The NLTT Catalogue and First Supplement

(Luyten 1979, 1980)
(Luyten and Hughes 1980)

Documentation for the Computer-Readable Version

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Abstract

The machine-readable version of the catalog, prepared initially by reading the published version with optical character recognition equipment and transferring the data to a computer, is described. The *First Supplement*, as computerized at the Astronomisches Rechen-Institut in Heidelberg, was reformatted and merged into the main catalog to prepare a comprehensive and uniform data file ordered by right ascension. The remarks, included with the data in the published catalog, have been separated and placed into a second file. Additional supplements will similarly be merged into the existing data file if they become available.

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1 Introduction

1.1 Description

The *NLTT Catalogue* (Luyten 1979, 1980) is a collection of stars on more than 800 *Palomar Proper Motion Survey* plates found to have relative annual proper motions exceeding $0\farcs18$. The motions have been determined by Luyten and his coworkers by either hand blinking and measuring or with the automated-computerized scanner and measuring machine built by Control Data Corporation and located at the University of Minnesota. The new catalog replaces the *LTT Catalogues* (Luyten 1957, 1961, 1962), wherein stars in the *Bruce Proper Motion Survey* discovered to have motions exceeding $0\farcs2$ had been compiled. For further information on the *NLTT Catalogue* itself, including discussions of positional errors, estimation of magnitudes, star designations used in the catalog, completeness, and accuracy of the measured motions, the introduction to the published NLTT (see Volume I) should be consulted.

The *First Supplement to the NLTT Catalogue* (Luyten and Hughes 1980) is the result of continued plate analysis and measurements during printing of the NLTT. The *Supplement* contains data for 398 stars having motions larger than $0\farcs179$ annually.

A detailed discussion of the computerization of the catalog can be found in Section 3 of this document. The document describes the machine-readable version of the *NLTT Catalogue and First Supplement* as it is currently being distributed from the Astronomical Data Center (ADC). It is only intended to facilitate the processing and use of the data in the machine version. As mentioned above, users should consult the source publication for additional details. **A copy of this document should be transmitted to any recipient of the machine-readable catalog.**

1.2 Source References

Luyten, W. J. 1979, 1980, *New Luyten Catalogue of Stars with Proper Motions Larger than Two Tenths of an Arcsecond* (Minneapolis: University of Minnesota).

Luyten, W. J. and Hughes, H. S. 1980, *Proper Motion Survey with the Forty-Eight Inch Schmidt Telescope. LV. First Supplement to the NLTT Catalogue* (Minneapolis: University of Minnesota).

2 Structure

2.1 File Summary

The machine version of the *NLTT Catalogue and First Supplement* consists of two files. 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. The first file contains the basic data of the catalog, while the second contains the notes for particular stars, as flagged in the individual records of the first file.

NLTT Catalogue and First Supplement				
File	Contents	Record Format	Record Length	Number of Records
1	Data	Fixed	65	58845
2	Notes	Fixed	90	5843

Table 1: Summary Description of Catalog Files

The information contained in the above table is sufficient for a user to describe the indigenous characteristics of the machine-readable version of the *NLTT Catalogue and First Supplement* 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.

2.2 Catalog (File 1 of 2)

This file contains the basic data of the catalog, which are the positions, magnitudes, spectral or color classes, and proper motions of the cataloged stars. The remarks flagged by asterisks in the star-identification field are contained in the notes file described in Section 2.3.

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 many data fields contain character data and others are blank when data are absent. Default (null) values are always blanks in data fields for which primary suggested formats are given as A.

Star identification Star designation in one of a variety of other catalogs. Identifiers from the *Bonner* and *Córdoba Durchmusterungen* are used when they exist. Other miscellaneous identifiers (Oxf = *Oxford Astrographic Catalogue* [AC]; Grw = *Greenwich AC*; U = Upgren; R = Ross, etc.) are used for non-DM stars. Identifiers without prefixes are DM or Luyten numbers from the *Bruce Proper Motion Survey* (L numbers) or the *Luyten-Palomar Survey* (LP numbers), the former in zones $-45°$ to $-89°$ and the latter in zones $+89°$ to $-44°$. Alternate identifiers are sometimes given in the notes. An asterisk (*) in the identification field indicates that a note will be found in the "notes" file of the catalog. The miscellaneous designations can be found in Fernandez *et al.* (1983) and Lortet and Spite (1986).

Equatorial coordinates Positions are for equinox 1950 at epoch, with the precision varying (bytes 21-22 and 38 sometimes blank).

Bytes	Units	Suggested Format	Default Value	Data
1-14	—	A14	—	Star identification
15-16	hours	I2	—	Right ascension
17	—	1X	—	Blank
18-19	min	I2	—	R.A.
20	—	1X	—	Blank
21-22	sec	I2	blank	R.A.
23	—	1X	—	Blank
24-27	min	F4.1	—	R.A.
28	—	1X	—	Blank
29	—	I1	—	Right ascension precision flag
30	—	1X	—	Blank
31	—	A1	—	Sign of declination
32-33	deg	I2	—	Dec.
34	—	1X	—	Blank
35-38	arcmin	F4.1	—	Dec.
39	—	1X	—	Blank
40-43	mag	F4.1	blank	Red magnitude
44	—	A1	—	Red magnitude flag
45-48	mag	F4.1	blank	Photographic magnitude
49	—	A1	—	Photographic magnitude flag
50-52	—	A3	—	Spectral class or type
53	—	1X	—	Blank
54-58	arcsec/yr	F5.3	—	Relative proper motion, μ (annual)
59	—	A1	—	Relative proper-motion uncertainty flag
60-62	deg	I3	—	Position angle of proper motion, θ
63	—	A1	—	Position-angle uncertainty flag
64	—	A1	—	Addenda flag
65	—	A1	—	Supplement flag

Table 2: Data File Record Format

Right ascension flag Due to the varying precision of the reported positions in the published catalog (right ascensions in the polar caps [$+90°$ to $+80°$; $-45°$ to $-90°$] are reported to minutes and tenths only, while other zones are given to seconds of time) it was necessary to reformat the R.A. data to make them uniform. Therefore, the right ascensions were computed in both seconds of time and minutes plus tenths for all stars. The flag denotes the original format:

- **1** Original R.A. reported in minutes and tenths of time
- **2** Original R.A. reported in seconds of time

Magnitudes Red and photographic magnitudes were estimated by Luyten for stars fainter than 10^{m} *pg*, but some magnitude data fields are blank. Magnitudes for brighter stars were evidently taken from the source catalogs whose identifiers are given, or from a variety of sources.

Magnitude flags A "+" indicates a magnitude fainter than the reported value.

Spectral types Lower case letters represent estimated color classes or ranges, while spectral types are reported where known. All data are left justified in the field, not centered as in the printed version.

Relative proper motion Total proper motion, μ, is reported. The proper-motion vector is defined by the equation:

$$\mu = (\mu_\alpha^2 \cos^2 \delta + \mu_\delta^2)^{1/2}$$

Proper-motion flag A colon (:) indicates uncertainty in μ.

Position angle The direction of the proper-motion vector, as measured in the usual way (north through east). The position angle of μ. is defined by the following set of equations:

$$\mu_\alpha = \mu \sin\theta \quad ; \quad \mu_\delta = \mu \cos\theta$$

Position-angle flag A colon (:) indicates uncertainty.

Addenda flag The letter "A" indicates that data have been changed for the machine-readable version, and the record does not entirely match that of the published catalog. In some cases, the star is entirely new and does not appear in the published catalog. Deleted stars are listed in a separate table in Appendix A of this document – they have been removed from the machine version entirely.

Supplement star flag A "1" denotes a star from the *First Supplement* (Luyten and Hughes 1980). The supplement stars have been merged into the main catalog entirely.

2.3 Notes (File 2 of 2)

This file contains the notes for stars flagged by an asterisk in the identification field of the data file.

Bytes	Units	Suggested Format	Default Value	Data
1-16	—	A16	—	Star identification
17	—	1X	—	Blank
18-19	hours	I2	—	Right ascension
20	—	1X	—	Blank
21-22	min	I2	—	R.A.
23	—	1X	—	Blank
24-25	sec	I2	—	R.A.
26	—	1X	—	Blank
27	—	A1	—	Sign of declination
28-29	deg	I2	—	Dec.
30	—	1X	—	Blank
31-34	arcmin	F4.1	—	Dec.
35	—	1X	—	Blank
36-90	—	A55	—	Note(s)

Table 3: Notes File Record Format

Notes Notes in free text (upper and lower case) form. All notes are contained in single records, *i.e.*, no notes for one star extend to additional records.

3 History

3.1 Remarks and Modifications

The desirability for a machine version of the NLTT was evident immediately upon publication of the catalogs and, although the *Palomar Proper Motion Survey* data for stars of large proper motions reside on magnetic tape in Minneapolis, the tapes have not yet been processed to prepare a usable machine version. A possible format for the NLTT was designed at the ADC in 1980 shortly after the receipt of the final volume of the published catalog, and several pages of volume I were keyed into a computer; however, the project was put aside because of the great effort that it would have involved to key and check the data manually. When interest in a machine version was expressed by Space Telescope Science Institute personnel for use with the *Guide Star Selection System* for the *Hubble Space Telescope*, an automatic method of computerizing the catalog was contemplated and the present collaboration was formed. In 1981 March, we had received information on the Kurzweil Data Entry Machine (KDEM, an optical scanning device) from Intermedia Digital Conversion, Inc. (IDC) in Kensington, Maryland. A visit to the IDC was arranged and sample pages were taken for a demonstration run. The results indicated that the machine would perform satisfactorily as long as high quality source material were used, although there were indications that some data records might be shifted because of varying start positions in the left margin where the star identification field begins each entry. However, we were informed that it might be possible to avoid this problem if the machine could be set up and operated properly. Because of the cost involved for processing of the entire catalog, we decided to investigate other possibilities before making a final decision. A visit to The Johns Hopkins University Applied Physics Laboratory was arranged to examine an optical character recognition (OCR) machine located there, but this machine turned out not to have the capabilities required. (It is restricted to text prepared with a special font and, therefore, could be eliminated from contention immediately.)

Professor Luyten kindly supplied us with an extra copy of the entire NLTT, which was burst and set up for the job, and a contract was let to the IDC to proceed with the work. A question arose about how to process the Greek letters and double characters (*e.g.*, $0\overset{''}{.}10$) included in the catalog, since they could not be translated directly into established hexidecimal character codes. The Kurzweil machine, however, has specific input capability for hexidecimal codes to represent individual characters, and these can be inserted manually when the machine stops at unrecognizable characters. Therefore, a table was provided so that the Greek letters could be inserted manually, as represented by extended EBCDIC codes now used to print on an extended chain printer. The double (overstrike) characters were processed so that they merely followed one another (*e.g.*, 0".10), since this situation could be corrected globally via a machine editor. (The hexidecimal-code insertion technique failed because the codes turned out to be unrecognizable to the computer, but no attempt was made to correct this situation after it was decided that three-letter abbreviations should be substituted for the letters anyway.)

Careful checking and sample proofreading of the final catalog showed that many problems were present:

1. Despite the indicated operational precautions, a significant number of records had been shifted left or right to produce misalignment. This not only occurred at the beginnings of records, but began at various points in the records as well; *i.e.*, the shifting seemed to be random and occurrence was unpredictable.
2. Certain characters were frequently misread (not a significant percentage of the total, but enough to require that review and correction procedures be undertaken). Fortunately, most of these involved the substitution of "S" for "8" and "5", "I" or "L" for "1", and "K" for "k", etc., occurrences that could be identified as out of context via general editor search procedures.
3. A large number of commas had been substituted for decimal points, but these also could be systematically identified as out of place.
4. The machine determined the left margin anew for each page; thus, if an unusual identifier occurred as the first record on a page, groups of records on that page were misaligned.

Attempts were made to write computer programs to find record shifts and correct them automatically, first with a Fortran program, then with assembly language code, but the shifts were so random and sometimes multiple within a record that a universal algorithm could not be developed easily. Since other types of errors also occurred, it was decided to use an editor to simply review terminal screens full of records and fix them in a sequential fashion. This initial editing was done at the ST ScI. No changes were made to the comments fields at that time, however, because the comments were not required for use at ST ScI. In fact, a second version was created there, in which the remarks fields were removed. This short version was then refined by the detection and correction of letters in numerical data fields, etc. The original and refined versions were then processed through a special program that compared records and indicated disagreements. This was not a simple compare program because missing records had been detected and added at various places and because some shifted fields had still not been detected and corrected in the full version. The program was written and run at the ST ScI and the output sent to the ADC for review and analysis.

The analysis was performed not only for the detection of individual errors in the original version, but to formulate general rules for the systematic global correction of cetain types of errors so that each would not require specific editing. In fact, almost all errors occurred in a systematic fashion and could be corrected by a set of predesigned global editing commands.

Since the KDEM read the data exactly as published, the hours of right ascension were missing on all but the first entry of each page. A computer program was written to add these data. The program also checked for the agreement of asterisks in the star identification field for stars having remarks and vice versa. This was done in preparation for separating the remarks to make a second file for notes only. Disagreements in both directions were found and corrected. The remarks themselves were then reviewed and made uniform with regard to alignment, abbreviations for Greek letters, missing punctuation, etc. This was a multistep process, with large numbers of changes being made before printing, review, and final editing.

The *First Supplement* had been keypuched at the Astronomisches Rechen-Institut in Heidelberg, and was kindly supplied on magnetic tape by H. Jahreiss. The format was different, of course, and the remarks had not been included. Therefore, another program was written to reformat the *Supplement* data and the corresponding notes were edited in manually. A flag “1” to denote “Supplement 1” was added to all *Supplement* records so that they can be distinguished in the merged catalog.

During the course of the work, many errors were found in the original data. Most of these had occurred as a result of misprints and were resolvable by reference to context or to the LTT. Following the merging of the main catalog and the *Supplement*, and sorting by right ascension (which was approved by Professor Luyten), the remarks were stripped from the data and placed into a separate data set. To simplify the location of particular remarks, the right ascension and declination of each star are duplicated in the remarks file. Since only one tenth of the stars in the catalog have notes, a considerable amount of storage was saved by creating a separate file.

Another problem with the coordinates had to be solved to produce a uniformly formatted data file. This difficulty occurred because of the varying precision reported for stars in the polar and equatorial regions of the published catalog. It would have been unacceptable to convert the lower precision coordinates of the polar regions to equatorial format, and one certainly wouldn’t want to convert the seconds of time to fractions of a minute for the equatorial stars. Yet, it is not at all desirable to have two different forms for the coordinates within the catalog. Therefore, the right ascensions are reported in both forms for the entire catalog. This was accomplished by adding a data field to the machine version and computing the alternate form. A flag was added to each record to indicate which form is used in the original published catalog, since this is the accuracy that should be adhered to when using the data.

Following the completion of the merged data file, the catalog was processed through the ADC's General Validation Program to check for miscellaneous problems. This program checks ordering and ranges for all specified values. Not surprisingly, many additional letters were found in numerical fields, even though careful checks were thought to have been made. Additional unresolvable errors were found in position angles and positional data that fell outside the allowable ranges. These problems were submitted to Professor Luyten, who kindly returned to the original card file to resolve them. All entries of this nature, including published addenda incorporated into the machine version, are flagged by the letter "A" in each affected record. This is the case whenever a record in the machine version does not agree with its corresponding entry in the published catalog. All such records are listed in Appendix A so that a user can either resolve a discrepancy or identify as an error any true disagreement between the present machine version and the published catalog.

Additional possible and probable errors published by E. W. Weis (1987) where checked and corrected where appropriate. Changes were made as a result of Notes 6, 8, 15–18, 24–25, 28, 39, and 46, while 7, 13, and 38 had been detected and corrected independently; no action was taken for 10, 29, 31, and 33.

Although most of the hundreds of changes made to the published catalog involved only the correction of certain data, some stars have actually been removed from the catalog. These deletions were primarily the result of duplicate entries and included stars that have later been found to display "no motion" (defined as motion smaller than the lower cutoff for the catalog). The deleted stars are listed in Appendix A so that users can determine immediately if a star found to be missing in the machine version has been intentionally removed.

3.2 Acknowledgments

The computerization of the *NLTT Catalogue* was a collaborative effort between the Space Telescope Science Institute (ST ScI) and the Astronomical Data Center of the National Space Science Data Center, with funding for the optical scanning being provided by the former organization. The assistance of Elizabeth D. Siciliano with programming and editing, Victoria G. Laidler and Deborah Kenny with editing, and Karen Myers (all Computer Sciences Corp., ST ScI) with proofreading selected pages, of Steven F. McLaughlin (Computer Sciences Corp., ST ScI) with programming and comparison checks on partial data computerized at the Astronomisches Rechen-Institut (ARI) in Heidelberg, and of Joanne A. Sheridan (formerly of the ADC/NSSDC) with programming, is appreciated.

We also gratefully acknowledge the help of Dr. Hartmut Jahreiss of the ARI in providing machine-readable data from Volumes I and II of the NLTT and all of the *First Supplement* keypunched in

Heidelberg. Dr. Jahreiss also found and sent several short lists of errors detected during the course of his own work with the catalog.

The help of Professor Willem J. Luyten, who confirmed many of the errors detected by returning to the original data and who cheerfully responded to our many inquiries, was invaluable in preparing the corrected machine version. We hope that the collaborative effort of these many persons has produced a permanently useful addition to the long list of important machine-readable astronomical catalogs.

3.3 References

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Luyten, W. J. 1957, *A Catalogue of 9867 Stars in the Southern Hemisphere with Proper Motions Exceeding* $0\overset{\prime\prime}{.}2$ *Annually* (LTT) (Minneapolis: The Lund Press).

Luyten, W. J. 1961, *A Catalogue of 7127 Stars in the Northern Hemisphere with Proper Motions Exceeding* $0\overset{\prime\prime}{.}2$ *Annually* (LTT) (Minneapolis: The Lund Press).

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Luyten, W. J. and Hughes, H. S. 1980, *Proper Motion Survey with the Forty-Eight Inch Schmidt Telescope. LV. First Supplement to the NLTT Catalogue* (Minneapolis: University of Minnesota).

Weis, E. W. 1987, *Astron. J.* **92**, 451.

A Deletions and Addenda

Table 4 lists the stars (or entries) that have been removed from the machine version of the NLTT catalog. Many of these deletions were circulated in a list entitled "Errata to the NLTT Catalogue", distributed by Professor Luyten; additional deletions were received from him via private communication, forwarded to us by Dr. H. Jahreiss of the ARI, or discovered at the ADC during the course of this work. The latter occurrences were in all cases confirmed by Professor Luyten before they were removed. Where specific reasons are known for the deletions, they are given in the table.

Star	α_{1950}	δ_{1950}	Remarks
	1 10 48	−01 59.5	
467- 86	1 12 40	+14 20.9	
408- 1	1 29 08	+20 33.5	Duplicate entry
-69: 88	2 05 42	−69 06.	No motion
	2 56 44	+48 49.2	Duplicate entry
+34: 724	3 41 12	+34 48.8	Duplicate incorrect entry
155-291	3 42 22	+49 30.5	
-60:1088	4 06 24	−59 52.	No motion (10 observations)
161- 75	6 52 39	+47 03.5	
	10 44 58	+34 59.2	Duplicate entry
794- 82	11 53 46	−19 22.1	
U38-101	12 23 12	+38 02.0	Same as LP266-50 at 12 22 55
320-583	12 25 45	+31 28.0	
U43-151	12 40 06	+43 19.0	Correct entry at 12 39 25 +43 19.1
-63:1233	16 47 12	−64 03.	No motion (6 observations)
	17 40 15	+01 38.0	No motion
+45:2877	18 18 56	+45 30.0	
-74:1278	18 44 36	−74 32.	No motion
+29:4321	20 05 06	+29 34.	
106-304	20 28 02	+57 40.7	Duplicate entry

Table 4: Stars Deleted from the NLTT Catalogue

Table 5 lists all stars whose data differ in the machine and published versions. These are all flagged with the letter "A" in byte 64 of the data file records. The table has been printed separately and inserted into this document; thus, it begins on the following page.

1-157	0	17	54	17.9	1	+86	03.0	16.3	17.9	m	0.496	80	A
405-7	0	20	49	20.8	2	+19	33.6	11.3	12.9	m	0.287	124	A
465-65	0	37	52	37.9	2	+13	26.5	13.7	14.8	k	0.237	98	A
241-53	0	42	30	42.5	2	+39	02.0	13.9	15.4	m	0.342	229	A
526-48	0	58	27	58.5	2	+8	02.9	17.3	18.4	k	0.245	122	A
+14:167B*	1	02	51	02.9	2	+15	07.4	9.6	10.9	k-m	0.199	175	A
527-20*	1	11	28	11.5	2	+6	18.4	16.7	18.0	k-m	0.195	112	A
+30:206B*	1	18	38	18.6	2	+31	04.9	13.0	14.5	m	0.527	103	A
+30:206A	1	18	39	18.7	2	+31	04.9	9.5	10.6	k	0.527	103	A
468-99*	1	29	48	29.8	2	+14	02.1	16.9	18.5	m	0.220	125	A
468-98	1	29	48	29.8	2	+14	01.9	11.0	12.3	k-m	0.220	125	A
939-117	1	38	04	38.1	2	-38	18.0	14.2			0.307	72	A
768-453	1	43	52	43.9	2	-16	55.6	12.9	14.6	m	0.187	200	A
*	2	03	48	03.8	2	+44	57.3	10.5	11.8	K5	0.510	148	A
Pulk 22-18	2	45	26	45.4	2	+44	32.8	13.0	14.5	m	0.281	125	A
198-106	2	56	57	57.0	2	+44	06.5	18.4	21.	+m	0.250	135	A
471-54	3	04	37	04.6	2	+12	33.9	12.7	13.6	g-k	0.328	142	A
831-38	3	10	13	10.2	2	-21	42.3	14.5	16.3	m	0.302	175	A
831-39*	3	10	13	10.2	2	-21	42.3	15.3	16.8	m	0.302	175	A
198-289	3	10	15	10.3	2	+44	05.1	11.1	12.0	g-k	0.180	125	A
198-290*	3	10	15	10.3	2	+44	05.1	11.5	12.6	k	0.180	125	A
-35:1111*	3	10	33	10.6	2	-34	59.7	10.2	11.3	k	0.182	186	A
+48:884*	3	15	49	15.8	2	+49	07.7	10.2	11.3	k	0.241	134	A
155-231	3	29	02	29.0	2	+45	14.0	16.3	17.8	m	0.181	144	A
+34:724	3	41	18	41.3	2	+34	49.1	10.9	12.2	k-m	0.250	135	A
474-233	3	56	00	56.0	2	+9	28.0	12.6	13.7	k	0.183	103	A
31-302*	4	00	30	00.5	2	+71	08.9	15.1	16.4	k-m	0.417	155	A
+11:570	4	03	08	03.1	2	+11	49.9	10.5	12.0	M1	0.200	88	A
833-51*	4	09	30	09.5	2	-26	10.2	13.1	14.4	k-m	0.195	139	A
358-60*	4	13	41	13.7	2	+24	39.9	14.5	15.6	k	0.398	85	A
358-152	4	19	24	19.4	2	+22	49.0	18.3	20.8	m	0.182	169	A
302-49	4	19	59	20.0	2	+31	59.3	12.4	13.9	m	0.271	179	A
415-254	4	33	54	33.9	2	+18	55.0	18.7	21.2	m	0.378	140	A
358-501	4	37	26	38.4	2	+22	09.4	15.8	17.0	k	0.189	113	A
358-499	4	37	33	38.6	2	+24	55.5	13.1	14.7	m	0.207	102	A
891-12*	4	43	17	43.3	2	-27	31.7	17.1	16.6	b	0.236	246	A
891-13	4	43	21	43.4	2	-27	31.4	15.1	16.4	k-m	0.236	246	A
360-9	5	18	44	18.7	2	+23	29.2	12.0	13.5	m	0.243	197	A
119-43	5	23	52	23.9	2	+55	12.8	14.8	16.8	m+	0.228	228	A
481-6	6	42	34	42.6	2	+9	38.9	10.0	11.1	k	0.220	129	A

Table 5: NLTT Addenda Stars

-43:2907*	7 02	27 02.5	2	-43 32.5	6.9	7.5	G0	0.412	343	A
-43:3260A*	7 27	39 27.7	2	-43 11.9	3.3	4.6	K5	0.200	340	A
88-308*	7 40	40 40.7	2	+56 53.3	18.7	21.0	m+	0.207	124	A
+68:518*	8 00	47 00.8	2	+68 31.6	7.6	8.0	F5	0.306	224	A
+45:1576	8 20	48 20.8	2	+45 06.8	7.7	8.6	g-k	0.201	202	A
- 9:2563*	8 30	32 30.5	2	- 9 23.4	10.7	12.2	m	0.199	217	A
368- 36	8 38	24 38.4	2	+21 14.5	17.7	19.5	m	0.228	140	A
-18:2482*	8 45	15 45.3	2	-18 48.5	11.0	12.3	k-m	0.180	282	A
18-173*	9 05	41 05.7	2	+78 57.0	18.2	20.0	m	0.319	221	A
+ 6:2182	9 27	19 27.2	2	+ 5 52.4	7.0	8.2	K2	0.523	282	A
668- 59	9 48	00 48.0	2	- 4 43.6	9.5	10.8	k-m	0.193	291	A
+12:2149*	10 05	43 05.7	2	+12 12.7	1.4	1.2	B8	0.241	270	A
489- 63	10 14	56 14.9	2	+ 8 51.0	17.0	18.9	m	0.196	253	A
670- 1	10 20	31 20.5	2	- 7 20.0	15.0	16.6	m	0.325	152	A
490- 68	10 29	30 29.5	2	+ 8 46.0	11.7	12.8	k	0.220	151	A
-18:3019*	10 43	19 43.3	2	-18 50.6	11.2	12.8	m	1.980	251	A
791- 55*	10 43	19 43.3	2	-18 50.7	16.2	16.5	f	1.980	251	A
VBs 18*	10 54	26 54.4	2	+42 14.2	15.0	16.8	m	0.352	228	A
102- 26*	10 56	12 56.2	1	-66 31.	12.9	14.4	m	0.24	305	A
168- 47	10 56	28 56.5	2	+44 30.8	17.0	18.1	k	0.240	264	A
+56:1499	11 03	52 03.9	2	+55 59.0	9.2	9.8	G0	0.212	246	A
318-129*	11 18	21 18.4	2	+30 02.5	13.0	14.5	m	0.237	171	A
374- 54*	11 24	47 24.8	2	+23 06.3	12.3	14.5	k-m	0.635	217	A
-31:9083*	11 30	32 30.5	2	-31 34.8	3.7	4.6	G5	0.209	260	A
+36:2219	11 48	33 48.6	2	+35 32.9	10.6	11.9	k-m	0.350	321	A
493- 60*	11 48	42 48.7	2	+13 10.6	19.0	19.0	f	0.210	182	A
673- 42b*	11 50	44 50.7	2	- 7 05.5	19.0	19.4	f	0.538	198	A
	11 56	04 56.1	2	+59 50.0	10.7	12.2	m	0.699	271	A
Grw +68:4303	11 57	35 57.6	2	+68 05.7	11.5	12.8	k-m	0.192	242	A
-34:7900A*	12 02	42 02.7	2	-34 54.5	10.1	11.2	k	0.210	288	A
-34:7900B*	12 02	42 02.7	2	-34 54.5	13.2	14.3	k	0.210	288	A
64-125*	12 07	28 07.5	2	+68 25.8	15.0	16.3	k-m	0.337	244	A
U 40- 83	12 09	57 10.0	2	+39 57.3	11.4	12.9	M2	0.239	130	A
794- 49	12 16	03 16.1	2	-20 07.5	15.3	16.8	m	0.346	278	A
495- 36	12 19	00 19.0	2	+14 38.5	14.8	16.3	m	0.273	261	A
435- 46*	12 20	17 20.3	2	+17 41.6	14.9	16.4	m	0.323	224	A
U 43-151	12 39	25 39.4	2	+43 19.1	11.6	12.9	k-m	0.257	215	A
436- 19*	12 47	13 47.2	2	+16 29.1	11.8	13.3	m	0.238	189	A
39-231*	12 49	13 49.2	2	+71 34.1	16.2	17.7	m	0.263	286	A
377- 90*	12 49	43 49.7	2	+23 00.4	11.9	13.0	k	0.203	292	A

378-315	13	00	41	00.7	2	+24	14.2	14.4	16.0	m	0.420	268	A
+59:1488	13	07	16	07.3	2	+58	50.7	9.2	10.5	K2	0.294	225	A
557- 17	13	09	36	09.6	2	+ 4	45.6	15.0	15.9	g-k	0.219	260	A
*	13	11	38	11.6	2	+ 6	34.6	15.5	16.6	k	0.334	216	A
617- 43	13	20	21	20.4	2	- 0	35.2	18.7	19.0	f-g	0.192	304	A
617- 46	13	21	16	21.3	2	+ 0	07.2	19.0	21.0	m	0.193	259	A
379- 57*	13	31	30	31.5	2	+21	24.7	13.0	14.7	m	0.305	245	A
380- 7	13	45	49	45.8	2	+21	53.1	15.9	17.0	k	0.197	199	A
+24:2642*	13	46	12	46.2	2	+24	25.2	11.0	12.5	m	0.203	298	A
324- 26	13	51	22	51.4	2	+27	00.1	18.7	20.7	m	0.185	194	A
439-150	13	59	15	59.3	2	+16	26.5	18.3	21.0	m+	0.304	175	A
439-448	14	06	23	06.4	2	+17	46.2	12.1	13.0	g-k	0.265	214	A
381- 41*	14	17	46	17.8	2	+22	55.9	12.0	12.2	f-g	0.429	248	A
+ 2:2820A	14	24	04	24.1	2	+ 2	21.2	9.7	10.8	k	0.198	308	A
	14	25	23	25.4	2	- 0	09.2	13.1	14.8	m	0.412	283	A
500- 98	14	34	07	34.1	2	+11	15.7	13.4	14.9	m	0.292	118	A
500- 99*	14	34	08	34.1	2	+11	15.9	13.5	15.0	m	0.292	118	A
-64:867B*	14	38	24	38.4	1	-64	46.	8.8	9.9	k	0.31	218	A
+14:2771*	14	39	07	39.1	2	+13	49.1	8.4	8.9	F8	0.397	257	A
500- 80*	14	39	08	39.1	2	+13	50.4	12.8	14.3	m	0.397	257	A
+18:2917B*	14	40	40	40.7	2	+18	17.2	13.8	15.3	m	0.352	151	A
682- 71	15	16	52	16.9	2	- 5	26.2	18.8	20.8	m	0.181	257	A
W 571	15	40	38	40.6	2	+ 5	00.4	12.7	13.8	k	0.180	263	A
177-118	15	47	48	47.8	2	+45	36.0	18.7	19.8	k	0.232	246	A
100- 27*	15	49	53	49.9	2	+59	07.1	16.0	17.5	m	0.260	265	A
384- 64	15	50	59	51.0	2	+22	59.9	13.5	15.0	m	0.276	236	A
744- 19*	16	04	29	04.5	2	-14	14.7	11.9	13.2	k-m	0.180	192	A
42-329*	16	15	51	15.9	2	+74	34.5	11.6	12.7	k	0.180	282	A
Grw +67:5226*	16	16	39	16.7	2	+67	22.6	11.1	12.7	M3	0.522	279	A
686- 18*	16	48	14	48.2	2	- 8	47.1	12.6	13.5	g-k	0.322	228	A
-10:4463*	17	13	26	13.4	2	-10	48.9	10.3	11.5	K2	0.225	149	A
W 672A	17	16	05	16.1	2	+ 2	00.2	14.9	14.7	DA	0.512	237	A
W 672B*	17	16	06	16.1	2	+ 2	00.0	13.2	15.4	M3	0.512	237	A
L 485-9*	17	21	35	21.6	2	-35	26.1	14.5	15.6	k	0.316	186	A
747- 27	17	23	40	23.7	2	-13	07.0	10.9	12.2	k-m	0.187	136	A
24- 50*	17	40	48	40.8	2	+76	45.9	14.8	16.3	m	0.218	351	A
748- 34*	17	47	22	47.4	2	-13	39.1	13.8	15.3	m	0.202	212	A
748- 35	17	48	08	48.1	2	-12	29.5	13.5	14.8	k-m	0.349	224	A
+ 4:3561a*	17	55	23	55.4	2	+ 4	33.4	9.2	11.2	M5	0.310	356	A
139- 42	18	02	27	02.5	2	+53	24.6	12.0	13.1	k	0.222	289	A
449- 10	18	04	35	04.6	2	+17	20.3	14.7	15.8	k	0.234	3	A

570- 18*	18	29	27	29.5	2	+ 8	33.9	13.1	13.7	g	0.285	196	A
L 489-68	18	34	57	35.0	2	-39	07.8		14.0		0.188	73	A
630- 16	18	36	09	36.2	2	+ 1	56.5	13.5	15.0	m	0.232	186	A
450- 12	18	39	00	39.0	2	+16	18.7	10.1	11.2	k	0.231	176	A
867- 2*	18	43	59	44.0	2	-23	33.7	13.0	14.3	k-m	0.448	232	A
R 154*	18	46	45	46.8	2	-23	53.2	11.0	12.7	M6	0.720	107	A
811- 16	18	50	13	50.2	2	-16	19.2	13.3	14.6	k-m	0.202	199	A
336- 6*	19	05	45	05.8	2	+32	26.8	11.6	13.3	M3	1.635	49	A
+11:3777*	19	11	46	11.8	2	+11	43.5	10.5	11.6	k	0.251	228	A
104-443	19	25	21	25.4	2	+58	06.5	16.0	17.5	m	0.356	222	A
+50:2848*	19	40	32	40.5	2	+50	24.0	6.4	7.0	G0	0.214	223	A
925- 35*	19	40	36	40.6	2	-29	14.7	12.8	14.6	m	0.223	165	A
869- 29	19	42	34	42.6	2	-24	11.3	17.8	20.5	m+	0.240	213	A
926- 4	19	47	28	47.5	2	-29	24.2	14.0	15.3	k-m	3.204	187	A
870- 64	20	00	54	00.9	2	-23	48.5	13.2	13.8	g	0.185	237	A
L1573- 24	20	02	33	02.6	2	+38	00.1	13.8	14.9	k	0.320	202	A
	20	16	04	16.1	2	+23	09.4	10.7	12.2	m	0.258	4	A
755- 36*	20	32	51	32.9	2	-13	06.8	14.5	15.6	k	0.322	134	A
R 764	20	40	31	40.5	2	+52	05.8	10.8	11.7	g-k	0.226	345	A
+45:3245A	20	40	39	40.7	2	+45	38.7	7.7	8.3	G0	0.205	200	A
+38:4344*	21	04	40	04.7	2	+38	29.8	5.8	7.2	K8	5.204	52	A
186- 1*	21	07	00	07.0	2	+46	57.4	11.7	12.9	K3	0.497	120	A
457- 11*	21	09	42	09.7	2	+18	10.1	15.7	16.8	k	0.195	179	A
285- 11*	21	15	24	15.4	2	+34	33.7	14.3	15.8	m	0.240	50	A
517- 35	21	17	42	17.7	2	+13	04.9	14.7	16.5	m	0.248	0	A
	21	26	53	26.1	2	+39	40.3	13.7	15.2	m	0.280	101	A
-68:2241*	21	34	18	34.3	1	-68	17.	8.5	10.0	m	0.22	101	A
463- 20	21	34	40	34.7	2	+20	43.7	11.5	12.6	k	0.204	103	A
398- 17	21	37	52	37.9	2	+21	32.6	18.9	20.6	m	0.202	48	A
+ 5:4868	21	44	56	44.9	2	+ 6	22.2	11.0	11.6	g	0.280	64	A
W 945	21	45	58	46.0	2	+50	00.3	13.7	15.2	m	0.823	58	A
*	21	51	55	51.9	2	+41	32.8	10.6	11.9	K8	0.533	133	A
R 263	21	54	17	54.3	2	+19	32.3	13.4	14.7	k-m	0.477	194	A
283- 3	22	00	14	00.2	1	-50	51.7	11.9	13.4	m	0.58	148	A
Grw 65: *	22	04	25	04.4	2	+65	23.9	12.3	13.4	k	0.393	308	A
1032-120	22	20	06	20.1	2	-43	42.5	14.0			0.863	117	A
640- 76*	22	30	16	30.3	2	+ 2	03.2	14.3	16.2	m	0.180	94	A
-28:17852*	22	34	37	34.6	2	-28	20.3	11.1	12.4	k-m	0.386	121	A
-28:17856*	22	34	50	34.8	2	-28	20.9	10.0	11.3	k-m	0.386	121	A
27-403*	22	39	59	40.0	2	+75	31.4	15.7	17.0	k	0.180	71	A

+51:3485	22 48	37	48.6	2	+51 47.6	7.1	7.7	G0	0.220	36	A
400- 70*	22 50	40	50.7	2	+27 10.9	17.1	19.4	m+	0.181	91	A
701- 84*	22 53	05	53.1	2	- 6 29.4	16.0	17.5	m	0.268	120	A
-26:16395A*	22 55	05	55.1	2	-26 22.3	7.4	8.0	G0	0.338	148	A
+11:4913	22 56	48	56.8	2	+11 55.6	8.5	9.1	G0	0.371	114	A
+40:4962	22 57	22	57.4	2	+40 47.2	11.0	12.5	m	0.260	224	A
521- 59	22 59	10	59.2	2	+15 11.9	17.2	18.7	m	0.248	219	A
985-108	23 09	22	09.4	2	-38 15.6	11.8	13.1	k-m	0.180	140	A
+20:5292	23 10	49	10.8	2	+20 40.4	9.9	10.8	G5	0.253	154	A
	23 15	00	15.0	2	+37 56.6	10.9	12.9	m	0.470	196	A
643- 33*	23 37	23	37.4	2	- 1 43.7	18.5	21.0	m+	0.210	214	A
+46:4175P	23 45	43	45.7	2	+46 48.4	9.3	10.4	k	0.236	125	A
+59: 68a	0 27	32	27.5	2	+59 54.5	9.1	9.5	F5	0.206	62	A
-57:395*	1 57	06	57.1	1	-57 07.	8.0	8.9	G0	0.20	45	A
-57:396*	1 57	06	57.1	1	-57 07.	8.3	9.2	G5	0.20	45	A
W 1059	7 57	23	57.4	2	+29 09.1	12.4	13.0	G0	0.481	184	A
375- 23	11 39	43	39.7	2	+23 18.2	10.8	12.3	m	0.202	281	A
-48:7070	11 59	42	59.7	1	-48 27.	9.2	10.1	G5	0.23	268	A
-26:10310	14 25	48	25.8	2	-27 01.6	11.6	12.7	k	0.270	248	A
-73:1474*	19 48	42	48.7	1	-73 58.	9.6	9.7	K0	0.21	126	A
- 6:5663*	21 01	19	01.3	2	- 6 20.0	9.7	11.3	m	0.455	235	A
290- 60	23 31	07	31.1	2	+32 17.7	13.7	14.8	k	0.261	95	A
	23 47	23	47.4	2	+29 17.8	15.2	15.8	g	0.531	191	A