Lichtenknecker-Database of the BAV

**Collection of Times of Minima of
Eclipsing Binaries**

Bundesdeutsche Arbeitsgemeinschaft für Veränderliche Sterne e.V. (BAV)

Contents

1   Introduction

This collection of times of minima of eclipsing binaries was started at the end of the seventies of last century by Dieter Lichtenknecker. This meant a tremendous research of the corresponding literature in lots of libraries, as well as a laborious electronic recording with the simple computers of that time. After the death of Dieter Lichtenknecker in 1990, his work was carefully continued by Franz Agerer until 2005.

At present the database is administered by Frank Walter (lkdb@bav-astro.de). Please send your questions, error messages, or proposals for improvements to him.

To honour the initiator of this data-collection it is called the "**Lichtenknecker-Database of the BAV**". The database was made available to astronomical scientists and interested amateurs in April 2004 via CD-ROM (Rev. 1.0). Since the publication of revision 3.0 in January 2007 the Lichtenknecker Database of the BAV (abbreviated below with LkDB) is available to all interested professional and amateur astronomers through the World Wide Web.

Rev. 5.1, April 2014

Rev. 5.1 contains only an update of data (more stars, more minima). There are no changes of the user interface or the functionality.

- The LkDB now contains 21342 eclipsing variable stars with 178887 times of minimum (TOM).

- The most important sources for new data are

IBVS	Information Bulletin on Variable Stars
	Rev. 5.1 contains all data of IBVS up to No. 6095
	as far as they concern TOM for eclipsing binaries.
AAVSO	Observed Minima Timings of Eclipsing Binaries No. 01 – No. 12 and
	Journal of the AAVSO up to Vol. 41
VSOLJ	Variable Star Bulletin No. 33 – No. 56
OEJV	Open European Journal on Variable Stars up to No. 160

    New eclipsing binaries are:

    CL Ari, EX CVn, WW CMa, GG Cep and V404 Gem.

Munich, July 2015
Frank Walter, Joachim Hübscher, Wolfgang Grimm

2 The „Lichtenknecker-Database of the BAV" - an Overview

The Lichtenknecker-Database of the BAV (LkDB) contains only data of eclipsing binaries – in the meantime more than 173.000 observed times of minima of more than 2.100 stars. The exact number can be found on the starting page of the (O-C)-Generator of the LkDB.

Some statistical evaluations of the minima stored in the LkDB according to several criteria may be made with the page "Statistical interpretation". For more see chapter 4.1.

The data were collected and compiled from a variety of bibliographical sources all over the world. We estimate that especially the historical data are nearly complete. On the one hand, minima are collected that result from the analysis of observational runs with light electric photometer, CCD-cameras, series of photographic pictures or visual observations. In addition reports about weak images on photographic plates are included, although these are no minimum in the proper meaning.

The criteria for an inclusion of eclipsing binaries into the database are a magnitude not fainter than 13mag during maximum light and a declination north of −20 degree. There is no limit regarding the amplitude of the change of light or period.

Due to the increasing use of CCD-cameras in the recent years also fainter objects were included into the database if more than one minimum was published.

For Algol (Beta Persei) a lot of minima are published since his early discovery. Until now, only a few of them were included into the database.

The database contains only results of stars which have been confirmed and officially named as variable. Thus it may happen that earlier observations, which were published under a preliminary designation, are still not included into the database.

Attached to the Lichtenknecker-Database is a library – the real knowledge base – which contains nearly all source-texts of the corresponding references mentioned within the database. Usually, the sources were photocopied out of the original publications. Meanwhile, the library extends over 25 meters of documents. The BAV will try to publish this library on digital media later.

The times of minima and the abbreviations for observing technique, literature and observer have been entered as carefully as possible. On the other hand they only have been checked roughly for errors and consistency. Thus the data should be used carefully and watched critically, especially whenever a result deviates significantly from the trend of the (O-C)-diagram.

The BAV will always be happy to answer questions regarding the database and its applications. Please feel free to contact the administrator through the following E-Mail-address lkdb@bav-astro.de

3   The (O-C)-Generator

3.1   How to start the (O-C)-Generator

There are different ways to start the (O-C)-Generator.

On the one hand there is a item "Lichtenknecker Database of the BAV" in the main menu on the starting page with the sub point "(O-C)-Generator". However it is possible to call the generator from several other menus e.g. "Service for Scientists". Additionally the generator can be started directly by using the address "www.bav-astro.de/LkDB/index.php?lang=en&sprache_dial=en".

After the call you will see the starting window like in picture 1. It contains short explanation about the contents and extent of the LkDB plus links to further information e.g. this documentation.

(O-C)-Generator for the Lichtenknecker-Database of the BAV

The **Lichtenkecker-Database of the BAV** (LkDB) is the collection of 173073 minima of 2113 eclipsing binaries. With the exception of some stars, they all are in normal light brighter than mag 13 and have a declination δ >= -20°.

Detailed information about the LkDB, the history of the LkDB as well to Dieter Lichtenknecker can be found in the documentation.

This is revision 5.0 of the LkDB with a completely revised (O-C)-Generator.

Quick overview about the changes and novelties.

Through the menu-entry "Statistical interpretation" the stored minima can be evaluated according to several criteria (For more information see there).

Name of the variable (e.g. RT And):   **Quick help for usage**

The choices for the range of date and the method of observation can be found on the page of the (O-C)-diagram.

| Select a Constellation | Generate (O-C)-Diagram | Reset Input |

Last revision: 7.4.2013 (Rev 5.0)

Picture 1: Starting window of the (O-C)-Generator

The information about the number of minima and stars depends on the actual version and may differ from the illustration above.

If the cursor is positioned on the text **"Quick overview about the changes and novelties"**, a window is overlayed, in which the changes and novelties are summarized (similar to "Quick help for usage" described in the next sentence).

A short description of the input options is shown, if the mouse-pointer is positioned on **"Quick help for usage"** (see picture 2).

The selection of the star, for which the (O-C)-diagram should be generated, can be done on two ways:

Either by entering the name of the star into the input field or through a mouseclick on the button **"Select a constellation"**. Then a "list" with the common abbreviations of the constellations with stars in the LkDB is displayed (see picture 3).

After a click on the constellation a list of the stars from this constellation in the LkDB is displayed (see also picture 4).
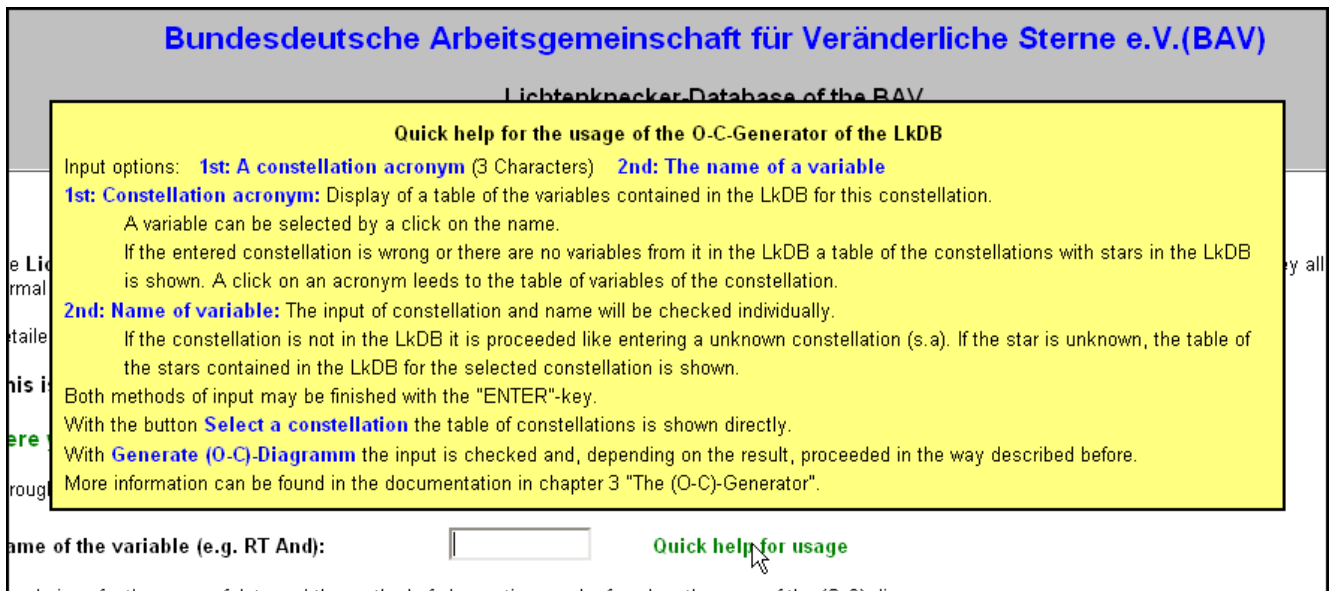
Picture 2: Quick help for usage

If the input field is left blank and the button **"Generate (O-C)-Diagram"** is used, the list of constellations appears (see picture 3).
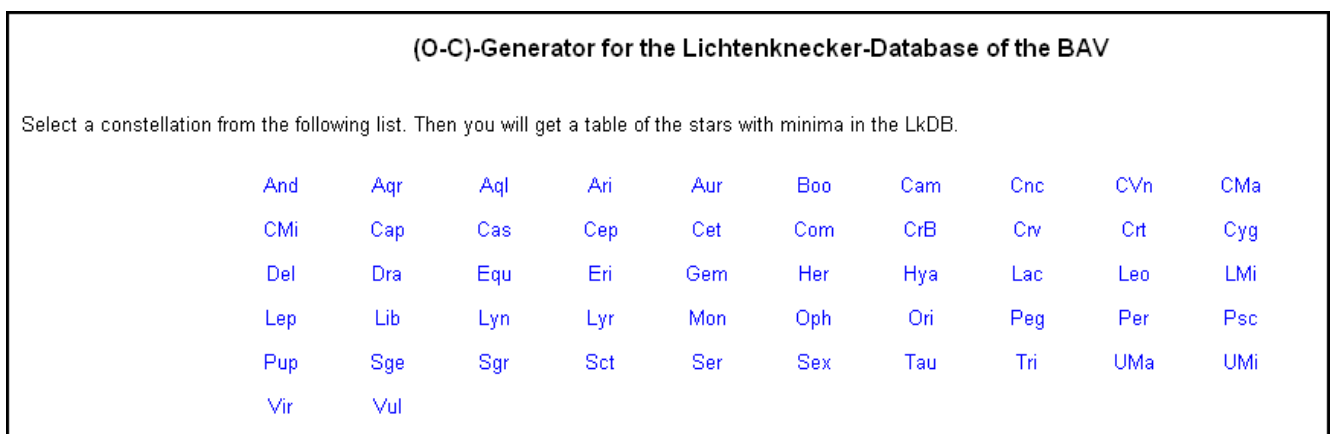
Picture 3: List of constellations with stars in the LkDB

A click on the name of the constellation produces a list of the names of the stars with minima in the LkDB. With another click on the starname, the (O-C)-diagram is generated.

On entering a name of the star into the input field, only names of stars are accepted, that were published in the GCVS or in the namelists of the IBVS as final designations.

If the name is entered in the wrong format or the star is not contained in the LkDB, a window is displayed with a hint to the fault and, depending on the fault, the list of valid constellations or stars appears.

An example can be seen in picture 4. The starname "oo Aql" was entered with lower case letters instead of uppercase letters. The reason of the fault is displayed and the list of the stars contained in the LkDB for the constellation Eagle (Aquila) is shown. The right star can be selected by a mouse-click.

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(O-C)-Generator for the Lichtenknecker-Database of the BAV

A T T E N T I O N:
Star **oo Aql** unknown or not found in the LkDB.

For the constellation **Aquila (Aql)** the LkDB contains observations of the stars listed below. After selecting one of the stars the (O-C)-Generator will be started.

XZ	YZ	AL	DK	FK	KO	KP	LT	OO	OP
QS	QY	V0337	V0340	V0342	V0343	V0346	V0348	V0406	V0407
V0408	V0409	V0415	V0416	V0417	V0418	V0420	V0445	V0479	V0602
V0609	V0616	V0631	V0640	V0676	V0688	V0694	V0699	V0719	V0724
V0760	V0761	V0770	V0784	V0799	V0803	V0804	V0805	V0822	V0829
V0843	V0873	V0889	V0917	V0919	V0926	V0936	V0962	V0981	V0997
V1045	V1075	V1096	V1097	V1168	V1182	V1184	V1197	V1243	V1269
V1299	V1331	V1341	V1353	V1355	V1376	V1379	V1426	V1430	V1490
V1542	V1646								

Picture 4: List of the stars for a constellation contained in the LkDB

If either a wrong abbreviation was entered or there are no stars with times of minima of the constellation in the LkDB, an appropriate message is displayed and the listing of the constellation is shown like in picture 3.

After using the button **"Generate (O-C)-Diagram"** (see picture 1) or after the selection of a star from the list (see picture 4) the (O-C)-diagram is generated and displayed.

ATTENTION:

The pictures shown here are produced with the browser Firefox. Other browsers like e.g. the Internet Explorer are potentially unable to show the buttons like in picture 1 (and other pictures) in the way shown here.

3.2   The Results of the (O-C)-Generator

The page created by the (O-C)-generator consists of 2 parts:

The upper part (Informational part):
This part shows the details for the star like coordinates and type, the facts about the minima (quantity, first and last minimum), the various possibilities for selection and input as well as the buttons for further work (see picture 5).

Picture 5: The upper part of the display of the (O-C)-Generator

This part includes several areas. After the name of the star and its number according to the GCVS-scheme are the following areas, which are explained in the chapters further on:

Stardata	Chapter 3.2.1.1
Facts about the Minima	Chapter 3.2.1.2
Selection Possibilities	Chapter 3.2.1.3
Further Selections	Chapter 3.2.1.4
Enter your own Minima	Chapter 3.2.1.5

Furthermore there are the buttons **"Generate (O-C)-Diagram"**, **"List of Minima"**, **"List of literature Reference"** and **"Select another Star"**.

The extra large button **"Generate (O-C)-Diagram"** starts the recalculation of the (O-C)-diagram after entering values for the period of time, selection of other elements or entering additional minima.

With the button **"List of Minima"** a list of the times of minima used for the generation of the (O-C)-diagram will be created. Depending on the browser used, the list is displayed in a new window or tab. Details about this list can be found in chapter 3.2.3.

The button **"List of literature Reference"** displays a list with the abbreviations and complete name of the sources of the literature, from where the minima were adopted, in a new window or tab. This list is a PDF-file, which can be browsed.

The button **"Select another Star"** calls the starting page of the (O-C)-Generator and the generation of a (O-C)-diagram for another star can be started.

The lower part (the (O-C)-Diagram):

This is the real (O-C)-diagram (see picture 6 as an example). To display the diagram the whole screen is used minus small areas at the upper, lower and right rim (for address- and symbol bars of the browser, status lines, etc.). If the window in which the (O-C)-generator is started doesn't use the whole screen, only a part of the diagram is shown.

Therefore it is strongly recommended to maximize the window.
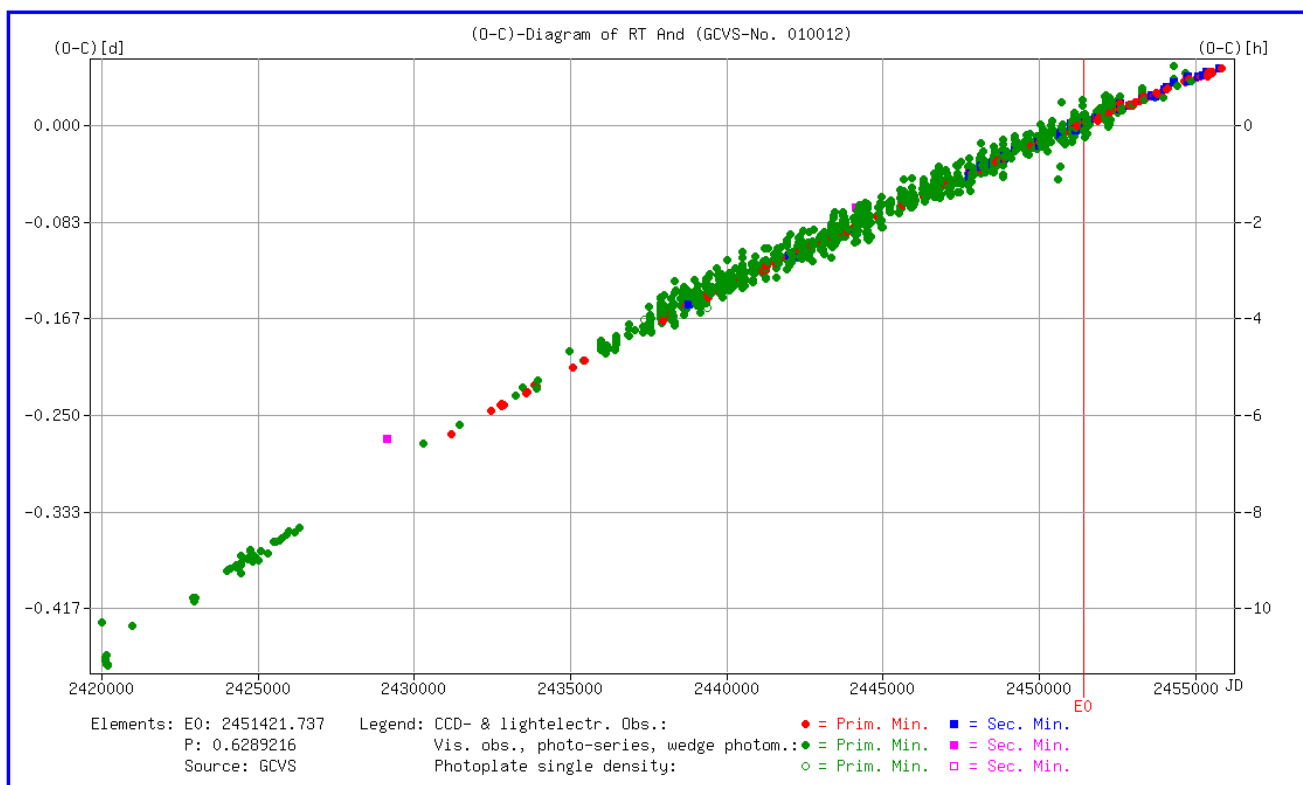
Picture 6: Lower part of the display of the (O-C)-generator (the (O-C)-diagram)

The display is scrolled in such a way, that the (O-C)-diagram can be seen immediately. To view the upper part of the output, scroll to the top.

3.2.1 The Informational Part

The informational part starts with the starname und the number according to the GCVS-numbering-scheme.

For some stars changes in their name were published in Namelist 78 (IBVS 5721) because of more precise measurement of the position. If an "old" starname is entered it is recognized automatically and changed to the new name. A hint about this is displayed below the starname (see picture 7).

Picture 7: Hint in case that starname was changed

3.2.1.1 Stardata

For the selected star the coordinates, the type and the brightness at maximum and primary minimum are shown. If known also the brightness at secondary minimum is displayed. Al this information is taken from the GCVS. The data for starting epoch and period can be found in the part **"Selection Possibilities".**

Picture 8: Stardata

3.2.1.2 Facts about the Minima

The quantity of minima used for the diagram is stated. All minima that are determined from observations with CCD-cameras or lightelectric photometer are listed in the column "CCD". All the minima originating from other observational methods are accumulated in the column "visual".

Below this are the dates of the first and last minimum in JD and UT.

Picture 9: Facts about the minima

3.2.1.3 Selection Possibilities

Here it is possible to decide with which elements the (O-C)-diagram is calculated. At the first call the elements from the GCVS are used. If there are no such elements or these are not complete (E0 and / or P are missing), it is calculated with elements published by J. Kreiner (http://www.as.up.krakow.pl/ephem/). If these are missing too or are incomplete, the date of the first minima is used as starting epoch and a period of 1. These values are displayed in the line "Own elements".

	E0	P	Source	Date
●	2451421.737	0.6289216	GCVS	2.Feb.2012
○	2452500.3510	0.62892863	Kreiner	4.Dec.09
○	2451421.737	0.6289216	Own elements	

Click here to enter your own times of minima

Picture 10: Selection Possibilities

The elements selected for the calculation are marked in the first column with the black dot (in the example above the elements from the GCVS). One of the other elements can be selected through a mouseclick on the open circle. If the starting epoch and / or the period are not known "unknown" is displayed in the respective field. These "elements" cannot be selected (no circle in the first column for this line).

If elements from the GCVS are known they are entered in the fields of "Own elements". If the GCVS elements are unknown, the same is tried with the elements from Kreiner. If these are missing too, the time of the first minimum is used as E0 and "1" as the period.
Only the values in the fields of "Own elements" can be modified.
The information from the catalogues are from the current electronic version of the GCVS (General Catalogue of Variable Stars, http://www.sai.msu.su/groups/cluster/gcvs/gcvs) respectively from J.M. Kreiner, 2004, Acta Astronomica, vol. 54, pp 207-210 (http://www.as.wsp.krakow.pl/ephem).

For the GCVS the date of publication of the used electronic version is shown in the column "Date". For the catalogue of Kreiner it is the date of the last processing of the star. It must be pointed out, that the elements of Kreiner are instantaneous elements.

If the selection of elements was changed or a change was made at "Own elements" the calculation of the new (O-C)-diagram must be started with the button **"Generate (O-C)-Diagram"**.

3.2.1.4 Further Selections

This area offers the following options:

1st   It is possible to select that the (O-C)-diagram is generated only with the minima got from observations with lightelectric photometer or CCD-camera.

2nd   Minima that are marked "uncertain" by the administrator of the LkDB are not used to generate the (O-C)-diagram.

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Picture 11: Further Selections

3rd   The period of time for which the (O-C)-diagram is calculated can be constrained. The normal case is that the analysis is carried out from the first until the last minimum. If a value for "from" is entered (like shown in picture 11), all minima are used for the calculation of the (O-C-)-values (more about how the values are calculated in chapter 3.3). But when generating the diagram only the part starting at the chosen value is displayed. When a value for "till" is entered the generation works analogous. So it is possible to enlarge parts of the (O-C)-curve (magnifier function).

A date can be entered either as JD or as normal date. For JD all 7 digits of the integer part must be entered. A decimal part may be entered, but is neglected. The normal date must be entered as "dd.mm.yyyy" (the german way to enter a date). The year must be entered with all four digits.

The values for "from" and "till" are limited. The earliest date for "from" is 1.1.1800 = JD 2378496. The latest allowed date is 31.12.2049 = JD 2469807.

But "empty" areas before the first minimum or after the last minimum are neglected for an optimal presentation of the diagram (the diagram always starts shortly before the first minimum and ends shortly after the last minimum in the limited period of time).

All entered dates are checked. If a value is invalid (to large, to small, invalid day (like Feb. 30) ore month) an appropriate error message is displayed below this area and, for the calculation, the limiting values is assumed (see picture 12). The wrong value is still displayed for easier correction.

Picture 12: Error message when entering wrong date
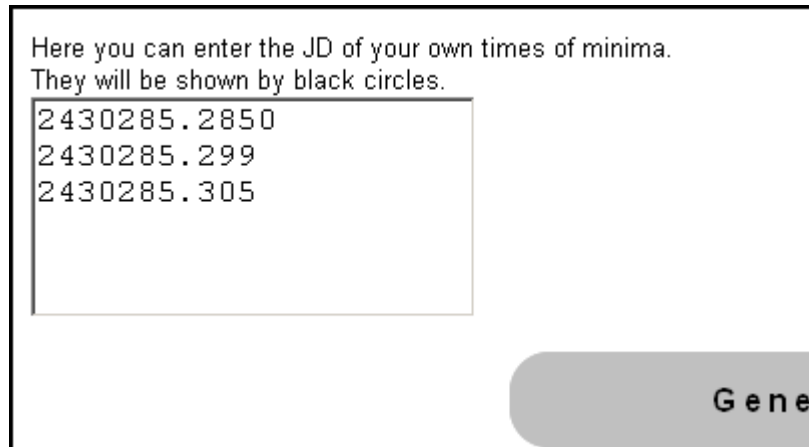
If due to selections and / or the values entered for the period of time no time of minima comply with the conditions an appropriate message is displayed. Moreover no diagram is generated.

If the selections are changed or values for period of time entered the button **"Generate (O-C)-Diagram"** must be used to recalculate the (O-C)-diagram.

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3.2.1.5 How to enter your own Times of Minima

Below the area "Selection Possibilities" (see chapter 3.2.1.3 and picture 10) is the possibility to enter your own times of minima. After a click on "Click here" a small area is opened. In this area the times of minima may be entered in the form JJJJJJJ.JJ . All seven digits left to the decimal point must be entered. The number of digits to the right of the point is arbitrary. However it doesn't make sense to enter more than 5 or 6 digits.

Only one time of minimum may be entered in a row. The row must be finished with the "Enter"-key (may be omitted with only one minimum). The number of minima is "in principle" unlimited.
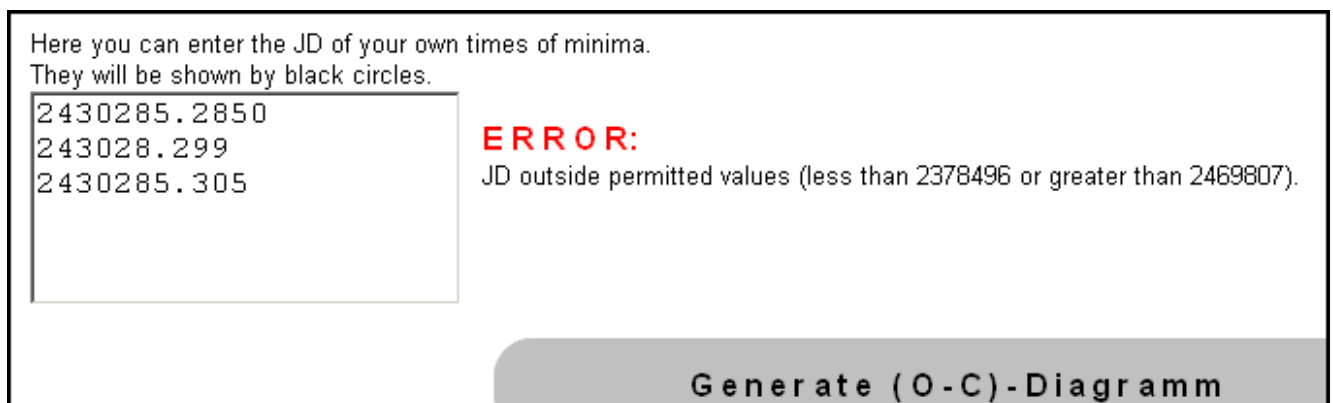
Picture 13: Entering your own times of minima

If times of minima are entered or changed a recalculation of the (O-C)-diagram must be started with the button **"Generate (O-C)-Diagram"**.

The display of the entered times of minima is described in chapter 3.2.2.2.

The entered values are checked in a way, that except of the decimal point only digits are entered and that the values are between the earliest and latest permitted value, see also chapter 3.2.1.4, 3rd part: Entering a value for "period of time".

If a value is outside the limits or there is a non-digit-character an appropriate error message is displayed. This value is not used further. Following correct values are processed in the normal way.

Picture 14: Error on entering own times of minima

The entered own times of minima are displayed after the recall of the (O-C)-generator. In the (O-C)-diagram, these minima are always displayed with black dots, regardless if they are primary or secondary minima. Also if it was selected, that only minima which are made with lightelectric or CCD-observations should be shown, these minima are displayed.

3.2.2 The (O-C)-Diagram

Here once again the (O-C)-diagram as already shown above.
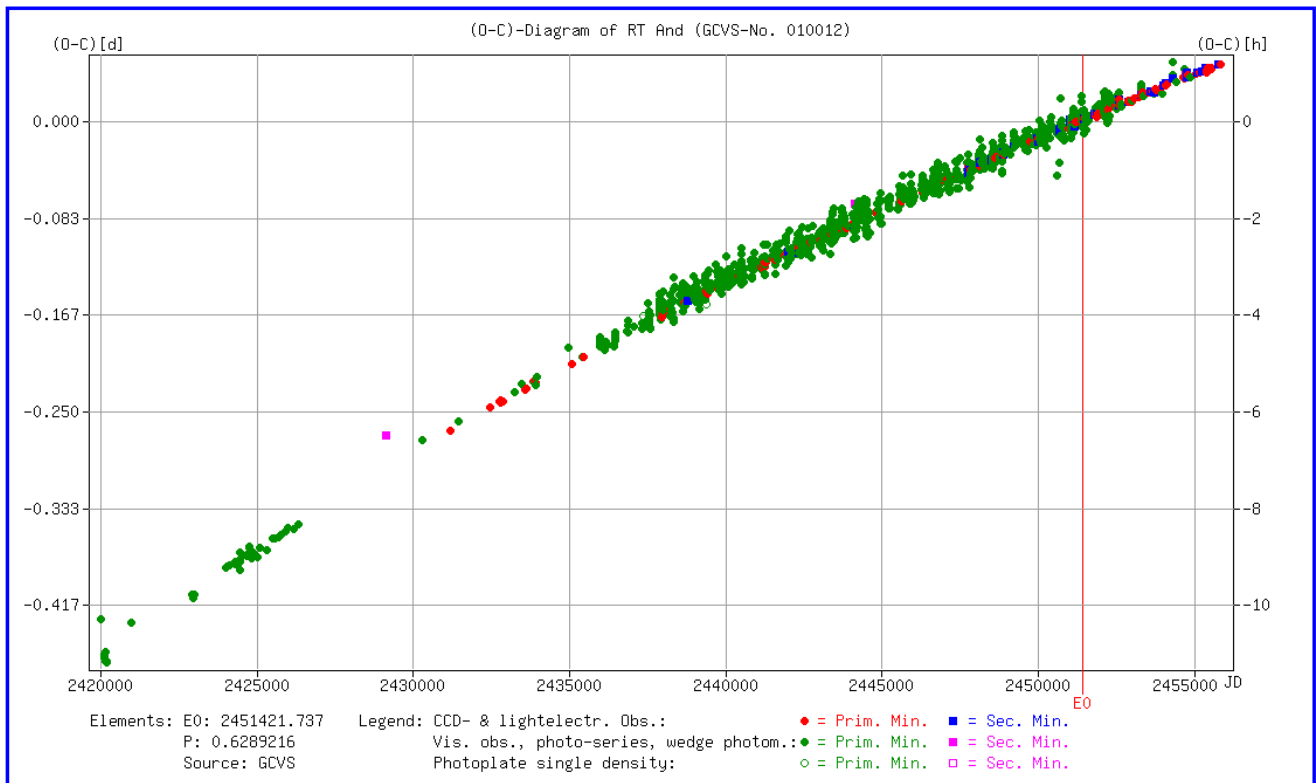
Picture 15: (O-C)-diagram (repetition)

For the display of the diagram the whole (physical) screen minus some small areas at the upper and lower border for address- and symbol-bars of the browser and symbol- and status-rows of the operating system is used.

Therefore it is recommended to maximize the window.

3.2.2.1 Explications of the Presentation of the (O-C)-Diagram

Above the diagram the starname and the GCVS-number is shown.

Below the diagram the used elements and their source are shown at the left side.

Aside the elements follow the explication for the symbols used for the display of the minima. If own times of minima are entered, the used symbol (black dot) is shown in addition. Because the times of minima from weak pictures on photographic plates are often not of good quality, these minima are marked with symbols of their own (see e.g. EG Cep or V345 Lac).

The decision about a minimum being marked as a primary or secondary minimum is made during the calculation of the respective (O-C)-value, see chapter 3.3 "The Calculation of the (O-C)-Values".

Additionally the starting epoch E0 used is marked with a vertical red line.

The X-axis shows the time as Julian Date [JD]. The range of values extends from first until the last time of minimum.

The Y-axis shows the (O-C) in hours [h] at the right side and in days [d] at the left side. The range of values extends from a bit higher than the highest value down to a value a bit smaller than the lowest value.

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If the mouse pointer is moved into the actual diagram (within the X- an Y-axes) it changes to crosshairs. This allows a more exact positioning onto the symbol of a minimum.

If the mouse pointer is positioned onto the symbol of a minimum, a small window appears with some information about the minimum (see picture 16). Displayed is the time of minimum in JD and normal date (as UT), the (O-C)-value in days and fractions of the period, the method of observation used for calculating the time of minimum, the filter used, the observer, the source of publication and the number of epochs since the starting epoch (negative if the minimum was before E0). Details about the calculation of the (O-C)-value and the number of epochs can be found in chapter 3.3. "The Calculation of the (O-C)-Values".
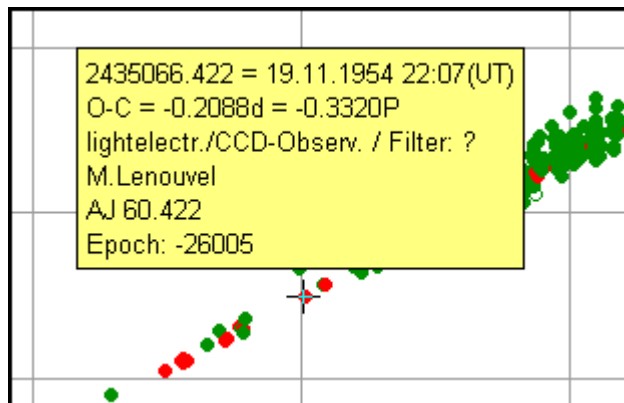
Picture 16: Information about the minimum

If the mouse pointer is moved into the area between the diagram and the blue frame and the right mouse button pressed the normal context menu is displayed. With this the diagram can be stored for example. Inside the diagram (where the mouse pointer is shown as crosshairs) this is not possible.

3.2.2.2 The Presentation of own Times of Minima

The own times of minima entered according description at chapter 3.2.1.5 are shown as black dots. There is no distinction between primary and secondary minimum.

If the mouse pointer is moved onto the symbol the window with information appears. In this case the method of observation is always marked as "unknown" and "Filter" is set to a question mark ("?"). The observer is always stated as "User". The source is always "Testdata" with the additional number of the minimum entered. See also picture 17. There the symbol for "Own times of minima" is also displayed in the legend at lower right.

ATTENTION:

If an entered minimum has the same time as an existing minimum or is in an area with many other minima, it may seem that it is not shown. But it is only overwritten by the symbols of the other minima. In the list of minima (see chapter 3.2.3) the entered minimum can be found.
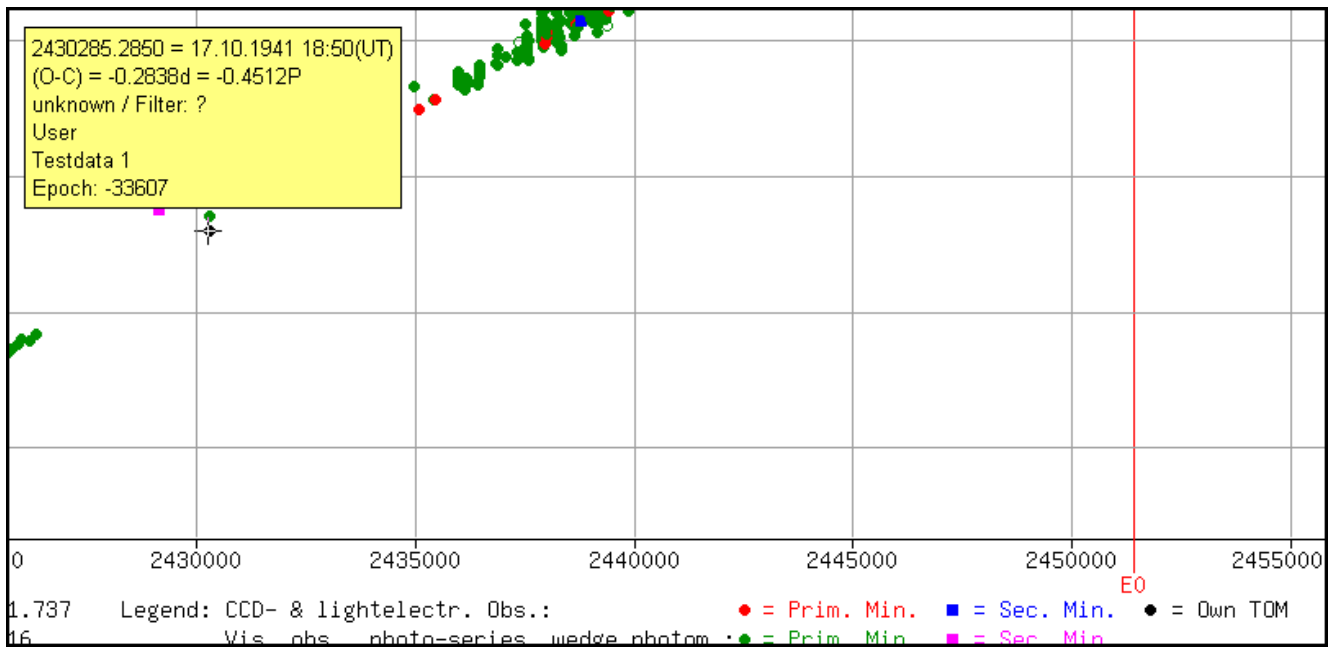
Picture 17: The Presentation of own Times of Minima (=TOM)

3.2.3 The List of Minima (1)

If the button **"List of minima"** in the informational part is clicked, a list of the minima that are used for the (O-C)-diagram is shown in a separate tab or window.

An example for such a list is shown in picture 18.

There are two buttons before the beginning of the list:

"List of Minima for further processing" and

"List of literature Reference".

The function of the first button is explained in the next chapter (3.2.4). The button **"List of literature Reference"** was already explained in chapter 3.2 "The Results of the (O-C)-Generator".

Because the list may be very long (several hundred times of minima) the two buttons are repeated after the end of the list.

Following the buttons there is the starname and the GCVS-number and a listing of the elements used, the source and the adjustment of the selectable options.

Then the list begins with a headline where the content of the columns is specified. With this headline the data in the columns should be explained clearly.

List of Minima for further processing	List of literature Reference

Minima of RT And from the Lichtenknecker Database of the BAV
GCVS-No.: 010012
Elements used: E0 = 2451421.737   P = 0.6289216
Source of elements: GCVS
Choosen options and input:
Show only lightelectric & CCD minima: NO
Exclude uncertain minima-observations: NO
Selected period of time from 2445000 till last minimum

Minimum [HJD]	Minimum [UT]	Epoch	(O-C) [d]	Photometry	Filter	Observer	Source
2445131.824	11.06.1982 07:46	-10001	-0.068	V		G.Samolyk	AOEB 1
2445183.396	01.08.1982 21:30	-9919	-0.068	V		W.Braune	BAVM 36
2445200.370	18.08.1982 20:52	-9892	-0.075	V		V.Urminsky	BRNO 26
2445200.372	18.08.1982 20:55	-9892	-0.073	V		R.Germann	BBS 62
2445200.373	18.08.1982 20:57	-9892	-0.072	V		N.Machkova	BRNO 26
2445200.378	18.08.1982 21:04	-9892	-0.067	V		L.Hutta	BRNO 26
2445205.410	23.08.1982 21:50	-9884	-0.066	V		V.Urminsky	BRNO 26
2445232.452	19.09.1982 22:50	-9841	-0.068	V		N.Machkova	BRNO 26
2445235.599	23.09.1982 02:22	-9836	-0.065	V		G.Samolyk	AOEB 1
2445237.476	24.09.1982 23:25	-9833	-0.075	V		M.Zejda	BRNO 26
2445515.459	29.06.1983 23:00	-9391	-0.075	V		N.Machkova	BRNO 26
2445515.460	29.06.1983 23:02	-9391	-0.074	V		P.Svoboda	BRNO 26
2445539.364	23.07.1983 20:44	-9353	-0.069	V		W.Braune	BAVM 38
2445556.343	09.08.1983 20:13	-9326	-0.071	V		N.Machkova	BRNO 26
2445561.373	14.08.1983 20:57	-9318	-0.073	V		S.Saner	BRNO 26
2445561.390	14.08.1983 21:21	-9318	-0.056	V		P.Svoboda	BRNO 26
2445564.528	18.08.1983 00:40	-9313	-0.062	V		P.Ralincourt	BBS 68
2445566.410	19.08.1983 21:50	-9310	-0.067	V		P.Ringe	BAVM 38
2445576.468	29.08.1983 23:13	-9294	-0.072	V		P.Svoboda	BRNO 26

Picture 18: List of Minima (Start)

If the source mentioned is one of the BAV Mitteilungen (BAVM), an IBVS or a report of the OEJV, the entry is formatted as a direct web link to the source. After a click on the link, the publication is displayed in a tab or window of its own.

At the end of the list follows a legend with the explanation of the use abbreviations in the columns "Photometry" and "Filter" (see picture 19).

```
Legend:
Column Photometry: C = CCD, E = lightelectr. Photometer, F = Series of exposures, P = Photoplate single density, V = visual,
    K = Wedge Photometer, ? = unknown
Column Filter: B = blue, G = green, R = red, I = infrared, U = ultraviolet, V = visual (yellow/green), -I = Infrared blocking filter,
    Rc = Redfilter (Cousins), Ic = Infraredfilter (Cousins), C = Clearfilter, o = without filter, ns = not specified, ? = unknown,
    B;V = Mean value of minima with B- and V-Filter (also B-V or BV), also other combinations of 2 or 3 filters are possible,
    m = Mean value of several observations with different filters, -U-I = with UV- and IR blocking filter (also -UI)
```

Picture 19: List of Minima (End)

If own times of minima are entered they can be found also in the list. In the columns "Photometry" and "Filter" a question mark ("?") is shown. In the column "Observer" is always "User" inserted and in the column "Source" the string "Testdata x", where "x" is the number of the own time of minima entered (see picture 20, the minima entered at chapter "How to enter your own Times of Minima" (3.2.1.5) are marked).

						(P.D.Wood)	
2429119.592	09.08.1938 02:12	-35460.5	-0.271	F		S.Gaposchkin	HA 113.71
2430285.2850	17.10.1941 18:50	-33607	-0.2838	?	?	User	Testdata 1 ←
2430285.295	17.10.1941 19:04	-33607	-0.274	V		K.Walter	GUL 2.4
2430285.299	17.10.1941 19:10	-33607	-0.270	?	?	User	Testdata 2 ←
2430285.305	17.10.1941 19:19	-33607	-0.264	?	?	User	Testdata 3 ←
2431175.856	26.03.1944 08:32	-32191	-0.266	E	?	K.Gordon	AJ 60.422
2431435.698	11.12.1944 09:35	-31778	-0.258	F		V.Ferguehr	AJ 60.422

Picture 20: Own times of minima in the list

3.2.4 The List of Minima (2)

With the button **"List of Minima for further processing"** in the list described in chapter 3.2.3 another list can be produced.

This version is equal with regard to contents to the list described above.

However this list doesn't contain the control characters that a browser needs for a proper display. Rather the list is displayed in simple text-format (ASCII).

The lines in the first part with starname, elements etc as well as the headline all begin with a "#"-character, which is used as a mark for a comment line in many programs.

Following are the lines with the data. The individual information are separated by a horizontal-tab-sign (Hex 09), that is not displayed. Thereby it is easy to carry over the data for further processing for example into a table calculating program.

The legend after the end of the list of minima is shown in the same way as the lines with the star data.

```
#
# Minima of RT And from the Lichtenknecker Database of the BAV
# GCVS-No.: 010012
# Elements used  E0 = 2451421.737      P = 0.6289216
# Source of elements:  GCVS
# Choosen options and input:
# Show only lightelectric & CCD minima: NO
# Exclude uncertain minima-observations: NO
# Selected period of time from 2445000 till last minimum
#
#
# Minimum [HJD]    Minimum [UT]        Epoch   (O-C) [d]  Photom. Filt.   Observer        Source
2445131.824      11.06.1982 07:46     -10001  -0.068       V            G.Samolyk      AOEB 1
2445183.396      01.08.1982 21:30     -9919   -0.068       V            W.Braune       BAVM 36
2445200.370      18.08.1982 20:52     -9892   -0.075       V            V.Urminsky     BRNO 26
2445200.372      18.08.1982 20:55     -9892   -0.073       V            R.Germann      BBS 62
2445200.373      18.08.1982 20:57     -9892   -0.072       V            N.Machkova     BRNO 26
2445200.378      18.08.1982 21:04     -9892   -0.067       V            L.Hutta BRNO 26
2445205.410      23.08.1982 21:50     -9884   -0.066       V            V.Urminsky     BRNO 26
2445232.452      19.09.1982 22:50     -9841   -0.068       V            N.Machkova     BRNO 26
2445235.599      23.09.1982 02:22     -9836   -0.065       V            G.Samolyk      AOEB 1
```

Picture 21: List of the minima in textual form

3.3 The Calculation of the (O-C)-Values

As already mentioned above, beginning with rev. 5.0 the calculation of the (O-C)-values is carried out in another way as in earlier versions. This method shall be explained here in detail.

Preparative activities:

In preparation of the publication of a new version of the LkDB, a file is produced, in which for all stars some important information are collected from several documents. These are beside the elements from GCVS and Kreiners catalogue data like coordinates, brightness, type etc.

Thereby a value for the phase of the secondary minimum as fraction of the period is stored. The default value is 0.5, which means the secondary is in the middle between two primary minima.

For several stars at Kreiners list elements are given not only for the primary minimum (PM), but also for the secondary minimum (SM). In these cases the phase of the secondary is calculated from these values:

Phase of SM = (JD(SM) – JD(PM)) / period.

Based on this "Phase of SM" two limits are determined the beginning of the calculation of the (O-C)-values. If the (O-C)-value, which is calculated in the first step (see calculation of X3 below) lies between these limits the minimum is regarded as a secondary minimum. The limits are "Phase of SM" plus / minus 40 percent of the smaller distance to the adjacent primary minima.

Two examples:	V889 Aql	AN Cam
Phase of SM	0.3569	0.7768
Distance SM to PM before	0.3569	0.7768
Distance SM to next PM	0.6431	0.2232
40% of smaller distance	0.14276	0.08928
Lower limit (phase SM – 40%)	0.21414	0.68752
Higher limit (phase SM + 40%)	0.49966	0.86608

The Calculation:

To calculate the (O-C)-values the times of minima (TOM) are split into two areas: On the one hand the TOM before the starting epoch (E0) and on the other hand the TOM after the starting epoch.

In the following the procedure of calculation is described for the TOM after E0.

It starts with the first TOM after E0. For this the initial state of (O-C) is assumed with zero. Now the (O-C)-value is calculated (nearly) in the normal way:

$$X1 = (JD(TOM) – E0) / P$$
$$X2 = INT(X1)$$
$$X3 = X1 – X2$$

The function "INT" deletes the fractional part of X1, so that X2 contains only the integer part. In the next step X3 receives the fractional part.

X3 is the (O-C)-value as fraction of the period (phase of TOM). Eventually this value is corrected (see below) and then converted to fractions of day by multiplication with the period.

From X2 the number of epochs is determined.

Through the following tests X3 and the number of epochs may be changed as well as the type of minimum is defined:

If X3 has a value between 0 and the lower limit for the secondary minimum:

No correction, the TOM is the one for a primary minimum, the number of epochs is X2.

If X3 has a value between the higher limit for the secondary minimum and 1:

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X3 = X3 – 1, the TOM is for a primary minimum, the number of epochs is X2 + 1.

If X3 has a value between the limits for a secondary minimum:

X3 = X3 – phase SM, the TOM is for a secondary minimum, the number of epochs is X2 + 0.5.

The (O-C)-value calculated this way is considered to be "local" (only for this TOM). This value is added to a "global" (O-C)-value, which is set to zero before the start of the calculation

The "local" (O-C)-value is added to the starting epoch. The result is used as new E0 in the calculation for the next TOM. (If the calculation is done again for this TOM with this new E0, the (O-C) will be 0.)

Then the calculation for the next TOM begins with the new starting epoch. By this way all TOM from the first one after the original E0 up to the last (newest) are executed in a loop.

The "global" (O-C)-value of a particular TOM is the value used for the diagram (and the list of TOM). It can become larger than one period (e.g. AC Boo).

The "local" (O-C)-values stay relatively small. This prevents (in most of the cases) a "period jump" so that the (O-C)-curve is separated into multiple parts.

The procedure for the TOM before E0 is in principle the same. The loop begins with the (temporal) last TOM before E0 and runs backward up to the first (oldest) one. It must be kept in mind, that in these cases X1 is negative and that some of the corrections must be done in a respectively different way.

A problem may result from larger gaps between times of minima.

Before the calculation of the (O-C) it is checked, that the temporal interval to the TOM handled before does not exceed a certain limit. This limit is defined fixed as 3000 periods.

If the gap is larger than the limit, a "presumably" (O-C)-value is calculated on the base of the TOM already executed and their (O-C)-values through linear interpolation. This value is added to the original E0 and used as new E0 for the calculation described above.

ATTENTION: Important Information

1st   As already noted the decision whether a TOM is for a primary or secondary minimum is done only on the basis of the fractional part of the calculation above. A possible statement in the source of the TOM is disregarded.

2nd   Through the use of other elements the classification as primary or secondary minimum for a given TOM may be changed.

3rd   The number of epochs result only from the calculation described above. A statement in the source is disregarded. The number of epochs for a secondary minimum always gets a fractional part of ".5", even if the phase of the secondary minimums has another value.

4th   The linear interpolation to bridge a gap without TOM works in most cases. However in cases of large gaps, the results must be dealt with great care (e.g. DI Her: gap roughly 33 years, VW Peg: gap roughly 55 years, BQ Vul: gap larger than 70 years).

4   Additional Functions and Information

4.1   Statistical Interpretation

With the page "Statistical Interpretation" (www.bav-astro.de/LkDB/statistics_menu.php?lang=en) it is possible to make some statistical evaluations of the times of minima stored in the LkDB. In reality it is "only" a sorting according to several criteria.

After calling the page the following display can be seen:

Statistical interpretation of the Lichtenknecker-Database of the BAV

Currently the **Lichtenkecker-Database of the BAV** (LkDB) contains 169643 minima of 2075 eclipsing binaries distributed in 52 constellations. This webpage allows some statistical interpretations.

For more informations about the possible options move the mousepointer to the beginning of this line.

Sort criterion :
- ⦿ By constellation and variable name
- ○ By JD of first observation
- ○ By JD of last observation
- ○ By quantity of all observations
- ○ By quantity of CCD- and light-el. observations
- ○ By quantity of other observations

Sort sequence :
- ⦿ ascending
- ○ descending

Select a constellation from the following table. For "all constellations" either select nothing or "All" (at the end of the table)

Selected constellation: [   ]

And	Aqr	Aql	Ari	Aur	Boo	Cam	Cnc	CVn	CMa	CMi	Cap	Cas	Cep	Cet
Com	CrB	Crv	Crt	Cyg	Del	Dra	Equ	Eri	Gem	Her	Hya	Lac	Leo	LMi
Lep	Lib	Lyn	Lyr	Mon	Oph	Ori	Peg	Per	Psc	Pup	Sge	Sgr	Sct	Ser
Sex	Tau	Tri	UMa	UMi	Vir	Vul	All							

[Start evaluation]

Picture 22: Starting page of the statistical interpretation

This page offers some possibilities for the selection of the times of minima to be used and the way how the result is organized.

The sorting may be done according to one of the following criteria:

1st   According to the constellation and variable name (default).
       If no constellation was selected, these are listed in the common order from Andromeda to Vulpecula. Inside the constellation the stars are sorted also in the normal order, beginning with R, S, T … (naturally only stars are listed with times of minima stored in the LkDB).

2nd   According to the JD of the first time of minimum of the stars.
       The output is sorted according to the JD of the first (oldest) time of minimum of the stars. If this is done for all stars the list begins with S Cnc whose first observation originates from 1.2.1848 (provided the sort sequence selected is "ascending").

3rd   According to the JD of the last time of minimum of the stars.
       The output is sorted according to the JD of the last (newest) time of minimum of the stars. With this it is possible to determine which stars aren't observed for a longer time (for which reason whatever).

4th   According to the quantity of all times of minima of the stars.
       The sorting is made on the quantity of all times of minima of the stars. If the sort sequence is "ascending" (the default) the output begins with approximately 40 stars, for which only one time

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of minimum is stored in the LkDB. Following are another 40 stars with only two times of minima. For a lot of other stars not more than 10 times of minima are stored. In many of these cases the last time of minimum dates back about several decades.

5th   According to the quantity of times of minima destined from observations with lightelectric pho-
tometer or CCD-cameras.
Principally this works like criteria 4. However only those times of minima of the stars are used, that are destined from observations with lightelectric photometer or CCD-cameras.

6th   According to the quantity of times of minima of the stars observed with other methods.
Principally this works like criteria 4. However only those times of minima are considered that are NOT destined from observations with lightelectric photometer or CCD-cameras.

Through the selection of the "Sort sequence" it can be determined how the output is sorted. The possibilities are sorting in ascending (default) or descending order.

At "Sort criteria" and "Sort sequence" only one of the possibilities can be selected.

The sort criteria can be applied either to all times of minima of the stars stored in the LkDB or to the times of minima of the stars in only one constellation. The constellation can be selected easily through a click on the abbreviation.

It is not possible to enter the abbreviation manually.

Either one constellation may be selected or all constellations through the selection of "All". This is the default and is equal to an empty field. A previous selection is overwritten.

If no constellation is selected and no changes are made at "Sort criteria" and "Sort sequence", all times of minima are used (see first criteria above). An example for the result can be found in picture 23, in this case limited to the constellation Andromeda.

All results are shown in a new tab or window (but always in the same).

Independent from "Sort criteria" and "Sort sequence" the result is always arranged in the same way (see picture 23). After some explanations it is shown, which "Sort criteria" and "Sort sequence" were selected. Moreover, if a constellation was selected, the name is shown.

Following is the list of the stars. For each star the line begins with the GCVS-number and the name. In the next columns follows the date of the first time of minima with JD and normal date and the same for the last time of minimum. The normal date refers to the time zone UT and has no value for time.

At the end of the row there are three columns with the quantity of times of minima. At first is the total number of times of minima, then the number of times of minima coming from observations made with lightelectric photometer or CCD-cameras and in the last field the number of times of minima made with other observational methods (visual, series of photos,…).

At the head of the list is specified, which information can be found in the individual rows.

Picture 23: Result of an interpretation

If the mouse pointer is positioned onto an starname, a small window appears thith the following information about the star (see picture 24).

> The type of variability
> The elements (GCVS and Kreiner)
> The brightness at maximum and primary minimum and eventually at secondary minimum,
> The values for "D" and "d"
> The coordinates.

Picture 24: The window with information about the star

With a click onto a starname, the (O-C)-generator is started. The (O-C-)-diagram is shown in a new tab or window.

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Before the start and after the end of the output there is a button **"Make listing for further processing"**.

With this button, the result of the sorting is displayed in plain text format (ASCII) in a new tab or window. This display may be stored as a file for further processing.

The structure of this list is the same as for the list before. Yet there are no formatting instructions for the browser. Rather the data fields are separated by "Horizontal tab"-signs (Hex 09). Because of this the data may be easily imported and processed by other programs like e.g. Excel.

```
"Nr."   "Name"  "Datum erstes Minimum"      "Datum letztes Minimum"         "Gesamt"        "CCD+licht-el." "andere"
010012  RT And  2420005.417     25. 8.1913  2455828.0111    23. 9.2011      1445    256     1189
010025  SY And  2417587.21      11. 1.1907  2442686.31      30. 9.1975      40      0       40
010027  TT And  2414898.34      31. 8.1899  2455039.4804    26. 7.2009      110     12      98
010030  TW And  2418567.4       17. 9.1909  2455866.0295    31.10.2011      153     13      140
010034  UU And  2419039.28      2. 1.1911   2455456.62189   17. 9.2010      222     21      201
010045  WW And  2413102.4       30. 9.1894  2447471.533     6.11.1988       31      0       31
010046  WX And  2422547.531     11. 8.1920  2455845.6912    11.10.2011      40      5       35
010048  WZ And  2411379.033     11. 1.1890  2455873.50864   8.11.2011       410     60      350
010051  XZ And  2411700.590     29.11.1890  2455885.617     20.11.2011      1080    66      1014
010055  AA And  2424711.530     15. 7.1926  2455851.1746    16.10.2011      46      26      20
010056  AB And  2424760.360     1. 9.1926   2455869.7476    4.11.2011       1892    270     1622
010058  AD And  2417469.374     15. 9.1906  2455491.5800    22.10.2010      293     75      218
010066  AM And  2416730.41      6. 9.1904   2454026.4049    17.10.2006      23      1       22
010067  AN And  2421060.350     15. 7.1916  2455461.4038    21. 9.2010      17      17      0
010069  AP And  2425865.488     10. 9.1929  2455575.5885    14. 1.2011      183     104     79
010072  AS And  2452548.5944    1.10.2002   2455482.3793    12.10.2010      8       8       0
010082  BD And  2427784.179     12.12.1934  2455547.2150    16.12.2010      111     67      44
010089  BL And  2415831.791     23. 3.1902  2455481.6220    12.10.2010      107     32      75
010092  BO And  2427360.310     14.10.1933  2455141.4982    5.11.2009       28      1       27
010101  BX And  2414668.54      14. 1.1899  2455521.6166    21.11.2010      301     123     178
```

Picture 25: List for further processing

4.2   Literature

In the records of the Lichtenknecker-Database of the BAV the source of the literature is given in an abbreviated form. The following link allows a direct access to the list of the abbreviations and the corresponding full names.

The list can also be accessed by the button **"List of literature Reference"** at the bottom of the informational part of the result of the (O-C)-generator (see chapter 3.2). The same button can also be found at the beginning and end of the list of minima (see chapter 3.2.3).

4.3   Right of Use and Licensing

It took an enormous amount of time to produce the Lichtenknecker-Database of the BAV.

The data were collected as careful as possible. But there was only a rough check for errors. Thus the BAV cannot guarantee either faultlessness or usability of the database.

The BAV has no rights on the stored observations. They are held by the authors and observers. Nevertheless we kindly ask all users of the database to cite the official title Lichtenknecker-Database of the BAV in regard of the enormous efforts of all the people who contributed to it.

The program to generate the (O-C)-diagrams has been used in a similar version for a long time. Nevertheless the BAV cannot guarantee either its faultlessness or usability.

Caution:
The commercial use and/or the passing of the database to any third party are expressively prohibited.

Berlin, July 2015
Lichtenknecker-Database: Description by Franz Agerer
Documentation and Production:
Joachim Hübscher, Frank Walter, Wolfgang Grimm

Published by

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5   Addendum: The History of the Lichtenknecker Database

5.1   The Development of the Database

(By Franz Agerer)

First of all for his own purposes Dieter Lichtenknecker put together a program of eclipsing binaries which are north of -20 degree declination, brighter than magnitude 11.5 in maximum light, and which have an amplitude of generally more than 0.5 mag. For these stars he also produced finding charts which are still in use at the BAV (see BAV Rundbrief 1979, No. 1/2, p. 13). To quickly identify potential objects for an observing night, Dieter Lichtenknecker stored all data on a special type of punching cards. On these the data of the objects were written and the cards punched accordingly to the selection criteria.

At the 1980-BAV-assembly in Bonn, it was decided to update and supplement the observational program of the BAV for eclipsing binaries. For this project Dieter Lichtenknecker, then leader of the section „Eclipsing Binaries" of the BAV, took the task for the examination of the frequency of observations for all eclipsing binaries which could be observed with typical amateur telescopes from a location between 45 – 53 degrees northern latitude (Germany). Correctly it should be „relative frequency", because he had only access to observations published by the BAV, BBSAG (Switzerland), AAVSO, IBVS as well as to data from amateurs of the Czech Republic and Slovakia.

It turned out that the stars of the „Standardprogramm" of the BAV were observed intensively by various other groups of observers, so that the continuity of observations of these stars seemed to be guaranteed. Thus it seemed to be wise to focus the observing-capacity of the BAV on objects which were followed by others only rarely or even not at all. In consequence, about 180 more or less neglected or rarely observed stars were combined within the „Programm 1982", finding-charts produced and ephemeris calculated (see BAVR 1983, No. 1, p. 36).

Soon Dieter Lichtenknecker extended the limits for his collection of observed minima. He now tried to collect all times of minima of all the officially named eclipsing binaries brighter than 13 mag in normal (=maximum) light and north of -20 degrees declination. He made no restrictions regarding amplitude and period.

The only tool Dieter Lichtenknecker had, to cope with these volumes of data for eclipsing binaries and to calculate the light changing elements, was a simple PC of the time at the end of the 1970s. This PC used magnetic audio cassettes as storage medium. At the end he had 53 cassettes – one for each observable constellation.

Together with the minima of selected eclipsing binaries, Dieter Lichtenknecker collected all available finding charts and literature. This led to a library of its own which allowed the identification of the variables and eased the evaluation of incoming observations. At this point we also have to thank Heinz Schmidt of Berlin, who helped to collect the literature in a self-sacrificing way.

From then on the database was used in the each time updated versions
- to identify neglected stars and recommend them for further observing
- to derive new elements
- to investigate the long-term-behaviour (e. g. rotation of apsidal nodes, change of period due to mass-transfer etc.)
- to compare the BAV-observations against the „Rest of World" to identify further need of observations as well as to detect mistakes at an early stage and avoid their publication.

When CCD-cameras became more and more available also for amateur astronomers, the limiting magnitude of observable objects was shifted to fainter stars. Therefore from time to time also observations of fainter objects found their way to the database.

Since the discovery of Algol (Beta Persei) a lot of times of minima found their way to literature. Until now, only a few of them were included into the database.

The database contains only results of stars which have been confirmed and officially named as variables. Thus it may happen that earlier observations, which were published under a preliminary designation, are still not included into the database.

Due to the very restrictive understanding of copyright at the AAVSO, this database does not include results of visual estimates which have been published by the AAVSO during the last years (Observed Minima Timings of Eclipsing Binaries No.1ff).

As of today the Lichtenknecker-database contains nearly 127.000 times of minima of 1.906 Stars.

Zweikirchen, November 2003

5.2   In memoriam Dieter Lichtenknecker

by Werner Braune and Karl B. Menzel

* 12.3.1933 † 26.8.1990

Dieter Lichtenknecker died August the 28th, 1990 at the age of 57 years after a long and serious sickness. He was a "BAVer" nearly from the beginning. On August 24, 1951 he observed his first minimum of an eclipsing binary (RT And), which was published in 1959, together with many further observations in the "BAV Mitteilungen Nr. 12". Unfortunately, many of those old observations are not registered within the BAV-light-curve-database, because it was not maintained carefully in the years before 1957. His light-curve of VV UMa from 1955 is the oldest one registered. And his latest observations of this early period of observations was made in 1961 – again RT And.

Regarding his profession, Dieter Lichtenknecker made a break in 1959: Having learned the profession of an precision optician, he got self-employed and founded a company for the production of (mainly) astronomical optics in the town of Weil der Stadt (west of Stuttgart). In the following years he became famous due to his slogan "Astronomical optics from the town of Kepler", this also with advertisements published in the BAV-Rundbrief.

Weil der Stadt was the location of the 2nd BAV-Assembly outside of Berlin in 1968 and was organised by Dieter Lichtenknecker – including a superb cold buffet in his workshop. Around this time, the 6"-objective for the main telescope of the BAV in Berlin was purchased for a special price. The telescope was used for years on different places.

After a short professional interlude in Berlin (1970-72), Dieter Lichtenknecker settled at the Belgic city of Hasselt where he founded his company "Lichtenknecker Optics". After some hard years, he was ready in his profession to reactivate his work in the BAV.

In 1976, he started a second astronomical phase – first of all again with observational activities. After a break of 15 years he began observing eclipsing binaries from his Penthouse, using a 5" – "richest-field"-telescope. His focus was on rapid W-UMa-stars, which were also observed by many others, mostly photoelectrical. That did not satisfy him at all.

In BAV Rundbrief 1/2, 1979, he reported on his re-orientation towards rarely observed stars with the aim to close the gaps of observations and to derive new results. In the following time he succeeded in this work. At first for his own observational purposes, Dieter Lichtenknecker compiled a list of eclipsing binaries north of a declination -20 degrees, brighter than 11.5 mag in maximum light and an amplitude not less than 0.5 mag in general. For these stars he also produced finding charts, which are still in use at the BAV.

On November 7, 1981, the BAV founded several working groups. Dieter Lichtenknecker took over the management of the division "Eclipsing Binaries" with a foresight vision. Till 1981 he observed very much, but from then on less and less because he mistrusted the accuracy of visual observations. He also discovered some flops in his own work. His last observational result dated from 1984 and is of the star SW Lac.

The organisational preparation of observations, with the aim to always have a list of the right stars to observe whenever the sky cleared, and the analysis of his observations. led Dieter Lichtenknecker away from active observation to theoretical work:. Supported by the newly appeared personal computers (Commodore 2001 etc.) a completely new field of work opened:

The at first for his own observational work developed collection of data developed gradually into a universal database. This did not only allow the analysis of observations, but also delivered hints for new successful observations. His aim was now the increase of the efficiency of observations together with an improvement of quality. At that stage he got help from a development which also became available for amateur astronomers within the late 70s: automatically operating telescopes, fitted with photometers and cameras.

Now a time for a very fruitful cooperation began, particularly with Franz Agerer and Peter Frank (both members of the BAV), who achieved those accurate results by means of photometric and photographic techniques, Dieter Lichtenknecker had waited for during his work within the BAV for such a long time. He now happily identified "catalogue-corpses" and could change them into ordinary variable stars by use of these improved observational techniques. The extremely good relationship between him, his database and those two observers is not only manifested in reports in the "BAV Mitteilungen", "BAV Rundbriefe" or articles in IBVS, but also within enthusiastic presentations of results at the BAV-meetings. After Dr. Mundry's death, Dieter Lichtenknecker together with Joachim Hübscher edited the annually published paper "BAV-Beobachtungsergebnisse". The results were always tested against the Lichtenknecker-database before publishing them. Thus, possibly incorrect data could be filtered out.

The consequent continuation of this conception, which had been developed for his personal purposes, led pretty fast to a further problem: The investigation for results in relevant literature. In contrast to the recent observations, which were mostly available within the BAV, older observations had to be collected from sources of historical and possibly complete literature-inventories. With this, Dieter Lichtenknecker depended on external help. The library of the Wilhelm-Förster-Sternwarte (WFS), Berlin turned out to be a rich source, which was analysed for years by Heinz Schmidt with great engagement.

A further data-mine was the library of the Bonner observatory at Hoher List. Dieter Lichtenknecker gained access to it through his close connection to Dr. Geyer, who was also the first professional astronomer who became aware of the Lichtenknecker-database and who recognized its utmost significance.

The planning for a adequate publication of the database came to a temporary end by Dieter Lichtenknecker's sickness and his sudden death. Until the last days of his life, he continued to enter

data to reach the variables in the constellation Vulpecula. Unfortunately, fate did not grant him to complete his life's work.

We remember Dieter Lichtenknecker in great mourning and can only state: There is no substitute for him.

In deep respect we feel it our duty to continue Dieter Lichtenknecker's work in his spirit. The Lichtenknecker-Database will find its place within the world of observing eclipsing binaries.

The following picture shows Dieter Lichtenknecker at his desk working at the database. In the background you can see some folders with the collected data for the variable stars, an early version of the Lichtenknecker-Database.

This picture shows Dieter Lichtenknecker at the observatory of Peter Frank (BAV) at Velden an der Vils (Germany), surrounded by several telescopes from his company "Lichtenknecker Optics". At the left is a MPT300 (Multi-Purpose-Telescope) und behind it a 90mm-refractor used as guiding-scope. At the right are two flatfield-cameras of different sizes.

Bundesdeutsche Arbeitsgemeinschaft für Veränderliche Sterne e.V. (BAV)