



# CATALOGS

## Understanding the 6<sup>th</sup> Orbital Catalog





## 6<sup>th</sup> Orbital Catalog Orbital Legend

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### Overview

When the WDS has a proposed orbital solution, it is added to the 6<sup>th</sup> Orbital Catalog.

All orbits are graded, and only those judged of highest grade for each system are included in the published *Sixth Catalog*.

If two orbits for a given system are judged to be of nearly identical quality, the earlier-published orbit is usually chosen for the catalog (unless the later orbit also includes formal errors to the elements).

A few systems are found to have two very different sets of orbital elements which yield comparable grades; in these cases both orbits are included. These "special cases" bring the total number of orbits in the current *Sixth Catalog* to 2,739.



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**Sixth Catalog of Orbits of Visual Binary Stars**  
(catalog updated frequently)

Optical/IR Products  
NOMAD  
UCAC  
URAT  
USNO-B1.0  
Double Stars  
WDS  
ORB6  
HMM  
INT4  
DM3  
WMC  
DSL  
Solar System  
Bodies  
USNO Image and  
Catalog Archive  
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Information Center

This catalog continues the series of compilations of visual binary star orbits previously published by Finsen (1934, 1938), Worley (1963), Finsen & Worley (1970), Worley & Heintz (1983), and most recently by Hartkopf, Mason, & Worley (2001) in their Fifth Catalog of Orbits of Visual Binary Stars. That catalog, containing orbits published through 1 January 2001, was one of four double star catalogs maintained at the USNO that were written to CD-ROM in 2001 and distributed. The 30 June 2006 edition of the Sixth Catalog was included on the second USNO Double Star CD-ROM, which is available upon request. The *Fifth Catalog* was removed from the web in August 2007, as it had long been supplanted by the *Sixth Catalog*.

As of 25 April 2016, the *Sixth Catalog* included 2,662 orbits of 2,558 systems (from a "master file" database currently containing 8,077 orbits). All orbits have been graded on a 1 - 5 scale, as in earlier catalogs; the grading scheme has been modified, however, as described below. Ephemerides are included for all orbits with complete elements, as are plots including all associated data in the current Washington Double Star database.

**2005 Mar:** The format of the catalog was extensively modified. A description of the new format is given [here](#)

**2007 Aug/Sep:** Orbit catalog notes were merged with those of the Washington Double Star Catalog and later the Fourth Interferometric Catalog, in order to create a common notes file (and file format) for all USNO double star catalogs. Cleanup of old notes is never really completed, of course - we welcome notification of any errors you may run across.

**2013 Aug:** A version of the elements file was created which includes delimiters, for those users who work with SQL-type databases. This is a work in progress - please let us know of any problems with this file.

**2013 Nov:** A link was added to the "master file" database of all orbits. A few comments are in order. First, the grade (col. 244-246) is here a decimal; the range of grades is 0.0 - 5.4 (rounded to an integer value in the main catalog) and differences in grade of a few tenths are usually insignificant. A grade of 6.0 is given for orbits considered too old to be worth grading; values of 7.0 are reserved for orbits with incomplete elements; values of 8.0 for interferometric orbits lacking rho/theta information; and values of 9.0 for astrometric orbits. Column 248 is a flag indicating a note, while column 250 is a yes/no flag indicating the solution considered currently "best".

**2014 Sep:** A new flag "m" was added for values of T0 expressed in modified Julian date. Although MJD (= JD-2,400,000.5) differs by only 0.5d from the truncated JD values (JD-2,400,000) flagged with "d", it was felt that a separate code for T0 values published in this unit would be less confusing than modifying published values for the catalog.

**2015 Mar:** The routine for generating ephemerides was extensively modified by George Kaplan (USNO), who converted it to double precision, with IAU expressions for Besselian epochs. This mainly affects those orbits with very short periods, resulting in changes to predicted theta values at the 0.1deg level or smaller.

USNO Master Clock  
Time  
**Thu, 13 Sep 2018  
22:34:02 UTC**

The Sky This Week  
The Sky This Week,  
2018 September 11 -  
18  
[More...](#)

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### Locating the Orbital Files and Other Information

Products  
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**2015 Mar:** The routine for generating ephemerides was extensively re-implemented for precision, with IAU expressions for Besselian epochs. This mainly affected predicted theta values at the 0.1deg level or smaller.

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# 6<sup>th</sup> Orbital Catalog Orbital Legend

## Overview

### Sixth Catalog of Orbits of Visual Binary Stars: Orbital Elements

Discoverer				Magnitudes				Orbital Elements												REF.....
RA,Dec (J2000)....	WDS.....	DD.....	HD....	V1...*	ppppp.pppppp*	aaa.aaaaa*	iii.iiii	000.0000*	TTTTT.TTTTTT*	e.eeeeeee	ooo.oooo	EQNX	G	N	P	E	REF.....			
		ADS .....	HIP...	V2...*	+/-	+/-	+/-	+/-	+/-	+/-	+/-	LAST								
000000.91-192955.8	00000-1930	LTT 9831	224690	9.0	499.7989	d	14.31	m	118.06	77.28	48397.3164	d	0.0000	0.00		9	<a href="#">N</a>	<a href="#">P</a>	<a href="#">E</a>	<a href="#">HIP1997d</a>
			2	.	18.8466		2.81		5.05	5.20	10.1805		.	.		1991				
000019.10-441726.0	00003-4417	I 1477	224750	6.80	384.1	y	1.023	a	75.3	141.6	2008.2	y	0.703	246.5	2000	5	<a href="#">P</a>	<a href="#">E</a>	<a href="#">Cve2010e</a>	
			25	7.56	22.5		0.096		2.4	1.9	14.9		0.056	3.1	2001					
000034.35-530551.8	00006-5306	HJ 5437	224782	6.55	948.6	y	2.17	a	24.7	340.9	1134.9	y	0.67	99.5	2000	5	<a href="#">P</a>	<a href="#">E</a>	<a href="#">Kiy2017</a>	
			50	9.85	284.6		0.43		8.2	26.8	286.4		0.06	25.3						
000123.67+393638.2	00014+3937	HLD 60	224873	9.09	223.2	y	0.8798	a	128.3	324.7	1903.08	y	0.6479	325.7	2000	3	<a href="#">N</a>	<a href="#">P</a>	<a href="#">E</a>	<a href="#">Hrt2011a</a>
		ADS 17178	110	9.77	12.2		0.0039		2.8	2.2	1.28		0.0123	3.8	2009					
000208.72-681650.6	00021-6817	I 699AB	224953	9.71	290.0	y	2.738	a	57.7	117.8	1884.54	y	0.65	207.1	2000	5	<a href="#">P</a>	<a href="#">E</a>	<a href="#">Zir2013d</a>	
			169	10.56	.		.		.	.	.		.	.	2000					

J2000 Coordinates &  
WDS Designation

Catalog

Period

Grade, Notes,  
Figure,  
Ephemeris  
References



## 6<sup>th</sup> Orbital Catalog Orbital Legend

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### Orbit Grades

Orbits are graded 1-5 based on: (1=definitive to 5=indeterminate)

**1 = Definitive.**

Well-distributed coverage exceeding one revolution; no revisions expected except for minor adjustments.

**2 = Good.**

Most of a revolution, well observed, with sufficient curvature to give considerable confidence in the derived elements. No major changes in the elements likely.

**3 = Reliable.**

At least half of the orbit defined, but the lesser coverage (in number or distribution) or data consistency leaves the possibility of larger errors than in Grade 2.

**4 = Preliminary.**

Individual elements entitled to little weight, and may be subject to substantial revisions. The quantity  $3 \log(a) - 2 \log(P)$  should not be grossly erroneous. This class contains: orbits with less than half the ellipse defined; orbits with weak or inconsistent data; orbits showing deteriorating representations of recent data.

**5 = Indeterminate.**

The elements may not even be approximately correct. The observed arc is usually too short, with little curvature, and frequently there are large residuals associated with the computations.

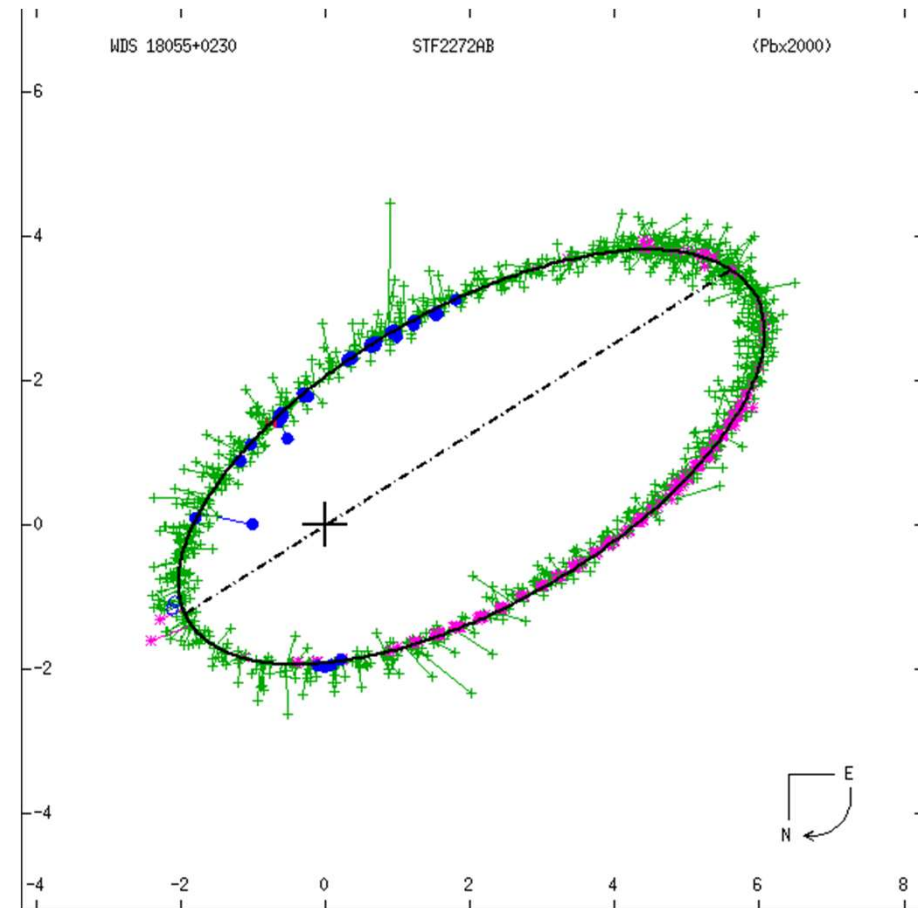




## 6<sup>th</sup> Orbital Catalog Orbital Legend

### Grade 1 Orbit

- Green plus signs indicate visual (micrometric) observations
- Violet asterisks photographic measures
- Blue symbols various interferometric techniques
  - Open circles – Eyepiece interferometry
  - Filled circles – Speckle or other single-aperture techniques
  - Filled squares - Multi-aperture techniques
- Red "H" or "T" indicates a measure from Hipparcos or Tycho
- Dot-dash line indicates the line of nodes
- Scales are in arcseconds
- Curved arrow at lower right indicates direction of orbital motion.



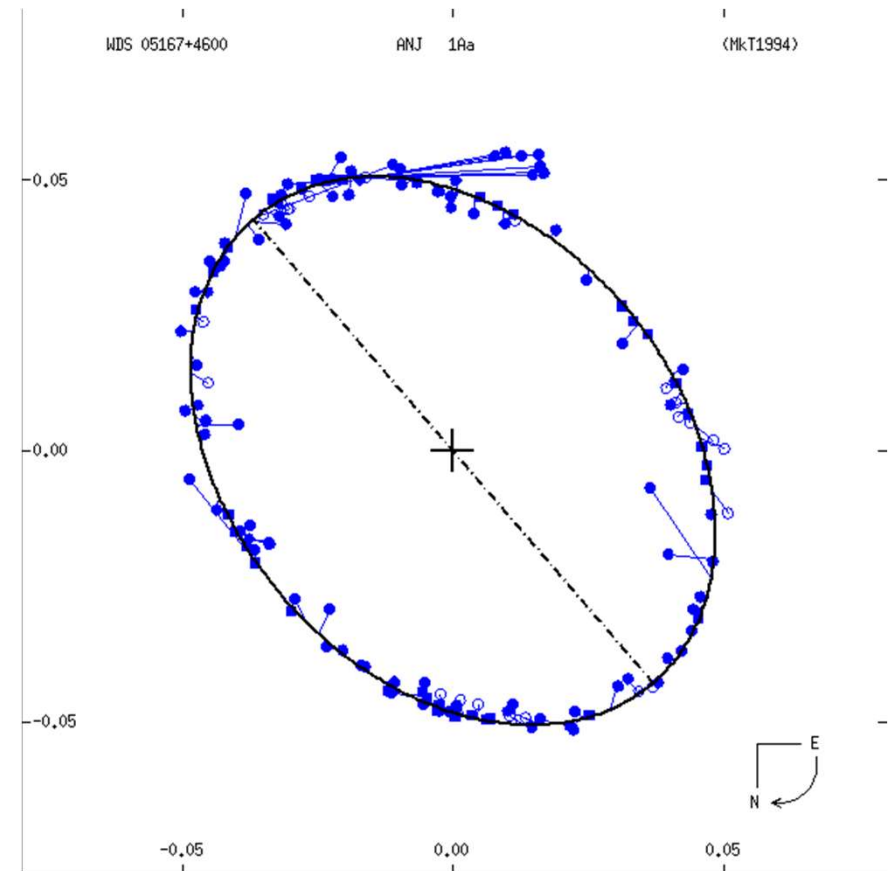
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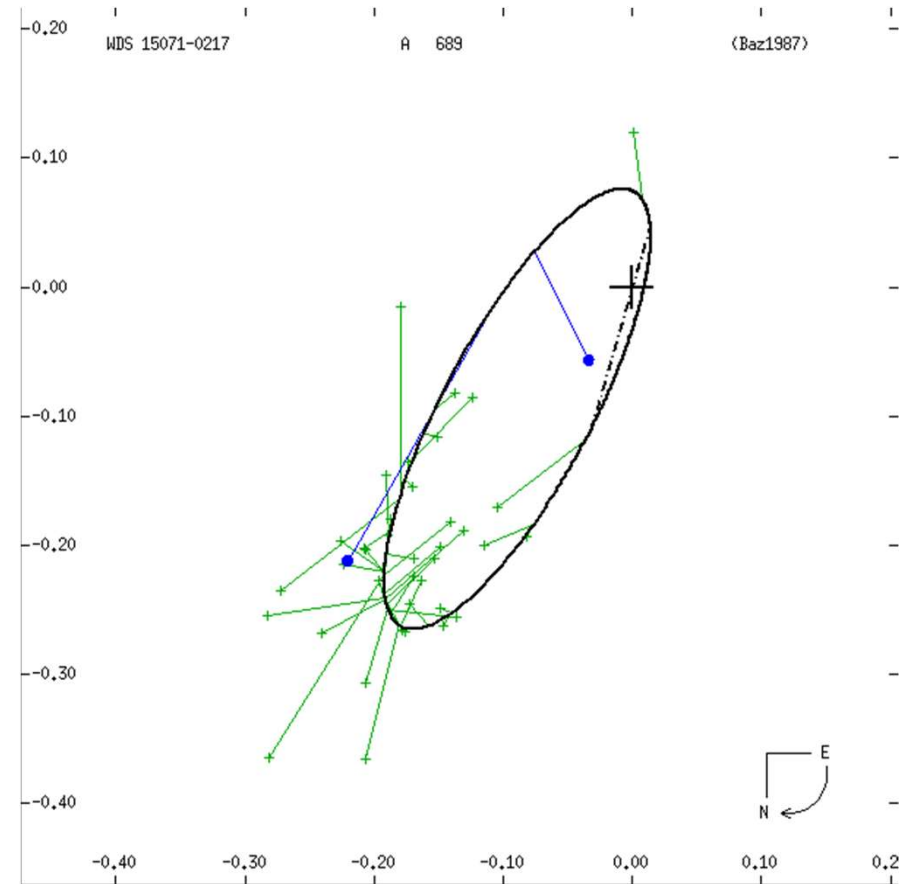




## 6<sup>th</sup> Orbital Catalog Orbital Legend

### Grade 5 Orbit

- Green plus signs indicate visual (micrometric) observations
- Violet asterisks photographic measures
- Blue symbols various interferometric techniques
  - Open circles – Eyepiece interferometry
  - Filled circles – Speckle or other single-aperture techniques
  - Filled squares - Multi-aperture techniques
- Red "H" or "T" indicates a measure from Hipparcos or Tycho
- Dot-dash line indicates the line of nodes
- Scales are in arcseconds
- Curved arrow at lower right indicates direction of orbital motion.



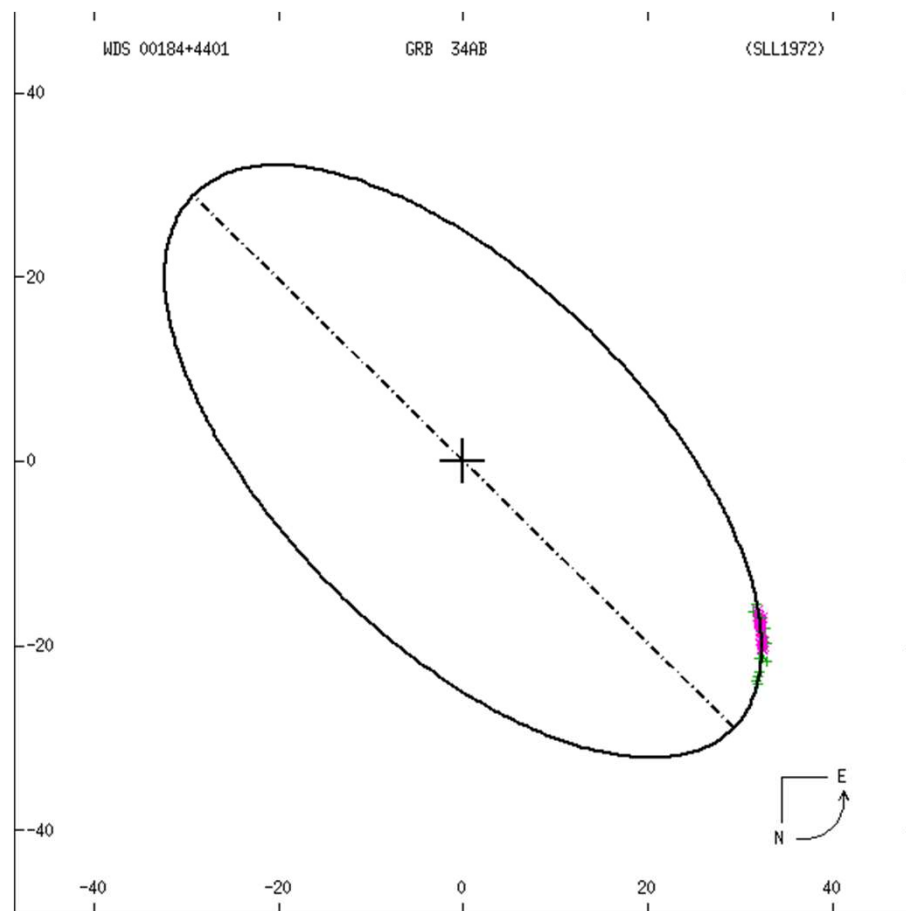
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## 6<sup>th</sup> Orbital Catalog Orbital Legend

### Grade 5 Orbit: Short Arc Binary Candidate

- Green plus signs indicate visual (micrometric) observations
- Violet asterisks photographic measures
- Blue symbols various interferometric techniques
  - Open circles – Eyepiece interferometry
  - Filled circles – Speckle or other single-aperture techniques
  - Filled squares - Multi-aperture techniques
- Red "H" or "T" indicates a measure from Hipparcos or Tycho
- Dot-dash line indicates the line of nodes
- Scales are in arcseconds
- Curved arrow at lower right indicates direction of orbital motion.



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**Questions?**