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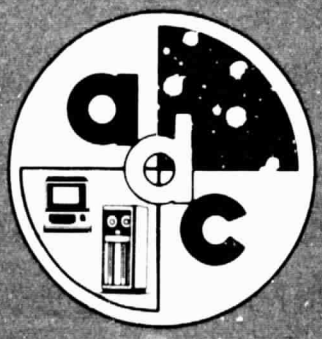
84-16

DOCUMENTATION FOR THE MACHINE-READABLE VERSION

OF THE

CAPE PHOTOGRAPHIC DURCHMUSTERUNG (CPD)



DECEMBER 1984

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December 1984

National Space Science Data Center (NSSDC)/
World Data Center A for Rockets and Satellites (WDC-A-R&S)
National Aeronautics and Space Administration
Goddard Space Flight Center
Greenbelt, Maryland 20771

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ABSTRACT

A detailed description of the machine-readable version of the catalog, as it is currently being distributed from the Astronomical Data Center, is presented. The complete catalog is contained in the magnetic tape file, and corrections published in all errata have been made to the data. The machine version contains 454877 records, but only 454875 stars (two stars were later deleted, but their logical records are retained in the file so that the zone counts are not different from the published catalog).

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SECTION 1 - INTRODUCTION AND SOURCE REFERENCE

The *Cape Photographic Durchmusterung* (CPD, Gill and Kapteyn 1895-1900) is a photographic survey of southern stars in the declination range -18° to -90°. The original goal of the work was to carry out a southern survey similar to those of the *Bonner Durchmusterung* (BD, Argelander 1859-1862) (see also Küstner 1903) and Schönfeld (1886) and the *Córdoba Durchmusterung* (CD, Thome 1892-1932) but using photographic plates which would provide a permanent record of the sky at the epoch of observation. The summary of the positional uncertainties quoted in the third volume of the published catalog gives $\pm 0^{s}.28$, $\pm 0''.044$ for zones -18° to -57°, $\pm 0^{s}.157 + 0^{s}.0764 \sec \delta$, $\pm 0''.056$ for zones -58° to -85°, and $\pm 0^{s}.157 + 0^{s}.0353 \sec \delta$, $\pm 0''.0127$ for the polar plate where, as explained in the introduction to the third volume, many positions were derived from rectangular coordinates (these are positions reported to $0^{s}.1$ and $0''.001$ in the -86° to -89° zones in the catalog). The probable error of a photographic magnitude, as determined by combining results for different magnitudes and weighting proportionately according to the numbers of stars in each class of magnitude, is given as $\pm 0^{m}.055$. From an analysis of the faint magnitude limits on the plates discussed in the third volume introduction, the catalog as a whole can be considered complete to photographic magnitude 9.2, but it is stated that it will be found practically complete, in or near the Milky Way, to magnitude 9.5. The total number of stars in the zones -19° to -89° and the total sky area covered result in a mean density of 32.66 stars per square degree, as compared with 15.19 for Argelander's BD, 18.21 for Schönfeld's SD, and 56.00 for the CD zones -22° through -41°.

This document describes the machine-readable version of the CPD, including a detailed format description and an outline of the procedure by which the computer file was created. A list of corrections made to the original data as a result of errata published in the three volumes is presented in Table 3, while zone statistics are given in Table 4. No other corrections or changes have been incorporated into the original data, e.g., from more modern positions and magnitudes or comparison with other catalogs. This document is intended to enable users to process the CPD data without problems and guesswork. For a more detailed description of how the observations were made and for additional statistics of star counts and distribution within each zone, the source reference should be consulted. A copy of this document should accompany any machine version of the catalog originating from the Astronomical Data Center.

SOURCE REFERENCE

Gill, D. and Kapteyn, J. C. 1895-1900, *Cape Photographic Durchmusterung*, *Ann. Cape Obs.* 3 (1895, Part I: zones -18° to -37°); 4 (1897, Part II: zones -38° to -52°); 5 (1900, Part III: zones -53° to -89°).

SECTION 2 - TAPE CONTENTS

A byte-by-byte description of the contents of the machine-readable *Cape Photographic Durchmusterung* is given in Table 1. A suggested Fortran 77-type format specification for reading each data field is included and can be modified depending upon individual programming and processing requirements. Data are present for all stars in the catalog, including some which have been deleted in the errata; these have been flagged by a "D" in byte 11 of each respective record, but the records and data have been left in the machine version in order not to change the star counts and numerical sequencing and so that the stars appear in the correct locations if the catalog is sorted by right ascension. Although there are only two deleted stars, the user should check byte 11 to be certain that the data for deleted stars are not used for plots, etc. Default (null) values are always blanks in data fields for which suggested formats are given as A. No default values are given for numerical fields here because there are always data present.

Table 1. Tape Contents. *Cape Photographic Durchmusterung.*

Byte(s)	Units	Suggested Format	Default Value	Description
1- 2	---	A2	---	Catalog prefix (the letters "CP").
3- 5	---	I3	---	Zone part of the CPD number.
6-10	---	I5	---	Star number within the zone.
11	---	A1	---	Lower case "a" or "b" if the star is a supplemental addition from the errata. A "D" appears for stars deleted in the errata (see Table 3) but the data are left intact.
12-15	mag	F4.1	---	Photographic magnitude or magnitude code to denote non-numerical entries in the original (20.0 = neb).
16-17	hours	I2	---	Right ascension, α, equinox 1875.0.
18-19	min	I2	---	α
20-23	sec	F4.1	---	α. Precision varies (tenths may be blank).
24	---	A1	---	Sign of declination, δ, equinox 1875.0 (always "-" for CPD zones).
25-26	°	I2	---	δ
27-32	'	F6.3	---	δ. Only bytes 27-30 are used in zones north of -86°; the complete field is used for many stars on the polar plate.

SECTION 3 - TAPE CHARACTERISTICS

The information contained in Table 2 is sufficient for a user to describe the indigenous characteristics of the machine-readable version of the *Cape Photographic Durchmusterung* 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, tape density, number of tracks, and internal coding (EBCDIC, ASCII, etc.) is not included, but should always accompany secondary copies if any are supplied to other users or installations.

Table 2. Tape Characteristics. *Cape Photographic Durchmusterung.*

NUMBER OF FILES	1
LOGICAL RECORD LENGTH (BYTES)	32
RECORD FORMAT	FB*
TOTAL NUMBER OF LOGICAL RECORDS	454877

* Fixed block length (last block may be short)

SECTION 4 - REMARKS, ACKNOWLEDGMENTS AND REFERENCES

The data in the machine-readable *Cape Photographic Durchmusterung* were keypunched directly from the published catalogs. The northern zones (-18° to -32° and -35°) were punched at Case Western Reserve University under the direction of B. N. Rappaport, who initiated the work and used the data as part of a project on the production of star charts by computer. However, only zones -18° through -26° and -28° had been verified and checked thoroughly, and some zones had not been completed. Mr. Rappaport was contacted and volunteered to continue the project and to oversee the punching and verifying of the remaining zones and those not verified and checked at Case. These zones were processed by a commercial firm with funding provided by the National Space Science Data Center, but all systematic checking of the completed zones was carried out by Mr. Rappaport on a volunteer basis. The zones were rechecked for counts and errata corrections, and the data reformatted to the standard DM catalog structure at the ADC by the author. The individual zones were then concatenated from disk data sets to a single magnetic tape file in CPD number order from north to south. Users should note that, due to corrections inserted from the errata, the CPD stars are not strictly in right ascension order within each zone; hence, if the catalog is sorted by α, e.g., for search purposes, some CPD numbers will become disordered. On the other hand, if right ascension searching is to be performed, it will be necessary to sort the catalog by α. All corrections made to the original catalog by incorporation of the errata are presented in Table 3, where it is noted when stars have become disordered in right ascension following the changes.

Table 3. Errata Corrections Made to Catalog.

CPD	Number		From	To	Remarks
-19	5160	RAm	9	19	
-20	4281	MAG	9.8	9.0	
-22	3334	DEC	30	30.6	
-24	2074	MAG	7.8	9.8	
-25	5857b				Insert: 9.6 16 40 2.8, -25 57.5.
-26	4031	RAs	44.7	54.7	
-31	3052	MAG	0.1	10.1	
-33	404b				Insert: 9.8 3 47 59.7, -33 41.9.
-33	1877	MAG	9.2	9.6	
-36	9696b				Insert: 9.4 23 0 10.6, -36 57.8.
-38	6265b				Insert: 9.6 15 36 47.6, -38 1.0.
-39	4387	MAG	10.7	10.4	
-41	3407	RAm	5	6	and 13 stars following.
-50	6654	MAG	9.6	6.7	
-50	11545	DEC	34.5	44.5	
-52	3270	DEC	.09	0.9	
-53	8923	RAs	38.5	39.5	
-56	620	MAG	9.2	9.6	
-56	1429	MAG	9.2	8.6	
-60	1	CPD	1	1a	Star count incorrect in published version, p. 289.
-60	47	CPD	47	46a	Changes suggested in errata, Vol. III, so as not
-60	92	CPD	92	91a	to change numbers in whole zone.
-60	137	CPD	137	136a	
-61	2560	MAG	9.8	8.2	
-64	987	RAs	10.8	0.8	
-65	4113	RAm	57	5	
-67	2715	MAG	19.0	10.0	
-67	3620				Delete data; does not exist. "D" after CPD number.
-71	36	RAm	0	1	
-72	2076				Delete data; does not exist. "D" after CPD number.
-73	1696	RAm	55	54	Puts out of order with 1694-5.
-78	848b				Insert: 9.7 14 2 2.5, -78 51.7.

Table 4 gives statistics for the individual zones of the *Cape Photographic Durchmusterung* and the number of logical records in the machine version for each zone. The number of stars is counted as those having valid data.

Table 4. Zone Statistics for the Machine-Readable CPD.

Zone	Number of Records	Highest Star Number	Stars Added	Stars Deleted	Number of Stars
-18°	491	491	-	-	491
-19	8448	8448	-	-	8448
-20	8559	8559	-	-	8559
-21	8323	8323	-	-	8323
-22	8432	8432	-	-	8432
-23	8376	8376	-	-	8376
-24	7513	7513	-	-	7513
-25	7617	7616	1	-	7617
-26	7545	7545	-	-	7545
-27	7607	7607	-	-	7607
-28	7750	7750	-	-	7750
-29	6927	6927	-	-	6927
-30	6857	6857	-	-	6857
-31	6897	6897	-	-	6897
-32	6721	6721	-	-	6721
-33	6442	6441	1	-	6442
-34	9339	9339	-	-	9339
-35	9481	9481	-	-	9481
-36	9839	9838	1	-	9839
-37	9437	9437	-	-	9437
-38	8604	8603	1	-	8604
-39	9318	9318	-	-	9318
-40	9912	9912	-	-	9912
-41	10007	10007	-	-	10007
-42	9663	9663	-	-	9663
-43	9815	9815	-	-	9815
-44	10406	10406	-	-	10406
-45	10518	10518	-	-	10518
-46	10625	10625	-	-	10625
-47	10081	10081	-	-	10081
-48	11012	11012	-	-	11012
-49	11858	11858	-	-	11858
-50	11905	11905	-	-	11905
-51	12075	12075	-	-	12075
-52	12255	12255	-	-	12255

Table 4 (concluded)

Zone	Number of Records	Highest Star Number	Stars Added	Stars Deleted	Number of Stars
-53	10591	10591	-	-	10591
-54	10431	10431	-	-	10431
-55	10161	10161	-	-	10161
-56	10225	10225	-	-	10225
-57	10427	10427	-	-	10427
-58	8131	8131	-	-	8131
-59	7957	7957	-	-	7957
-60	7721	7717	4	-	7721
-61	6795	6795	-	-	6795
-62	6468	6468	-	-	6468
-63	4949	4949	-	-	4949
-64	4404	4404	-	-	4404
-65	4199	4199	-	-	4199
-66	3825	3825	-	-	3825
-67	4000	4000	-	1	3999
-68	3599	3599	-	-	3599
-69	3349	3349	-	-	3349
-70	3038	3038	-	-	3038
-71	2787	2787	-	-	2787
-72	2803	2803	-	1	2802
-73	2349	2349	-	-	2349
-74	2136	2136	-	-	2136
-75	1830	1830	-	-	1830
-76	1639	1639	-	-	1639
-77	1600	1600	-	-	1600
-78	1485	1484	1	-	1485
-79	1250	1250	-	-	1250
-80	1083	1083	-	-	1083
-81	1050	1050	-	-	1050
-82	908	908	-	-	908
-83	761	761	-	-	761
-84	661	661	-	-	661
-85	560	560	-	-	560
-86	426	426	-	-	426
-87	349	349	-	-	349
-88	213	213	-	-	213
-89	62	62	-	-	62
Totals	454877	454868	9	2	454875

ACKNOWLEDGMENTS

This project owes its completion to the extensive work and striving for perfection of Barry Rappaport, who supervised the punching of all data, ran numerous machine and manual checks on completed zones, and prepared the preliminary tape of the finished catalog. The quality work of the keypunchers at Case Western Reserve University and Syntronix, Sherman Oaks, California is also greatly appreciated. The encouragement and support of the NSSDC Director, James I. Vette, made the completion of this project possible.

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Thome, J. M. 1892-1932, *Córdoba Durchmusterung, Resultados del Observatorio Nacional Argentino* 16 (1892, Part I: -22° to -32°), 17 (1894, Part II: -32° to -42°), 18 (1900, Part III: -42° to -52°), 21 (Part I) (1914, Part IV, -52° to -62°), 21 (Part II) (1932, Part V: -62° to -90°).

SECTION 5 - SAMPLE LISTING

The sample listing given on the following pages contains logical data records exactly as they are recorded on the tape. Groups of records from the beginning and end of the CPD catalog are illustrated. The beginning of each record and bytes within the record are indicated by the column heading index across the top of each page (digits read vertically).

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

```
            TAPE FILE NAME: Cape Ptg Durchmusterung
                   RECORDS        1 TO      20
                 TAPE FILE       3
             RECORD LENGTH      32 BYTES
              INPUT VOLSER    WHW016

C O L U M N                                                                                                                111111111111111
H E A D I N G            11111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111
I N D E X       123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345

RECORD       1 CP-18     1  8.6 010 7.9-1857.0
RECORD       2 CP-18     2  9.0 01731.0-1859.1
RECORD       3 CP-18     3  8.8 03710.8-1856.9
RECORD       4 CP-18     4  8.6 04037.8-1858.9
RECORD       5 CP-18     5  8.2 05833.1-1859.5
RECORD       6 CP-18     6  9.0 1 125.6-1857.2
RECORD       7 CP-18     7  9.6 1 3 5.6-1858.4
RECORD       8 CP-18     8  8.8 11451.7-1857.8
RECORD       9 CP-18     9  9.8 11827.4-1857.9
RECORD      10 CP-18    10  8.6 12058.8-1859.9
RECORD      11 CP-18    11  8.8 2 2 2.4-1857.9
RECORD      12 CP-18    12  9.6 21534.8-1858.9
RECORD      13 CP-18    13  8.6 24045.9-1858.4
RECORD      14 CP-18    14  8.7 24412.8-1859.3
RECORD      15 CP-18    15  9.0 24658.1-1857.7
RECORD      16 CP-18    16  8.6 25722.1-1859.9
RECORD      17 CP-18    17  9.6 31440.0-1856.8
RECORD      18 CP-18    18  7.7 33033.8-1857.9
RECORD      19 CP-18    19  8.5 34630.9-1857.3
RECORD      20 CP-18    20  9.3 4 0 6.0-1858.1
```

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

              TAPE FILE NAME: Cape Ptg Durchmusterung
                     RECORDS  454858 TO  454877
                   TAPE FILE      3
               RECORD LENGTH     32 BYTES
                INPUT VOLSER   WHW016

C O L U M N                                                                                                     111111111111111
H E A D I N G          111111111122222222223333333333444444444455555555556666666666777777777788888888889999999999000000000011111
I N D E X     123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890012345

RECORD  454858 CP-89   43  9.71632 7.7-89 9.301
RECORD  454859 CP-89   44 10.3173651.4-8918.415
RECORD  454860 CP-89   45 10.3173827.4-8917.003
RECORD  454861 CP-89   46 10.3175457.1-8946.505
RECORD  454862 CP-89   47  5.7181534.7-8916.649
RECORD  454863 CP-89   48 10.0191528.1-89 6.594
RECORD  454864 CP-89   49 10.1193025.5-8937.032
RECORD  454865 CP-89   50  9.220 957.5-8926.621
RECORD  454866 CP-89   51  9.7204727.3-8920.742
RECORD  454867 CP-89   52  9.72051 6.9-8921.928
RECORD  454868 CP-89   53  6.521 345.4-8925.488
RECORD  454869 CP-89   54 10.122 158.5-8928.251
RECORD  454870 CP-89   55 10.3221111.9-8945.918
RECORD  454871 CP-89   56  9.7221310.3-8923.023
RECORD  454872 CP-89   57 10.1222622.7-8916.380
RECORD  454873 CP-89   58 10.32250 9.7-8932.246
RECORD  454874 CP-89   59 10.22257 8.5-8917.931
RECORD  454875 CP-89   60 10.3232552.3-8911.413
RECORD  454876 CP-89   61 10.1234613.9-8915.824
RECORD  454877 CP-89   62  8.9235238.7-89 1.504
```