calCd,calAr, pfipff,pfipthar}
• Type of exposure: either a science exposure, or one of the available calibration frames. • Examples `TYPE calNe` `TYPE sci`					
VISITS	Number of visits	N	all	1	{1..n}
• Number of visits to execute for a given track. • Example: `VISITS 3`					
WAVELENGTH	Central Wavelength	N	MRS	7000	Int
• Central wavelength in Angstroms for cross-disperser on CCD. • Example: `WAVELENGTH 7000`					
XD	Cross Disperser	N	HRS	316g5936	(See table below)

PARAMETER KEYWORD	DESCRIPTION	REQ	INST	DEFAULT	ALLOWED VALUES

XD

	Wavelength (Å)			Orders				Wavelength (Å)				Orders		
XD	Begin	Central	End				**XD**	Begin	Central	End			
316g4931	*3057	4931	6793	200	124	90	**600g4739**	*3751	4739	5732	163	129	106
316g4931K	*3057	4931	6793	200	124	90	**600g4739K**	*3751	4739	5732	163	129	106
316g5936	4076	5936	7838	150	103	78	**600g5271**	4275	5271	6263	143	116	97
316g6948	5095	6948	8860	120	88	69	**600g5822**	4814	5822	6793	127	105	90
316g7940	6114	7940	9861	100	77	61	**600g6302**	5316	6302	7278	115	97	84
316g8991	7109	8991	**10917	86	68	56	**600g6869**	5879	6869	7838	104	89	78
316g10022	8152	10022	**11757	76	61	52	**600g7366**	6369	7366	8375	96	83	73
316g10917	9125	**10917	**12737	67	56	48	**600g7940**	6948	7940	8861	88	77	69
							600g8375	7456	8375	9406	82	73	65
							600g8990	7940	8990	9861	77	68	62
							600g9405	8491	9405	10362	72	65	59

*HRS+HET delivers very little flux below 4000 Å
**HRS+HET delivers very little flux above 10400 Å

K suffix means an extra focus offset is used for the blue end of the spectrograph (down near the Ca II K line)

- These values set the rotation of the cross disperser to:
  - select which orders fall on the CCD
  - set how much inter-order space there is for sky fibers
- The three wavelengths given above for each value of CrossDisp are the blaze (central) wavelengths of the blue-most order, the central order that falls between the two CCDs, and the red-most order.
- The wavelengths given are for the echelle=central setting.
- The shortest wavelength observable is 400nm, set by the filter for rejecting the 2nd order of the cross disperser, and by the HRS image quality (as specified and designed).
- The longest wavelength observable is approximately 1050nm due to the drop in the CCD quantum efficiency.
- The central wavelength of any order can be calculated from any other order of known central wavelength and order number (e.g. those in the table) by using the relationship:
  - lambda * order = constant
- e.g. for 316g4931, where lambda=4931 and order=124, the central wavelength of order 150 is (4931*124)/150=4076.
- The spectral coverage of a given order (its FSR or Free Spectral Range) is lambda/order number. eg. 316g4931: for order 124, lambda=4931 so FSR=39.8 Å.
- A filter is always used for rejecting the 2nd order of the cross disperser, and it is selected automatically.
- Example: `XD 600g5822`

XD	Cross Disperser	N	MRS	220	220 is currently the only available setting

- **220**: The 220 line/mm cross-disperser grating, blazed at 5900Å.
- **600**: The 600 line/mm cross-disperser grating, blazed at 6500Å.
- **900**: The 900 line/mm cross-disperser grating, blazed at 5150Å.
- **1200**: The 1200 line/mm cross-disperser grating, blazed at 5600Å.
- Example: `XD 220`

PARAMETER KEYWORD	DESCRIPTION	REQ	INST	DEFAULT	ALLOWED VALUES
XE	Xenon Lamps	N	all	undef	{0..n}
• Number of xenon wavelength calibration lamps to be taken at the end of the night. • This number of lamps is assumed to be *in addition to* any standard calibrations or EXTRACALS. • Default exposure time for the current setup is assumed. If this is not sufficient, use EXTRACALS. • Example: `XE 3`					