

# Minima of 126 Eclipsing Binary Stars

**Stephen P. Cook**

*Project Worldview, 910 Oak Terrace Drive, Prescott, AZ 86301; scook@projectworldview.org*

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**Abstract** Previously unpublished times of minima for 126 eclipsing binary stars are reported based on the author's CCD photometry—typically conducted in the 2015–2023 time frame.

## 1. Presenting the TOM and accompanying data

The accompanying list (Table 1) contains times of minima (TOM) for 126 eclipsing binary (EB) stars derived from CCD observations made by the author, nearly all using a 130-mm f/5 reflector with ST6 CCD imager and V filter. An observed TOM (and associated mean error) was the end result of applying the method of Kwee and van Woerden (1956) and making a heliocentric correction. The raw data starting point for this are all available online, identified by observer code CK in the AAVSO International Database (Kafka 2015–2023).

Table 1 will be web-archived and made available through the AAVSO ftp site at:

<ftp://ftp.aavso.org/public/datasets/3885-Cook-511-eb126.txt>.

Using the linear elements (epoch and period) and associated cycle number (all presented in Table 1), a computed TOM was determined, and subtracted from the observed TOM to get the O–C values also displayed there. The elements used (for all of the stars except four) are from the Krakow Astronomica group's TIDAK database (Kreiner 2004).

These elements provide the historical average ephemeris presented in the lower left corners of the O–C diagrams found on the webpages for thousands of EB stars on this website. Note sometimes these have an epoch similar, if not identical to, that given in the *General Catalogue of Variable Stars* (GCVS; Kholopov *et al.* 1985). They are not to be confused with current best prediction ephemeris elements also found in the TIDAK

database web pages and referred to as the light elements. The four stars which are exceptions—where the elements used are from the AAVSO Variable Star Index (VSX; Watson *et al.* 2014)—are V1811 Aql, V830 Cep, V667 Ser, and V1417 Tau.

## 2. Acknowledgements

The author wishes to thank Gerry Samolyk for helping him appreciate some of the fine points in applying the method of Kwee and van Woerden, and Lew Cook for putting together the heliocentric correction calculation spreadsheet, which he has made heavy use of.

## References

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- Kreiner, J. M. 2004, *Acta Astron.*, **54**, 207 (<https://www.as.up.krakow.pl/ephem/>).
- Kwee, K. K., and van Woerden, H. 1956, *Bull. Astron. Inst. Netherlands*, **12**, 327.
- Watson, C., Henden, A. A., and Price, C. A. 2014, AAVSO International Variable Star Index VSX (Watson+, 2006–2014; <https://www.aavso.org/vsx>).

Table 1. Recent times of minima of stars in the AAVSO eclipsing binary program.

<i>Star</i>	<i>Heliocentric Min.</i> JD 2400000+	<i>Mean Error</i> (d)	<i>Cycle</i>	<i>O-C,</i> (d)	<i>Epoch</i> JD 2400000+	<i>Period</i> (d)
AP And	59209.6911	0.0005	20566	0.0046	26565.4660	1.5872907
QX And	59924.7004	0.0008	31877.5	0.0631	46785.7432	0.41216827
ST Aqr	59892.6678	0.0017	23888	-0.1969	41236.2786	0.78100243
BX Aqr	59838.7880	0.0024	22217	0.1744	25855.3749	1.5296052
EE Aqr	59131.7629	0.0004	35959	-0.0025	40828.7802	0.508995945
EL Aqr	59527.8411	0.0013	23687.5	0.0041	48124.6444	0.48140127
V 889 Aql	59093.7614	0.0013	1875	0.7900	38241.5539	11.120756
V889 Aql	59842.7884	0.0067	1942.5	-0.8340	38241.5539	11.120756
V1719 Aql	59449.7596	0.0047	1843.5	-0.0672	51421.7530	4.3548
V1719 Aql	59460.6617	0.0041	1846	-0.0521	51421.7530	4.3548
V1811 Aql	59435.7873	0.0022	1846	-0.0007	53153.8500	3.403
TX Ari	59978.7458	0.0030	11730	0.0842	28409.4053	2.6913262
WW Aur	58897.7025	0.0041	6930	0.0138	41399.3043	2.525019399
GI Aur	59984.6687	0.0022	27890	-0.0010	26297.5048	1.20785819
HL Aur	59983.7279	0.0017	19390	-0.0063	47913.3495	0.622505659
V364 Aur	59616.6825	0.0023	29709	0.0068	38849.3589	0.69902443
V364 Aur	59983.6691	0.0015	30234	0.0056	38849.3589	0.69902443
MT Boo	59045.6840	0.0040	20883	0.0484	51416.4378	0.36533055
S Cnc	59292.5489	0.0043	2352	-0.0919	36985.0310	9.484528
SW Cnc	59347.6931	0.0010	16036	-0.0262	30495.6503	1.7992061
TX Cnc	59292.7538	0.0012	64945	0.0135	34426.4633	0.382882085
VZ CVn	59334.7041	0.0011	24279	0.0003	38880.5821	0.842461458
VZ CVn	59703.6998	0.0007	24717	-0.0022	38880.5821	0.842461458
GG CVn	59708.7750	0.0008	16080.5	-0.0163	53502.5511	0.38594821
AF Cap	59157.6899	0.0026	3522	0.0356	38252.4046	5.9356189
TV Cas	59891.6797	0.0012	9295	-0.1238	43043.6189	1.81260727
XX Cas	59178.7492	0.0011	7385	0.0147	36527.6220	3.0671784
CR Cas	59163.7306	0.0018	6562	0.2350	40526.2180	2.8401825
CR Cas	59200.6107	0.0019	6575	0.1928	40526.2180	2.8401825
DN Cas	59173.6559	0.0022	7696	-0.0001	41388.5640	2.3109527
DO Cas	59216.6656	0.0011	36938	0.0168	33926.4585	0.684665936
DZ Cas	59922.6158	0.0021	40118	-0.0308	28434.5740	0.7848864
V380 Cas	59202.6485	0.0009	1397	0.0003	55410.4377	2.71453867
V520 Cas	59932.7443	0.0035	38271	0.0088	41186.3670	0.48983221
V520 Cas	59935.6839	0.0021	38277	0.0094	41186.3670	0.48983221
V523 Cas	59813.9279	0.0003	79564.5	0.0721	41220.3880	0.2336905
V541 Cas	59522.7072	0.0006	14904	0.0053	45962.3067	0.90984938
V559 Cas	59610.7115	0.0016	11548	0.0068	41357.5595	1.58063259
V1112 Cas	59140.6914	0.0016	3646	0.0018	51378.6320	2.12892419
V1112 Cas	59206.6871	0.0014	3677	0.0009	51378.6320	2.12892419
V1141 Cas	59267.4195	0.0041	1118	0.4622	51542.5020	6.9091729
V1160 Cas	59144.7573	0.0015	3588	0.0024	51490.8753	2.13318828
SU Cep	59431.6766	0.0017	36727.5	-0.0059	26325.4637	0.901401369
WX Cep	59136.6082	0.0015	10078	0.0096	25088.5362	3.3784543
XZ Cep	59124.7288	0.0005	6492	-0.0385	26033.4391	5.0972471
AI Cep	59431.7336	0.0020	7782	0.0650	26550.2890	4.2253122
CQ Cep	59822.6930	0.0028	16674	-0.0873	32456.6654	1.64124475
CW Cep	59220.6778	0.0010	6431	0.0052	41669.5719	2.7291402
EG Cep	59124.7508	0.0005	24869	0.0107	45580.5475	0.544621521
FS Cep	59870.7048	0.0029	24445	0.0795	26930.4500	1.347522
GI Cep	59109.6623	0.0019	21427	-0.0716	36875.4104	1.03767786
GI Cep	59112.7782	0.0012	21430	-0.0687	36875.4104	1.03767786
GW Cep	59867.6831	0.0007	66541.5	0.0164	38652.1923	0.31883072
IP Cep	59873.7538	0.0046	25655	-0.0043	36812.4193	0.89890231
V358 Cep	59872.6787	0.0029	30944	-0.0808	45241.4702	0.47283122
V711 Cep	59220.6701	0.0028	6276	-0.0112	51034.5337	1.30435749
V800 Cep	59872.8061	0.0030	6885	-0.0021	51486.5470	1.2180481
V830 Cep	59870.6445	0.0067	32850.5	-0.0118	51325.6500	0.260118
V898 Cep	59123.6978	0.0016	2699.5	-0.2957	51363.5464	2.874772
V919 Cep	59116.6826	0.0011	4223	-0.0206	51295.7840	1.8519818
V922 Cep	59117.6276	0.0007	2101	-0.1423	51606.7550	3.5749714
V957 Cep	59429.7582	0.0012	3985	-0.0808	51504.7300	1.988735
EK Com	59344.7605	0.0013	37294	-0.0150	49398.9783	0.266686256
WZ Cyg	59142.7104	0.0007	31340	0.0266	40825.4880	0.584467
CV Cyg	59134.7086	0.0013	35265	-0.1577	24454.4669	0.98342264
V366 Cyg	59798.8519	0.0024	23092	0.0044	34489.5930	1.0960183
V370 Cyg	59882.6530	0.0016	32604	-0.0128	34629.4740	0.77454275
V753 Cyg	59518.6524	0.0017	27000	-0.0018	33804.4633	0.95237744

Table continued on next page

Table 1. Recent times of minima of stars in the AAVSO eclipsing binary program, cont.

<i>Star</i>	<i>Heliocentric Min.</i> JD 2400000+	<i>Mean Error</i> (d)	<i>Cycle</i>	<i>O-C,</i> (d)	<i>Epoch</i> JD 2400000+	<i>Period</i> (d)
V787 Cyg	59515.6992	0.0006	28170	-0.0019	16457.4260	1.52851527
V859 Cyg	59530.5842	0.0019	61484	0.0689	34629.4141	0.40500132
V1061 Cyg	59102.7849	0.0021	13955	-0.0118	26355.2150	2.3466558
AL Del	59878.6447	0.0039	22936	-0.0107	25807.5191	1.48548728
LS Del	59826.6619	0.0042	33081	0.0196	47790.4317	0.36384059
RR Dra	59837.6100	0.0026	15121	0.5692	17026.3840	2.8312054
RZ Dra	57973.7132	0.0008	25044	0.0098	44177.5609	0.55087616
SX Dra	59769.6263	0.0079	2914	0.5404	44705.6607	5.1693292
AR Dra	59706.7506	0.0011	24914	0.0257	42868.9122	0.67583739
AU Dra	59828.6658	0.0011	17580	-0.0345	50770.3112	0.51526673
BE Dra	59830.7043	0.0009	45002	0.0235	36317.3829	0.52249451
BF Dra	59361.8889	0.0024	1078	0.1033	47276.3491	11.21098
BS Dra	59364.7019	0.0009	5322	0.0112	41461.4248	3.36401088
V391 Dra	59769.6797	0.0030	6869	-0.0073	51310.7020	1.23147256
V441 Dra	59136.7674	0.0017	2684	-0.0092	51338.6830	2.9054
BZ Eri	60003.6329	0.0020	25848	-0.0031	42836.1697	0.664170006
AY Gem	59994.7288	0.0030	7651	-0.0116	36631.3219	3.05364246
LT Her	57975.6807	0.0020	15885	-0.0002	40755.7797	1.08403533
RX Hya	59348.6401	0.0013	6969	0.3520	43447.7480	2.28161
FW Hya	58607.6838	0.0016	16314	-0.0045	51982.0292	0.40613333
VY Lac	59139.6617	0.0005	23653	-0.0025	34629.3871	1.036243903
CN Lac	59523.7848	0.0039	11657.5	-0.0316	52093.8126	0.63735825
V Lep	59279.7061	0.0019	37758.5	0.1415	18873.6810	1.07011358
Y Leo	57874.6742	0.0004	14344	-0.0737	33689.4880	1.68608895
RW Leo	59377.8170	0.0069	9541	-0.0362	43324.7374	1.68254017
AG Leo	59684.6124	0.0056	9737	0.1050	26651.5918	3.3925147
AL Leo	59732.7347	0.0013	7417	0.0038	47824.6206	1.60551575
DU Leo	59685.6901	0.0008	8250	0.0098	48348.6580	1.37418452
EX Leo	59711.6964	0.0025	27439	0.0122	48499.9966	0.40860409
RZ Lyn	59691.7104	0.0014	29687	-0.0475	25643.3519	1.14691299
UV Lyn	59690.6657	0.0013	46795	0.0938	40271.5304	0.41498112
CD Lyn	60036.6739	0.0047	2432	-0.0168	54504.5210	2.27474081
UZ Lyr	57974.6718	0.0004	7553	-0.0166	43689.9496	1.89126689
EW Lyr	57630.8227	0.0005	15975	-0.0255	26499.6986	1.94874176
PR Mon	60026.7274	0.0037	3169	-0.0868	51870.6227	2.573743
VY Mic	59150.6111	0.0023	1563	-0.0421	52216.5600	4.4364
RV Oph	59817.7651	0.0015	9715	-0.0034	23997.3830	3.68712152
ER Ori	57443.6640	0.0005	33899.5	0.0721	43090.5353	0.423400246
EW Ori	60021.6744	0.0004	4682	-0.0925	27543.4670	6.9368432
DF Peg	59169.6680	0.0043	1746	-0.1010	33505.6467	14.69881
ER Peg	59181.5448	0.0012	6003	-0.0504	45526.5879	2.2746972
GH Peg	59171.6293	0.0012	12724	0.0009	26647.3450	2.5561367
KL Per	59629.6659	0.0018	10701	-0.0113	35840.3580	2.2230931
NZ Per	59607.6530	0.0026	33436	-0.0121	28247.3520	0.9379206
V427 Per	59620.6679	0.0029	7927	0.0189	37345.3430	2.810055
AQ Psc	59930.7234	0.0015	20179	-0.0858	50333.4784	0.47560983
DV Psc	59971.6267	0.0007	27614	-0.0091	51451.7177	0.308536181
RZ Pyx	58587.6192	0.0022	18384.5	0.0150	46522.3407	0.656273684
TX Pyx	58612.6690	0.0021	17969	-0.2458	48500.6294	0.56276284
CU Sge	59847.6705	0.0009	21744	-0.0020	42633.4813	0.79167546
CW Sge	59847.7932	0.0045	33840	0.0683	37501.1608	0.66035946
RS Sct	59166.6209	0.0016	22175	-0.0367	44437.1717	0.664238371
RS Sct	59170.6051	0.0008	22181	-0.0379	44437.1717	0.664238371
RS Sct	49573.7207	0.0014	7733	-0.0063	44437.1717	0.664238371
V667 Ser	59877.6512	0.0012	2248	0.0044	57681.5070	0.9769305
RZ Tau	57428.6806	0.0008	47518	0.1047	37676.5928	0.415673705
AH Tau	59978.6423	0.0017	84636.5	-0.0589	31822.3653	0.33267368
GW Tau	59635.6886	0.0007	66636	-0.1400	16900.2260	0.64132905
V1130 Tau	59661.7031	0.0007	8816.5	0.0077	52618.4781	0.798867726
V1241 Tau	59250.6587	0.0008	38528	0.0044	27531.6838	0.823270623
V1417 Tau	59970.7240	0.0013	5726	0.0179	54439.7050	0.965945
UX UMa	58637.7133	0.0008	159131	-0.0061	27341.2240	0.196671267
CX Vir	59372.7347	0.0014	44607	0.0357	26092.4440	0.74607696
DM Vir	59737.7841	0.0023	4315	-0.0002	39589.1817	4.66943281
FQ Vir	59792.7328	0.0008	10525	0.0124	51903.1506	0.74960283
AW Vul	59433.8079	0.0009	16304	-0.0296	46285.4605	0.806450989
BT Vul	59434.7185	0.0015	21059	0.0127	35402.1750	1.1412
CD Vul	59451.7040	0.0010	19237	-0.0074	46298.5050	0.6837452