

StarCat

IRTF Star Catalog Application

User's Guide v2606

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1. What is STARCAT?

The STARCAT software is a tool used to search star catalog files. Its 2 main functions are to provide Main Catalogs and manage the User List:

Main Catalog – There are numerous standard astronomical catalog available. User can specify a search coordinates and starcat will search the indicated catalogs and list the nearby stars.

User List – User can load their object list (a text file of objects) into the user list window.

Starcat can send slew request to the TCS using these catalogs lists, and query the TCS for its position for new search coordinate. These catalog lists can be viewed in a variety of formats, and sorted based on different fields. Starcat calculates the observed positional information on all listed objects. Is also display a diagram of the sky showing where the stars are located related to the IRTF's view of view.

If you have questions or comments concerning STARCAT, you may contact the IRTF. The starcat home page is at <http://irtfweb.ifa.hawaii.edu/~tcs3/related/starcat/>.

The current version of starcat is StarCat4

2. Setting up your user account

When STARCAT starts up, it read the file `~/.starcat-init` in your home directory. Using a text edit, you can customized STARCAT using commands from Appendix A. For example, the file may contain the following instructions to set the search radius, and load the user catalog from the user's home directory.

If this file exist, STARCAT expects it to contain STARCAT commands. See the STARCAT Command Dictionary for the syntax. Using a text editor you can place instructions in this file to configure when STARCAT starts up. Here an example of a `.starcat-init` file:

```
guider none
mainsort Ang.Offset
catalog.clear
catalog.set nomad
SkyMap.ShowFelix on
```

3. Starting STARCAT

STARCAT is installed in all IRTF observing workstation. Type 'starcat' on your terminal start it. Many observing desktop may have a STARCAT icon for you to use.

When starcat starts, this window should appear on your screen:

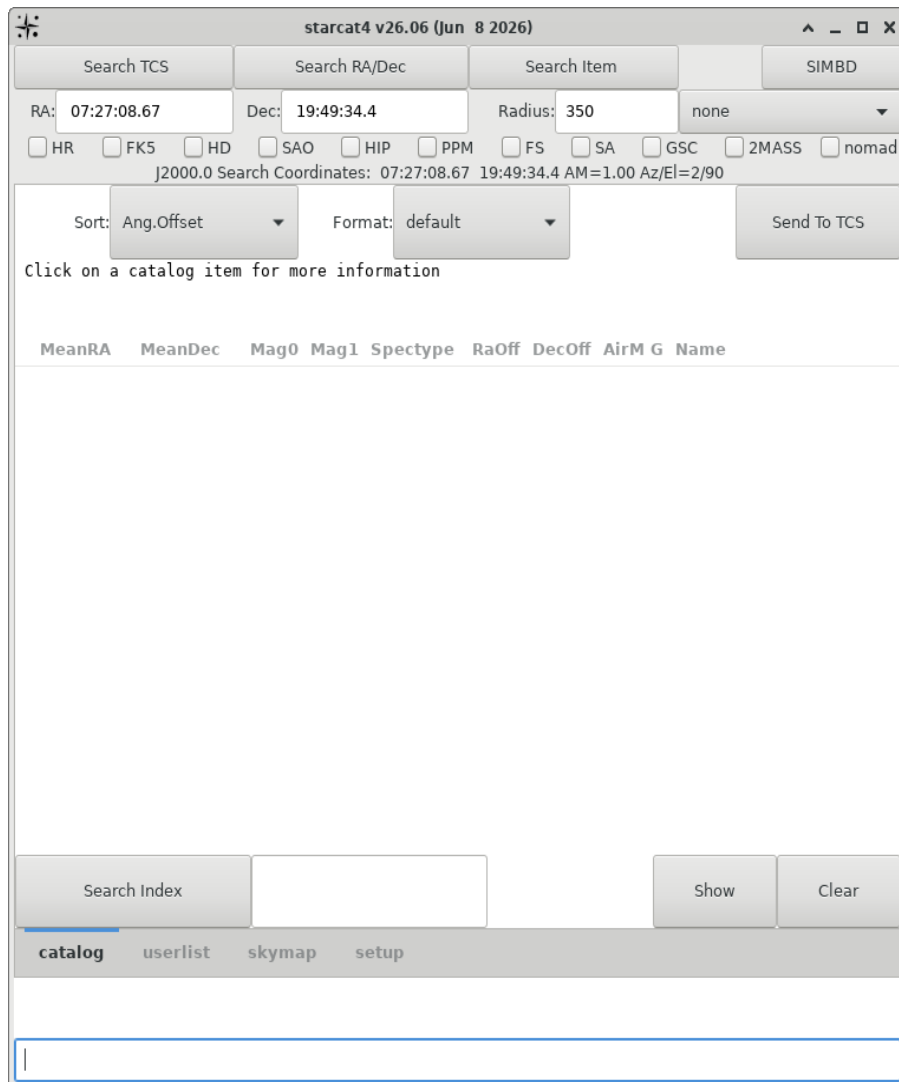


Figure 3.1 – The Base Window

4. Main Catalogs Search Options

These widgets allows you to search the Main Catalogs (HR, FK5, HD, ..) for data.

First select the catalog you wish to search, and insure the Radius is correct. You have 3 options as indicated by the 3 search buttons:

Search TCS – Starcat will query the TCS, update the RA/DEC field with the TCS's position, and perform a search on this position.

Search RA/DEC – First enter the coordinates in the RA/DEC text fields. Press this button to search the entered RA/DEC position.

Search Item - if you have catalog data loaded in the Main or User catalog list. You can highlight an entry and use that position as your search position. After highlighting a catalog entry, click the **Search Item** button.

The **SIMBAD** button will bring up the SIMBAD Query Dialog Window. This feature is explained in Section 8.

Below the list of star is **Search Index**.

Enter the Numeric ID for the star to find a particular star, for example, to find SAO_45859 enter 45859. For SA stars, the enter 4 digit for each NNN-NNN part, ie SA-35-535 would be "00350535". GSC, 2MASS, and NOMAD are not supported.

4.1 About the Radius Parameter

Search will look for star at the FK5 J2000.0 search coordinates. Stars within the search radius will be placed in the main catalog. The Radius has 2 widget associated with it. The text field and pull down menu.

The pull down menu has selection which determine is the radius is automatically. The options are:

Off-axis – The radius is set to the field of view of the off-axis camera (350 arcseconds).

None – When set to none, the radius is set to the minimum suggest value of all the selected catalogs. The minimum values are:

HR	18000 arcseconds or 5 degs
FK5	36000 arcseconds or 10 degs
HD	2500 arcseconds, or 0.7 degs
SAO	3600 arcseconds, or 1 degs
HIP	7200 arcseconds, or 2 degs
PPM	7200 arcseconds, or 2 degs
FS	108000 arcseconds, or 30 degs
SA	36000 arcseconds, or 10 degs

GSC	540 arcseconds, or 0.15 degs
2MASS	900 arcseconds, or 0.25 degs
nomad	350 arcseconds (offaxis guider FOV).

5. Main Catalog Display options

Clicking on the **Catalog** tab will display the Main Catalog Panel.

Sort: Ang.Offset
Format: default
Send To TCS

RA/Dec= 11:59:24.33 19:33:26.7 PM=(-37.32 -11.82)mas/yr Mag: 9.5V 8.8J 8.5K 0.0-
 HA= -04:18:29.21 AirM=2.023 AltAz=(29.5, 78.4) SpecType:
 Identifier: SA0_99896

MeanRA	MeanDec	Mag0	Mag1	Spectype	RaOff	DecOff	AirM	G	Name
11:59:24.3	19:33:26.7	9.5V	8.8J		-503as	-968as	2.023		SA0_99896
12:00:04.7	19:25:09.8	6.9V	2.7J	K7	+66.3as	-1465as	2.034		SA0_99901
12:01:53.0	19:44:59.4	9.8V	0.0-	G2	+1594as	-275as	2.056		SA0_82107
12:01:11.4	20:17:56.0	9.6V	8.8J	F6	+1007as	+1702as	2.038		SA0_82103
11:57:28.9	19:59:02.0	8.1V	6.6J	G5V	-2132as	+568as	1.990		SA0_82073
12:02:26.6	20:07:22.8	9.8V	8.7J	G2	+2069as	+1068as	2.059		SA0_82111
12:01:27.0	19:10:56.5	9.8V	8.7J	F5	+1227as	-2318as	2.057		SA0_99912
12:02:22.6	19:16:26.0	9.1V	8.4J		+2012as	-1988as	2.070		SA0_99917
12:00:24.5	20:44:46.9	9.4V	8.3J	G0	+346as	+3312as	2.021		SA0_82095
12:03:49.8	19:23:02.0	8.8V	7.7J	F9V	+3243as	-1592as	2.090		SA0_99926
12:02:20.6	20:47:27.7	9.7V	8.6J	G0	+1983as	+3473as	2.049		SA0_82109

Search IndexShow
Clear

catalog
userlist
skymap
setup

This tab displays the search results from the main catalogs. When you select a star from the list, more detailed information about his object is displayed just about the list. Using you mouse you can highlight/copy information for input into other applications (ie, SIMBAD data searches).

- Sort** menu – Specifies the sort field for the object list.
- Format** menu – Specifies the text format for the object list.
- Sent To TCS** button – Sends the highlighted object’s coordinates to the TCS
- Show** button – prints the list to standard output.
- Clear** button – clears the object in the main catalog list.

6. User List

Clicking on the **Userlist** tab will display the User List Panel.

The screenshot shows the User List Panel interface. At the top, there are two dropdown menus: 'Sort:' set to 'Index' and 'Format:' set to 'default'. To the right is a 'Send To TCS' button. Below these are several lines of text providing object details: 'RADec= 14:59:28.00 20:22:16.0 PM=(15.75 -9.00)mas/yr Mag: 8.6V 6.4J 5.6K 0.0-', 'HA= -07:14:15.37 AirM=15.000 AltAz=(0.0, 0.0) SpecType: K0', and 'Identifier: HD_132599'. A table with two rows of object data is displayed. The first row is highlighted in blue. Below the table are four buttons: 'User Load', a text input field containing 'userlist_v3.txt', 'Show', and 'Clear'. At the bottom, a navigation bar contains tabs for 'catalog', 'userlist', 'skymap', and 'setup', with 'userlist' being the active tab.

MeanRA	MeanDec	Mag0	Mag1	Spectype	RaOff	DecOff	AirM	G	Name
14:59:28.0	20:22:16.0	8.6V	6.4J	K0	+42deg	+1962as	15.000		HD_132599
23:31:01.8	-00:35:45.6	8.4V	5.7J	K2	+163deg	-20deg	15.000		HD_221307

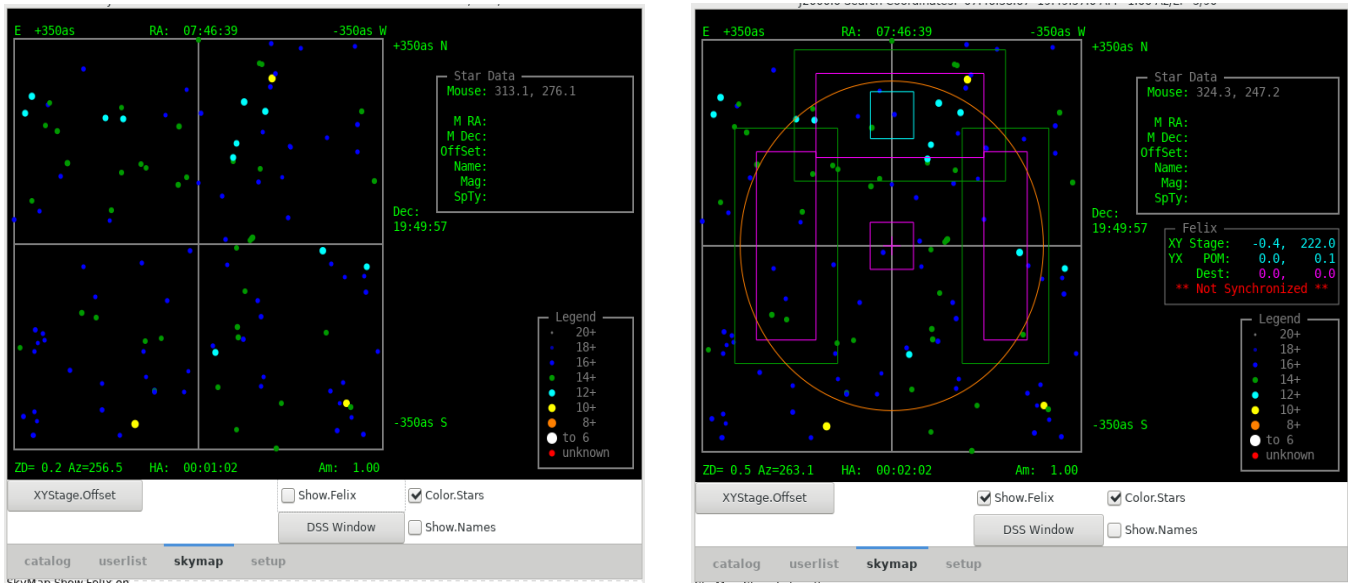
6.1 How to load your object list:

Enter the name of your user list file (the example shows userlist_v3.txt).
 Select the **Load** button.

6.2 Other User List functions:

- Sort** menu – Specifies the sort field for the object list.
- Format** menu – Specifies the text format for the object list.
- SentToTCS** button – Sends the highlighted object's coordinates to the TCS.
- Show** button – prints the list to standard output.
- Clear** button – clears the object in the main catalog list.

7. SkyMap Panel



Skymap with Show.Felix Off and ON

Clicking on the **SkyMap** tab will present the skymap panel. The SkyMap displays a drawing of the main catalog stars centered on the search coordinates.

The **Star Data** box on the left will display relevant data based on the mouse cursor position. When positioned on a star, details of the star is displayed.

The **Legend** box at the left of the coordinate system displays the current magnitude legend. This legend can be used to visually estimate the magnitude of stars shown in the skymap.

ColorsStars – this checkbox switches the legend from a grayscale to a colored scale.

ShowName – When checked, the names of the stars are display in the starmap.

DSS Window – Pressing the DSS Window button will instruct stacat to download a DSS image and display in it a dialog window. This DSS FOV is fixed at 12 arcmin, it is intended to display the star within the smokey offaxis guiding area to help the TO select an offaxis guide star. *Note: It may take from 5 to 10 seconds for the DSS window to appear or update, as the image are queried from the DSS server.*

Note: Controlling the **XYStage** should only be done by the Telescope Operator.

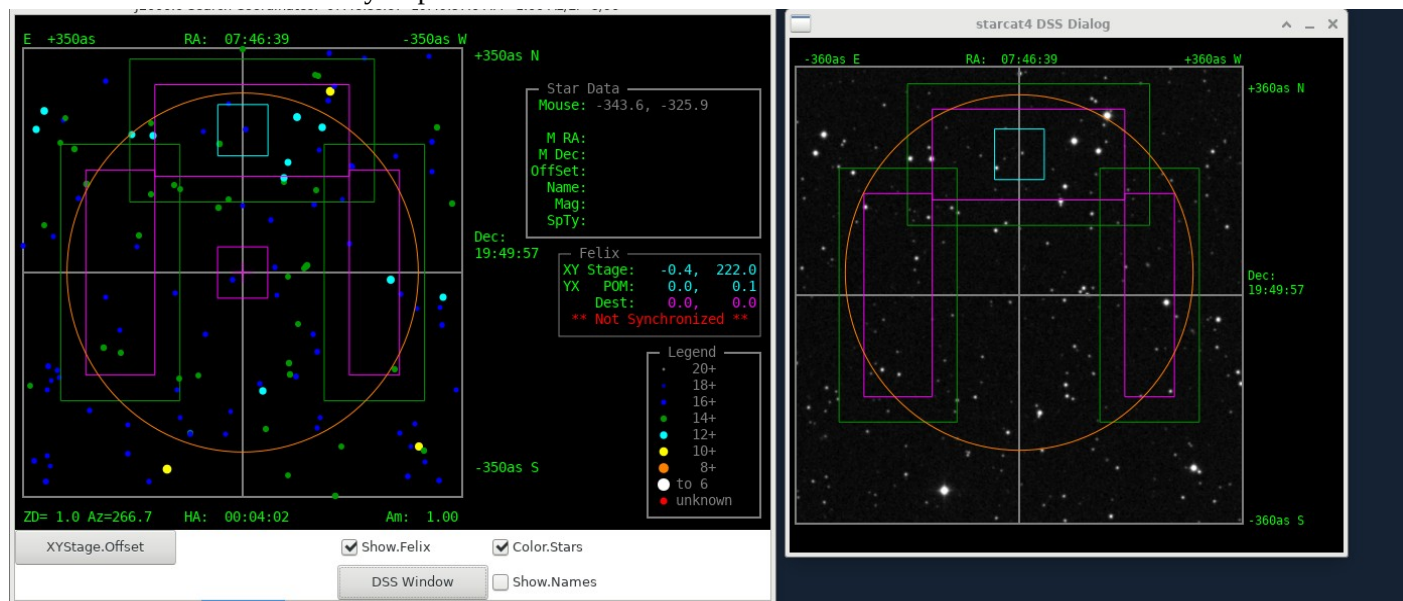
If **ShowSmokey** is enabled, the **Smokey** box (center-right) will display information relevant to the x-y stage and the POM. The **XYstage** and **POM** fields display the positions of x-y stage and POM, respectively. The cyan box show the current located of the smokey's mirror/POM. Clicking on the mouse will move the Magenta "+". This "+" show the destination for the POM with the **XYState.offset** button is pressed.

XYStage.offset – Move the x-y stage to the destination RA and DEC.

POMSync – Toggle whether the POM should sync with the XYStage when moved.

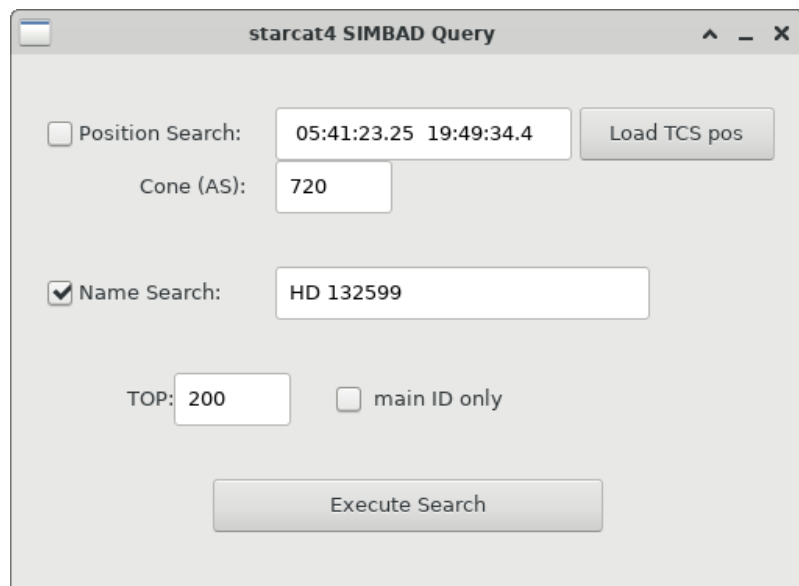
ShowSmokey – Toggle advanced Smokey controls.

Here is a screen shot of the SkyMap and DSS window.



8. SIMBAD Dialog Window

Clicking on the SIMBAD button brings up the following SIMBAD Query dialog:



The screenshot shows a dialog window titled "starcat4 SIMBAD Query". It contains the following elements:

- Position Search: 05:41:23.25 19:49:34.4 (with a "Load TCS pos" button)
- Cone (AS): 720
- Name Search: HD 132599
- TOP: 200 main ID only
- Execute Search button

This dialog enables you to execute a SIMBAD search. The results will be loaded main catalog list.

Check the **Position Search** checkbox to search a location (RA, DEC entry to the right). Type in your position, or use the **Load TCS pos** button to load the TCS position. The **Cone AS** entry specifies the area around the RA,DEC position to search.

Check the **Name Search** checkbox to search for a name. You must use the proper SIMBAD name. Starcat will try to help with spacing and upper case on some names before submitting the query.

In the name search the '%' character acts as a wild card.

TOP will limits the matches. Upper value is 800.

Main ID only, if checked, will limit the search to SIMBAD's BASIC database only. Enable this for position searches so you don't get duplicate name for a star. Normally off for Name Search as the name could be an alternate name for a star. The basic or mainID name is usually the 1st catalog to identity the star.

Once you specified your inputs, select the **Execute Search** button to do the query.

Link to SIMBAD Catalog: <https://simbad.cds.unistra.fr/simbad/>

9. Setup Panel

Clicking on the **setup** tap will present the setup panel. This panel simply displays the value of some starcat parameters and variables.

```

j2000.0 Search Coordinates: 07:46:38.67 19:49:57.0 RA=188 Az/El=5/89
Time Information
  UTC          Local          GMST          LAST
01:05:38     15:05:38     18:15:20     07:53:27
2026/06/09   2026/06/08

Search Position
  RA          DEC          HA          Az/El    AirMass    Radius    Guider
ICRS 07:46:38.67 19:49:57.0 00:05:02    5/89     1.00      350      none

Setup Information
Elevation      4168.0                      SkyMap.ShowFelix  on
rHumidity      0.10                       SkyMap.ShowNames  off
Lapse         0.00650                     SkyMap.ColorStars on
Latitude      19:49:34.39
Longitude     -155:28:19.20      Update.Period 60
Pressure      650.0               TCS.Hostname t1
TempK         273.0              Guider.Hostname felix
WaveLength    0.55

Catalog Information
Idx Name      Radius  Enable RA_path
0 HR          18000  0      /starcatalogs4/hr.catalog.ra
1 FK5         36000  0      /starcatalogs4/fk5.catalog.ra
2 HD          2500   1      /starcatalogs4/hd.catalog.ra
3 SAO         3600   0      /starcatalogs4/sao.catalog.ra
4 HIP         7200   0      /starcatalogs4/hip.catalog.ra
5 PPM         7200   0      /starcatalogs4/ppm.catalog.ra
6 FS          108000 0      /starcatalogs4/fs.catalog.ra
7 SA          36000  0      /starcatalogs4/sa.catalog.ra
8 GSC         540    0      /starcatalogs4/gsc.catalog.ra
9 2MASS      900    0      /starcatalogs4/2mass.catalog.ra
NOMAD: Mag.limit=18.0 enable=1 root=/starcatalogs4/nomad

starcata4 Version v26.06. Compiled on Jun  8 2026. Gtk+ 3.22.30
Window: 750x568 Font:8.0x16.0 Text: 93x35

catalog  userlist  skymap  setup
  
```

10. Userlist v3

10.1 The Userlist v3 text format

The user list version 3 is the only supported userlist format as of the 2023A semester. Previous userlist formats known as new(v2), and old (v1) are not supported.

The userlist is a text file. Each line describes an object. The column data is sparated by white spaces (any combination of spaces and tabs). Lines beginning with '#' are comment lines.

Column	Name	Description
1	Index	Numeric index of catalog
2	Name	Name as a string , max 30 chars (no blanks)
3	Right Ascension	hh:mm:ss.ss in ICRS coordinates.
4	Declination	dd:mm:ss.ss in ICRS coordinates.
5	RA Proper Motion	s.ss in milli-arcseconds/year. Use 0.0 if not known
6	Dec Proper Motion	s.ss in milli-arcseconds/year. Use 0.0 if not known
7	Spectra Type	7 chars max. Use 'n/a' if not known
8,9	Mag[0] value & type	m.m c. Use '0.0 -' if not known.
10,11	Mag[1] value & type	
12,13	Mag[2] value & type	
14,15	Mag[3] value & type	

Here is an example:

```
#
#Index _____Name_____  __ICRS_RA__  __ICRS_DEC__  RA_PM  Dec_PM  __ST__  Magn_0  Magn_1  Mang_2  Mang_3
#   30 chars max, no spaces  hh:mm:ss.ss  +dd:mm:ss.s  mas/y  mas/y  (7chars)  xx.x V  xx.x C  xx.x C  xx.x C
1   HD_132599                14:59:28.00  20:22:16.0  15.75  -9.00   K0      8.6 V  6.4 J  5.6 K
2   HD_221307                23:31:01.82 -00:35:45.6  13.05  -5.80   K2      8.4 V  5.7 J  4.7 K
```

10.2 The Userlist FAQ

How do I convert the 'new' format to this v3?

- Only convert object with epoch=2000 (FK5). Object with epoch of 1950 (FK4) should be updated with IRCS coordinates, or removed.
- Column 5, Epoch, can be removed. The v3 format use ICRS coordinates, so the epoch field is not needed.
- Proper motion values should be conveted to mas/yr.
 - To conver RA seconds /year to mas/yr: multiply by 15000. IE: 0.00105 * 15000 = 15.75
 - To convert Dec arcseconds/year to mas/yr: multiply by 1000. IE: -0.009 * 1000 = -9.00

Here is an example line of the new format (top), and the v3 format

New format:

```
#Index Name _____  __RA__  __DEC__  _Epoch_  RaPM  DecPM  __ST__  Magn_0  Magn_1  Mang_2
Mang_3
1   HD_132599  14:59:28.00  20:22:16.0  2000.0  0.00105  -0.009  K0      8.6 V  6.4 J  5.6 K
```

V3 Fomat:

#Index	Name	_ICRS_RA_	_ICRS_DEC_	RA_PM	Dec_PM	__ST__	Magn_0	Magn_1	Mang_2	Mang_3
#	30 chars max, no spaces	hh:mm:ss.ss	+dd:mm:ss.s	mas/y	mas/y	(7chars)	xx.x V	xx.x C	xx.x C	xx.x C
1	HD_132599	14:59:28.00	20:22:16.0	15.75	-9.00	K0	8.6 V	6.4 J	5.6 K	

What if I still have my 'new' format when I started observing?

The new format can still be read into starcat, but you have to enter this command on the command widget. Type:

```
userload.v2 userlist.txt
```

You should use the 'Print' button to display your list in the v3 format to stdout (terminal window). This way you will have a copy in the new format going forward. Starcat only prints FK5 objects. The userload.v2 command will be removed in future version of starcat.

Appendix A – Dictionary of Commands

This section describes the command set for STARCAT. Command can be type into the command widget (located on the bottom of the main GUI).

For the syntax, the following conventions are used:

Normal *Courier* fonts must be typed as showed.

Italic Courier fonts represent choices or values to be determined by the user.

These are further explained under the Range. Some examples:

{off|on} – represent a list of choice. You must select one.

[value] – the *[]* represent an optional parameter.

Catalog.set – Sets the toggle for a catalog by name.

Syntax `Catalog.set catalog_name { off | on }`

Range `catalog_name - { HR | FK5 | HD | SAO | HIP | PPM | FS | SA | GSC | 2MASS }`

Example `Catalog.set fk5 ON`

DSS – The DSS command invokes the download and display of the Digital Sky Survey image, and update the DSS window.

Syntax `DSS`

Example `DSS`

Guider – Tells starcat what guider is used. The guider affects the default search radius and the skymap range.

Syntax `Guider { none | off-axis }`

Range `none` – The radius is the largest value from the selected catalogs. See the catalog list in the setup tab.

`off-axis` – The default range is 250.

Example `guider off-axis`

Load – Specifies the parameters for the search position.

Syntax `Load ra dec [eqx] [epoch] [pm_ra] [pm_dec]`

Range `ra` – Right Ascension (Time format)

`Dec` – Declination (degrees)

`Eqx` – equinox. Default is 2000

`Epoch` – Epoch. Default is equinox value.

`Rapm` – RA proper motion in as/yr. Default is 0.

`Decpm` – Dec proper motion in as/yr. Default is 0.

Example `Load 20:34:23.4 19:49:34.39`

Main.Clear – clears the main catalog of data.

Syntax `Main.Clear`

Example `Main.Clear`

Main.Format – Specifies the data format for the main catalog.

Syntax `Main.Format { Default | Obs | Mag }`
 Range `Default` – The default data format
`Obs` – Data format highlighting observed position information.
`Mag` – Data format highlighting magnitude information.
 Example `Main.Format Obs`

Main.Search.ID – Searches the catalog to find a record with a matching ID value.

Syntax `Main.Search.ID ID`
 Range `ID` – A positive integer.
 Example `Main.Search.Id 5331`

Main.Search.RADEC – Searches the selected catalogs using the provided RA and Dec (J2000).

Syntax `Main.Search.RADEC RA Dec`
 Range `RA` – Right Ascension in HH:MM:SS.S
`Dec` – Declination in DD:MM:SS.S
 Example `Main.Search.RaDec 14:00:00.0 19:49:34.4`

Main.Send.To.TCS – Sent the selected item in the catalog list to the TCS's Next buffer.

Syntax `Main.Send.To.TCS`
 Example `Main.Send.To.TCS`

Main.Search.TCS – Loads the TCS coordinates in the RA, Dec fields and does a Main.Search.RADEC.

Syntax `Main.Search.TCS`
 Example `Main.Search.TCS`

Main.Sort – Specifies the sorting for the catalog.

Syntax `Main.Sort { Index | RA | Dec | Mag | Ang.Offset | RA.Offset | Dec.Offset |
 Airmass | Name | HA | Alt | Azi }`
 Example `Main.Sort Index`

NOMAD.Mag.Limit – Specifies the magnitude limit for the NOMAD catalog when doing NOMAD searches.

Syntax `NOMAD.mag.limit Mag`
 Range `Mag` – Range is 0 to 29.
 Example `NOMAD.Mag.Limit 18`

POM.Get.Offset – Retrieves the POM offset from Felix. Felix's POM offset is display in the SkyMap.

Syntax `POM.Get.Offset`
 Example `POM.Get.Offset`

Quit – Exits the application.

Syntax `Quit`

Example Quit

Radius – Sets the search box size. The number given is the “radius” of the box.

Syntax Radius *value*

Range Value – radius in arcseconds. 1.0 to 126000 AS. (That's 35 degrees).

Example radius 400

Set.Timer – Sets the application's timer period which controls it's refresh rate.

Syntax Set.Timer *ms*

Range ms – Time in milisecond. Rnge is 100 to 2000. Default is 1000.

Example Set.Timer 1000

SkyMap.ColorStars – If ON uses color for display skymap stars. If OFF, a gray scale is used.

Syntax SkyMap.ColorStars { *off* | *on* }

Range off – Use gray scale.

On – Use color scale.

Example SkyMap.ColorStars on

SkyMap.show.felix – Indicate if the skmap show the guide area for Felix.

Syntax SkyMap.show.felix { *off* | *on* }

Range off – Do not display the guider guide area.

On – Show the guide are as green boxes.

Example SkyMap.show.felix on

SkyMap.showNames – Indicate if the star name are displayed on the map.

Syntax SkyMap.showNames { *off* | *on* }

Range off – Do not display names.

On – Display the names.

Example SkyMap.showNames on

Update.Period– Indicate the period when the catalog observed positions are updated (lists are refreshed).

Syntax Update.Period *sec*

Range sec – Update period in seconds.

Update.Time – Updates the time information. This command is automatically execute every second by the starcat application.

Syntax Update.Time

Example Update.Time

User.Clear – Clears the user's catalog list from the user catalog display area.

Syntax User.Clear

UserFormat – Specifies the data format for the user list.

Syntax `User.Format { Default | Obs | Mag }`
 Range Default – The default data format
 Obs – Data format highlighting observed position information.
 Mag – Data format highlighting magnitude information.

Example `User.Format Obs`

User.Load – Loads the user's catalog file into the user catalog display area. Only userlist v3 format is supported.

Range `Filename` – the user's catalog list file.

Syntax `User.Load filename`

Range `Filename` – The userlist catalog's filename.

Example `User.Load Userlist_v3.txt`

User.Sent.To.TCS – Issues a NEXXT command to the TCS using the coordinates from the selected entry in the UserCatalog.

Syntax `User.Sent.To.TCS`

Example `User.Sent.To.TCS`

User.Show – Prints the user catalog to stdout (the terminal window) as displayed in the user list area

Syntax `User.Show`

Example `User.Show`

User.Sort – Indicated the sort field for the UserCatalog.

Syntax `User.Sort { Index | RA | Dec | Mag | Ang.Offset | RA.Offset | Dec.Offset | Airmass | Name
 | HA | Alt | Azi }`

Example `User.Sort RA`

XYStage.Get.Offset – Retrieves the XY Stage position from off-axis guider (felix).

Syntax `XYStage.Get.Offset`

Example `XYStage.Get.Offset`

XYStage.Offset – Ask the offaxis guider to move the x-y stage to the specified RA, DEC position.

Syntax `XYStage.Offset ra dec`

Range

Example `XYStage.Offset 64.0 32.25`

Appendix B – Depreciated UserList Formats

As of the 2023A (Feb 2023) the format known are 'old' and 'new' are no longer supported. Observers should used the v3 userlist format. The old format is documented here for historical purposes.

9.1 New_Format – Starcat2 to Starcat4 v2109.

This is the text file format for importing user's list. Each line describes an object. The column data is separated a white space (any combination of spaces and tabs).

Column	Name	Description
1	Index	Numeric index of catalog
2	Name	Name as a string , max 30 chars (no blanks)
3	Right Ascension	hh:mm:ss.ss
4	Declination	dd:mm:ss.ss
5	Epoch/Equinox	1950.0 assumes FK4. Otherwise FK5. Default to 2000.0
6	RA Proper Motion	s.ssss in seconds of time/year. Defaults to 0.
7	Dec Proper Motion	a.aaaa in second of arc/year. Defaults to 0
8	Spectra Type	7 chars max. Defaults to 'n/a'
9,10	Mag[0] value & type	m.mmm c. Default to '0' and '-' if not given.
11,12	Mag[1] value & type	
13,14	Mag[2] value & type	
15,16	Mag[3] value & type	

Lines beginning with '#' are comment lines.

Here is an example:

```
#
#Index Name_____  ___RA___  ___DEC___  _Epoch_ RaPM DecPM  __ST__  Magn_0  Magn_1  Mang_2  Mang_3
#
  1  IRTF-1      00:02:45.93  35:48:55.86  2000.0  0.00 -0.00  A0      7.30 V  99.90 P  0.00 x  0.00 x
  2  IRTF-2      00:15:57.26  04:15:03.75  2000.0  0.00 -0.02  A0      7.00 V  99.90 P  0.00 x  0.00 x
  3  IRTF-3      00:30:02.36 -03:57:26.35  2000.0  0.00 -0.01  K5      6.00 V  99.90 P  0.00 x  0.00 x
  4  IRTF-4      00:31:18.42 -43:36:24.78  2000.0 -0.00 -0.02  A2      7.50 V  99.90 P  0.00 x  0.00 x
```

9.2 Old_Format

This older format is the text format using by previous xstarcat and starcat version 1. Each line describes an object. The column data is separated a white space (any combination of spaces and tabs).

Column	Name	Description
1	Name	Name of object (no blanks allowed)
2	Right Ascension	hh:mm:ss.ss
3	Declination	dd:mm:ss.ss
4	RA Proper Motion	s.ssss in seconds of time/year.

5	Dec Proper Motion	a.aaaa in second of arc/year
6	Magnitude	m.mmm
7	Epoch	eeee.e . Equinox of 2000.0 is assumed.

Lines beginning with '#' are comment lines.

Here is an example:

```
#name      RA          DEC          paRA  pmDec  Mag  epoch
IRTF-1  00:02:45.93  35:48:55.86  0.00   0.00  7.30  2000
IRTF-2  00:15:57.26  04:15:03.75  0.00   0.00  7.00  2000
IRTF-5  00:32:49.08  28:16:49.08  0.00   0.00  6.40  2000
IRTF-6  00:33:39.52  20:26:02.36  0.00   0.00  7.60  2000
IRTF-7  01:09:43.94  35:37:13.93  0.00   0.01  2.40  2000
```