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National Space Science Data Center/
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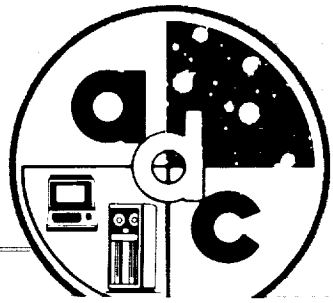
LICK JUPITER-VOYAGER REFERENCE STAR CATALOGUE

(Klemola, Morabito, and Taraji 1978)

Documentation for the Machine-Readable Version



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LICK JUPITER-VOYAGER REFERENCE STAR CATALOGUE

(Klemola, Morabito, and Taraji 1978)

Documentation for the Machine-Readable Version

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February 1990

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Abstract

The machine-readable version of the catalog, as it is currently being distributed from the Astronomical Data Center, is described. The catalog contains accurate equatorial coordinates for 4983 stars in a band of sky against which cameras of the Voyager spacecraft were pointed for observations in the region of Jupiter during the flyby. All of the reference stars are in the range $6^h\ 00^m$ to $8^h\ 04^m$ in right ascension (1950), declination zones $+16°$ to $+23°$, and $8^h\ 31^m$ to $8^h\ 57^m$, zones $+08°$ to $+14°$. Mean errors of the positions are about 0.″4.

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1.0 Introduction

1.1 Description

The *Lick Jupiter-Voyager Reference Star Catalogue* (Klemola, Morabito, and Taraji 1978) was prepared for purposes of determining up-to-date, reasonably accurate, equatorial coordinates for reference stars in a band of sky against which cameras of the Voyager spacecraft were aligned for observations of Jovian satellites during the Jupiter flyby. The requirements were a surface density of three to four reference stars per observation frame of 24 arcmin^2 of the cameras — somewhat greater that provided by the AGK3 catalog (Dieckvoss *et al.* 1975) — and a positional accuracy $\cong 0''.5$. Visual magnitudes were also required. The completed catalog contains 4983 stars in the right ascension ranges $6^h\ 00^m$ to $8^h\ 04^m$, declination zones $+16°$ to $+23°$, and $8^h\ 31^m$ to $8^h\ 57^m$, declination zones $+08°$ to $+14°$. Mean errors of the positions, as derived from least squares solutions against the AGK3 reference stars, are about $0''.4$; however, individual residuals are fairly numerous in the range $0''.6$ to $0''.8$, with some in the range $1''.0$ to $1''.3$. The accidental error of one measurement, as deduced from a tabular histogram given in the original catalog publication (referenced below), is about $0''.11$. Apparent photographic and visual magnitudes were derived from iris photometer measurements, m_v being approximated from a derived color-index relation using the AGK3 reference stars. The resulting magnitudes appear to have mean errors of at least $0^m.2$, while very blue and very red stars (C.I. $\lesssim 0^m.0$, $\gtrsim 1^m.5$, respectively) are less certain. The magnitudes are considered to be only approximate (residuals $\cong 0^m.5$ fairly common).

This document describes the machine-readable version of the *Lick Jupiter-Voyager Reference Star Catalogue* as it is currently being distributed from the Astronomical Data Center (ADC). It is intended to enable users to read and process the computerized catalog without problems and guesswork. For additional information concerning the observations and reductions, the original publication (available from A. R. Klemola) should be consulted. **A copy of this document should be transmitted to any recipient of the machine-readable catalog.**

1.2 Source Reference

Klemola, A. R. (Lick Obs.), Morabito, L., and Taraji, H. (Jet Propulsion Lab.) 1978, *Lick Jupiter-Voyager Reference Star Catalogue*, Lick Observatory, University of California, Santa Cruz.

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2.0 Structure

2.1 File Summary

The machine version of the *Lick Jupiter-Voyager Reference Star Catalogue* consists of a single file. Table 1 gives the machine-independent file attributes. All logical records are of fixed length, and, if the catalog is received on magnetic tape, it will contain blocks of fixed length (as noted below), except that the last block may be short.

Lick Jupiter-Voyager Reference Star Catalogue (Klemola, Morabito, and Taraji 1978)				
File	Contents	Record Format	Logical Record Length	Total Number of Logical Records
1	Catalog	FB	56	4983

Table 1. Summary Description of Catalog Files: FB = Fixed length blocks (last may be short)

The information contained in the above table is sufficient for a user to describe the indigenous characteristics of the machine-readable version of the *Lick Jupiter-Voyager Reference Star Catalogue* to a computer. Information easily varied from installation to installation, such as block size (physical record length), blocking factor (number of logical records per physical record), total number of blocks, density, number of tracks, and character coding (ASCII, EBCDIC) for tapes is not included, but should always accompany secondary copies if any are supplied to other users or installations.

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2.2 *Catalog (File 1 of 1)*

Table 2 gives a byte-by-byte description of the contents of the data file. A suggested Fortran format specification for reading each data field is included and can be modified depending upon individual programming and processing requirements (Fortran 77 character string-type formats are used); however, caution is advised when substituting format specifications, since certain fields contain character data and others are blank when data are absent. Particular care is necessary with the proper-motion data, where missing data will be read as zeros, but where valid zero values may exist. (Under certain circumstances, this might also be true for magnitude data, but there are no bright stars in this catalog.) For such fields, primary numerical format specifications are given to indicate decimal point locations, while alternate A-type formats are specified in parentheses. Default (null) values are always blanks in data fields for which primary suggested formats are given as A. Where no default values are given for numerical fields, there are always valid data present.

Byte(s)	Units	Suggested Format	Default Value	Data
1-4	---	I4	---	Running star number
5-8	---	I4	---	Plate number
9-10	hours	I2	---	Right ascension, α
11-12	min	I2	---	α
13-18	sec	F6.3	---	α
19	---	A1	---	Sign of declination zone
20-21	°	I2	---	Declination, δ
22-23	′	I2	---	δ
24-28	″	F5.2	---	δ
29-33	mag	F5.2 (A5)	blank	Photographic magnitude
34-38	mag	F5.2	---	Visual magnitude
39	---	A1	---	AGK3 zone sign
40-41	---	I2 (A2)	---	AGK3 zone
42-46	---	I5 (A5)	---	AGK3 number
47-51	″	F5.1 (A5)	blank	Proper motion in α
52-56	″	F5.1 (A5)	blank	Proper motion in δ

Table 2. Catalog Record Format

Running star number — A running star number denoting the order in which stars were selected for measurement on each plate.

Plate number — Four-digit plate number.

Equatorial coordinates — Equinox 1950, epoch 1978.27.

Photographic magnitude — Apparent photographic magnitude, m_{pg}, as determined from iris photometry.

Visual magnitude — Apparent visual magnitude, m_v, approximated from m_{pg} and a derived color-index relation using the AGK3 reference stars.

AGK3 identification — AGK3 identification number.

Proper motions — The centennial proper motions (μ_α, μ_δ). These data are taken from the AGK3 catalog. The proper motions in right ascension are given as the great circle measures ($\mu_\alpha \cos \delta$).

3.0 History

3.1 Remarks and Modifications

A magnetic tape containing the catalog, in binary format, was received from Dr. A. R. Klemola in November 1981. The data were converted to character-coded form and written to a direct access storage device for editing. The following modifications were made to the data in order to effect a more uniform format and to standardize the data representation:

1. Plus signs were added to all positive declination zones.

2. Missing data were converted from zeros to blanks. Since there are valid zero proper-motion data in the catalog, the source reference had to be scanned visually to locate all these values so that they could be converted back to zeros again. In the original machine-readable file, there was no way to tell between zero proper motions and missing values.

3. All AGK3 numbers were converted to the representation +XX XXXX.

4. The catalog was sorted by increasing right ascension (the stars were originally in some kind of plate or measurements order).

A copy of the catalog, originally archived and documented at the ADC in 1982, was sent to W. M. Owen, Jr. of the NASA Jet Propulsion Laboratory, in January 1990. Mr. Owen, having collaborated with Dr. Klemola in the preparation of the Lick Reference catalogs for the Uranus and Neptune encounters, reviewed the catalog and made the following modifications to the file:

1. AGK3 designations and proper motions were added for 44 stars not previously identified as AGK3 stars.
2. Three duplicate entries were deleted from the catalog, the positions and magnitudes of the redundant entries having been averaged for the remaining single entries.
3. Star 416/8627 (AGK3 + 18 648) was given as + 18 647, but the proper motions were correct. The error was fixed.
4. Zero proper motions (AGK3 values) were given as blanks for star 690/8630; the zeros were restored to the record.
5. Erroneous AGK3 proper motions for star 154/8630 (AGK3 +09 1124) were replaced by values of $-0''.7$ and $-0''.1$, as given by Lopez (1988).

The corrected catalog was returned to the ADC, where it was rearchived as catalog 1152.

4.0 Acknowledgments and References

4.1 Acknowledgments

Appreciation is expressed to A. R. Klemola for providing the magnetic tape of the catalog and for reviewing the modifications made to the data. Dr. Klemola also kindly reviewed a draft copy of this document before its completion and printing.

The work of W. M. (Bill) Owen, Jr., in correcting and updating the earlier version of the catalog, is gratefully acknowledged, as are his comments on the statistical accuracy of the positions and the revised documentation.

4.2 References

Dieckvoss, W., Kox, H., Günther, A., and Brosterhus, E. 1975, *AGK3. Star catalogue of positions and proper motions north of -2°.5 declination, derived from plates taken at Bergedorf and Bonn in the years 1928-1932 and 1956-1963*, Hamburger Sternwarte, Hamburg-Bergedorf.

Klemola, A. R. (Lick Obs.), Morabito, L., and Taraji, H. (Jet Propulsion Lab.) 1979, *Lick Jupiter-Voyager Reference Star Catalogue*, Lick Observatory, University of California, Santa Cruz.

Lopez, C. E. 1988, *Publ. Astron. Soc. Pac.* **100**, 1273.

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5.0 Sample Listing

The sample listing given on the following pages shows logical records exactly as they are recorded in the machine-readable version of the catalog. Groups of records from the beginning and end of the file are illustrated. The beginning of each record and the bytes within the record are indicated by the column heading index across the top of each page (digits read vertically).

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L I S T I N G O F R E C O R D S F R O M D A T A F I L E

Data File Name: Jupiter-Voyager Rf Stars

Records 1 to 20

Data File 53

Record Length 56 bytes

Input VOLSER ADC001

```
C O L U M N
H E A D I N G          1111111111222222222233333333334444444444555555555566666666667777777777888888888889999
I N D E X      12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123

Record      1  8948623 6 056.894+23 047.0511.8810.94
Record      2  7818623 6 1 7.330+2229 9.59 9.86 9.90+22  631  0.4 -1.3
Record      3  8388623 6 111.089+223817.8110.79 9.91
Record      4   318623 6 115.071+21 552.5110.3810.08+21  614 -0.5 -0.9
Record      5  7188623 6 118.348+221011.6510.5710.09+22  632 -1.3  2.0
Record      6  4528623 6 119.519+201152.46 9.28 8.72+20  618 -1.0 -1.1
Record      7  5428623 6 130.756+2047 4.4311.6110.80
Record      8  4518623 6 131.317+194154.1610.1910.14
Record      9  8958623 6 131.762+2323 0.45 9.94 9.40+23  597 -1.6  0.3
Record     10  5418623 6 136.670+2026 5.00 8.99 8.86+20  621 -1.0 -2.4
Record     11  6178623 6 136.780+21 350.4211.24 9.70
Record     12  8968623 6 138.079+231543.9111.2010.03
Record     13   328623 6 138.574+212357.14 8.40 8.27+21  615 -2.7  1.0
Record     14    78623 6 143.859+1856 0.8010.80 9.32+18  551  0.6 -0.6
Record     15  7198623 6 151.743+22 157.06 9.69 9.56
Record     16  7828623 6 153.142+2219 1.0810.45 9.57
Record     17  1578623 6 156.577+181457.1410.16 9.96
Record     18  8398623 6 2 0.996+224828.3910.6210.30
Record     19    88623 6 2 3.128+181855.05 8.80 8.50+18  552  1.1 -2.0
Record     20  6628623 6 2 6.931+2138 0.08 9.01 8.99+21  619 -0.7 -0.1
```

L I S T I N G O F R E C O R D S F R O M D A T A F I L E

Data File Name: Jupiter-Voyager Rf Stars
Records 4964 to 4983
Data File 53
Record Length 56 bytes
Input VOLSER ADC001

```
COLUMN
HEADING          1111111111222222222233333333334444444444555555555566666666667777777778888888889999
INDEX      12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123
```

```
Record    4964  1088630 85614.861+ 84013.8211.6610.29
Record    4965  6138630 85621.365+125359.08 9.29 8.96+12 1095 -3.4  2.0
Record    4966  5408630 85628.493+122532.9110.57 9.95
Record    4967  3218630 85628.559+104438.9711.4510.68
Record    4968  1778630 85630.437+ 92944.19 9.87 9.37
Record    4969  2498630 85630.577+10 4 5.0410.65 9.81
Record    4970  7418630 85636.771+141026.2910.09 9.77+14  971 -1.3 -1.5
Record    4971  6858630 85637.039+134517.8212.0911.14
Record    4972   218630 85638.208+ 91038.52 6.94 7.27+09 1157 -0.8 -0.9
Record    4973  3968630 85639.769+1115 2.9310.29 9.72
Record    4974  3208630 85640.220+103018.2811.1610.25
Record    4975  1078630 85641.930+ 81242.9910.30 9.90
Record    4976   528630 85642.018+131610.40 8.18 6.46+13  906 -1.1 -1.6
Record    4977   558630 85642.145+ 8 441.6311.6610.63
Record    4978  5418630 85643.736+124616.4110.9710.04
Record    4979  2488630 85644.326+ 944 1.5610.9210.01
Record    4980  3958630 85648.160+11 343.8711.3610.64
Record    4981  4688630 85654.622+12 737.87 8.63 8.31+12 1096  0.2 -3.5
Record    4982  6868630 857 1.008+14 440.2811.8010.95
Record    4983  4678630 857 1.367+1147 5.4110.03 9.44+11 1055  1.0 -3.4
```