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National Space Science Data Center/
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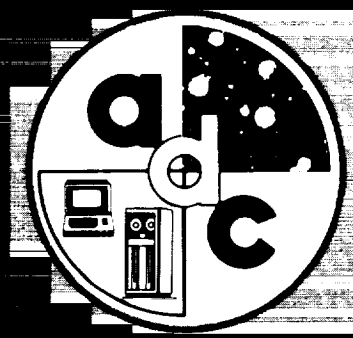
# SOUTHERN DURCHMUSTERUNG

# (Schönfeld 1886)

## Documentation for the Machine-Readable Version






April 1989

NSSDC/WDC-A-R&S 89-06

# *SOUTHERN DURCHMUSTERUNG*

# (Schönfeld 1886)

**Documentation for the Machine-Readable Version**

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National Space Science Data Center (NSSDC)/
World Data Center A for Rockets and Satellites (WDC-A-R&S)
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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 *Southern Durchmusterung* (SD) was computerized at the Centre de Données Astronomiques de Strasbourg and at the Astronomical Data Center at the National Space Science Data Center, NASA/ Goddard Space Flight Center. Corrigenda listed in the original SD volume and published by Küstner and Sticker have been incorporated into the machine file. In addition, one star indicated to be "missing" in a published list, and later verified, is flagged so that it can be omitted from computer plotted charts if desired. Stars deleted in the various errata lists have been similarly flagged, while those with revised data are flagged and listed in a separate table. This catalog covers the zones $-02°$ to $-23°$; zones $+89°$ to $-01°$ (the *Bonner Durchmusterung*) are included in a separate catalog available in machine-readable form.

# Table of Contents


**1.0 Introduction** ..... 1
1.1 Description ..... 1
1.2 Source References ..... 1

**2.0 Structure** ..... 3
2.1 File Summary ..... 3
2.2 Catalog (File 1 of 1) ..... 4

**3.0 History** ..... 7
3.1 Remarks ..... 7

**4.0 Acknowledgments and References** ..... 9
4.1 Acknowledgments ..... 9
4.2 References ..... 9

**Appendix A. Changes to Catalog Data** ..... 11
A.1 Zone Statistics ..... 12

**Appendix B. Sample Listing** ..... 13

# List of Tables

Table 1. Summary Description of Catalog Files . . . . . 3
Table 2. Data File Record Format . . . . . 4
Table 3. Distribution of Computerization Work for SD Data . . . . . 7
Table 4. Changes Made to SD Catalog Data . . . . . 11
Table 5. Zone Statistics for the SD . . . . . 12

# 1.0 Introduction

## *1.1 Description*

The *Southern Durchmusterung* (SD, Schönfeld 1886, Becker 1949, Schmidt 1967) is a visual survey of stars in the declination zones $-02°$ to $-23°$, completed as an extension to Argelander's (1859-62) monumental *Bonner Durchmusterung* (BD). Schönfeld's survey was carried out using the same methods as had been used for the BD, which Schönfeld had helped to compile as one of Argelander's assistants. The procedure consisted of allowing the telescope to drift along the mean declination of each zone and recording the positions and magnitudes of stars crosssing the transit line of each field. The goal of the survey was to extend the BD to declination $-23°$ (a plan originally adopted by Argelander) with approximately the same magnitude limits, although the primary instrument was of larger aperture (159 mm) than the 78-mm telescope used for the BD. Thus, whereas the BD magnitude estimates extend to $9^m.4$ with all fainter stars assigned a magnitude of 9.5, the SD magnitude estimates extend to $9^m.9$ with all fainter stars assigned a magnitude of 10. The fainter limit of the SD results in an increase in the average number of stars in each zone of a thousand or more over the BD. As with the BD, the SD contains a rather large number of stars fainter than $10^m.0$ and even occasionally as faint as $11^m$. Positions are given to the nearest $0^s.1$ in right ascension and 0'.1 in declination as in the BD.

This documentation is intended to fully describe the machine-readable version of the SD. It includes detailed descriptions of the format and the procedure by which the computer file was created. Lists of all corrections made to the original data as a result of published corrigenda, stars deleted according to overstriking in the printed catalogs or their inclusion in lists of "missing" stars, and stars inserted in later editions are given in a separate table. Zone statistics for the catalog are also given in a table. No other corrections or changes have been incorporated into the original data, *e.g.*, from more modern positions and magnitudes or from comparison with other catalogs. The document is intended to enable users to process the data without problems, guesswork, or further literature consultation. For more detailed descriptions of how the observations were made and for additional statistics of star counts and distributions within each zone, the source references should be consulted. The reader can also find additional information on the compilation and scale of the SD, published in English, in papers by Pickering (1885, see pages 361 and 478; 1892; 1913). **A copy of this document should accompany any machine version of the catalog originating from the Astronomical Data Center or from the Center de Données Astronomiques de Strasbourg.**

## *1.2 Source References*


Becker, F. 1949, *Bonner Durchmusterung*, Südlicher Teil, Deklinations-Zonen $-2°$ bis $-22°$ Sternverzeichnis, zweite, berichtigte Auflage (Bonn: Ferd. Dümmlers Verlag).

Schmidt, H. 1967, *Bonner Durchmusterung*, Südlicher Teil, Deklinations-Zonen $-2°$ bis $-22°$ Sternverzeichnis, dritte Auflage (Bonn: Ferd. Dümmlers Verlag).

Schönfeld, E. 1886, *Bonner Sternverzeichniss*, vierte Sektion, *Astronomische Beobachtungen auf der Sternwarte der Königlichen Rheinischen Friedrich-Wilhelms-Universität zu Bonn* **8**, Part IV (Bonn: Adolph Marcus).

# 2.0 Structure

## *2.1 File Summary*

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

| *Southern Durchmusterung* (Schönfeld 1886) | | | | |
|---|---|---|---|---|
| File | Contents | Record Format | Logical Record Length | Total Number of Logical Records |
| 1 | Data | FB | 32 | 134834 |

**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 *Southern 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, 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 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 some of the data fields contain character data. Default (null) values are always blanks in data fields for which primary suggested formats are given as A. Null values are also not specified for numerical fields that always contain valid data.

| Byte(s) | Units | Suggested Format | Default Value | Data |
|---|---|---|---|---|
| 1-2 | --- | A2 | --- | Catalog prefix (SD) |
| 3-5 | --- | I3 | --- | Zone |
| 6-10 | --- | I5 | --- | Star number |
| 11 | --- | A1 | --- | Code |
| 12-15 | mag | F4.1 | --- | Visual magnitude |
| 16-17 | hours | I2 | --- | Right ascension, $\alpha$ |
| 18-19 | min | I2 | --- | $\alpha$ |
| 20-23 | sec | F4.1 | --- | $\alpha$ |
| 24 | --- | A1 | --- | Sign of declination, $\delta$ |
| 25-26 | ° | I2 | --- | $\delta$ |
| 27-32 | ′ | F6.3 | --- | $\delta$ |

**Table 2. Data File Record Format**

**Catalog prefix** — The letters "SD" are included in each record in order to distinguish the SD from all other machine-readable Durchmusterungen. Thus, all of the DM catalogs can conceivably be combined into a single file, and the individual source catalogs will still be identifiable.

**Zone** — The $\delta$ zone part of the SD number. The sign is always in byte 3, with preceding zeros on single-digit zones where appropriate.

**Star number** — Sequentially increasing star number within the specified zone.

**Code** — Upper and lower case codes. All lower case letters represent supplemental (footnoted) stars added to the catalog via published corrigenda. Upper case letters and asterisks are flags that indicate changes to the original data or to the status of a star in the catalog. They have the following meanings:

* Data have been corrected as a result of corrigenda, or there are special notes associated with the star. All changes are given in "Appendix A. Changes to Catalog Data", Table 4 on page 11, with appropriate notes.

**D** The star has been deleted in a later edition of the catalog. This was done by overstriking entries with horizontal lines.

**M** The star was noted as "missing" in a list published by Pickering (1907). This entry (there is only one such star) was verified by R. A. Downes and at the ADC.

**Visual magnitude**

Magnitude as estimated by the observer or magnitude code to denote non-numerical entries in the published catalogs. The following codes are used (we describe all codes used in the Durchmusterung catalogs; not all are used in the SD):

**20.0** *neb* (denoting a nebula);

**30.0** *var* (denoting variability);

**40.0** *nova* or nova?;

**50.0** *cum* (denoting the cumulative [integrated] magnitude estimate of a cluster of stars).

**Equatorial coordinates**

Equinox 1855. For $\delta^m$ in the SD, only bytes 27-30 are used, so the data can be read with format F4.1. Bytes 31-32 were reserved to maintain a uniform format for all DM catalogs, since they are used in the southern zones of the *Cape Photographic Durchmusterung*.

# 3.0 History

## *3.1 Remarks*

The data in the machine-readable *Southern Durchmusterung* were keyed directly to disk storage from the published catalogs at the Centre de Données Astronomiques de Strasbourg and at the Astronomical Data Center of the National Space Science Data Center at the NASA Goddard Space Flight Center. Progress reports on the keypunching of the Durchmusterung catalogs have been published over the years in the *Bulletin d'Information du Centre de Données Stellaires* (Couteau *et al.* 1983; Wagner 1984, 1986; Warren 1987). The distribution of SD work is given in Table 3.

| Zones | Location |
|---|---|
| −01° | Astronomical Data Center/NSSDC |
| −02° to −21° | Centre de Données Astronomiques de Strasbourg (CDS) |
| −22° to −23° | Astronomical Data Center/NSSDC |

**Table 3. Distribution of Computerization Work for SD Data**

Most of the data entry work was done at the CDS, where the data were also verified. The ADC zones −01° and −23°, although not often used for stellar designations (the BD is used in zone −01° and the *Córdoba Durchmusterung* in zone −23°), were added for completeness. The three ADC zones were computerized and proofread by the first author (WHW). All zones were carefully examined, checked for sequencing and record counts, reformatted, and merged in the correct order at the ADC, where the final catalog was assembled. The published corrigenda lists were cross checked against the reprinted editions (1949, 1967) of the catalog. The final catalog was run through a verification program that checked numerical sequencing of the SD numbers, monotonic increase in right ascension, and allowed data ranges. All cases where stars are out of RA order were checked in the original data to verify that their positions are as in the original catalog or the corrigenda.

The final file is ordered north to south strictly by SD number, *i.e.*, in the zone order −01°, −02°, ···, −23°. Users should note, however, that all stars are not strictly in right ascension order within each zone. This is because individual stars are occasionally out of RA order in the original catalog and because of corrections inserted from the corrigenda. Thus, if the machine catalog is sorted by increasing RA, *e.g.*, for search purposes, some SD numbers will become disordered.

# 4.0 Acknowledgments and References

## *4.1 Acknowledgments*

The authors express appreciation to M. J. Wagner, M. Maslo, and R. Bonnet, who keyed the SD data to disk at the CDS using preprocessing software written and implemented by F. Ochsenbein. We thank Dr. R. A. Downes for bringing the cases of "missing" BD and SD stars to our attention. We are grateful for the support of the CDS director, Dr. C. Jaschek, during the course of the work.

## *4.2 References*

Argelander, F. W. A. 1859-1862, *Bonner Sternverzeichniss*, erste bis dritte Sektion, *Astronomischen Beobachtungen auf der Sternwarte der Königlichen Rhein.*, Friedrich-Wilhelms-Universität zu Bonn, Bände 3-5.

Becker, F. 1949, *Bonner Durchmusterung*, Südlicher Teil, Deklinations-Zonen $-2°$ bis $-22°$ Sternverzeichnis, zweite, berichtigte Auflage (Bonn: Ferd. Dümmlers Verlag).

Chandler, S. C. 1896, *Astron. J.* **16**, 145.

Couteau, P., Fulconis, M., Ochsenbein, F., Wagner, M. J., and Maslo, W. 1983, *Inf. Bull. CDS* No. 25, p. 83.

Küstner, F. 1918, *Astron. Nach.* **206**, 69 (Nr. 4929).

Küstner, F. 1925, *Astron. Nach.* **223**, 309 (Nr. 5347).

Pickering, E. C. 1885, *Harv. Ann.* **14**.

Pickering, E. C. 1892, *Harv. Ann.* **23**.

Pickering, E. C. 1907, *Astron. Nach.* **175**, 139.

Pickering, E. C. 1913, *Harv. Ann.* **72**.

Schmidt, H. 1967, *Bonner Durchmusterung*, Südlicher Teil, Deklinations-Zonen $-2°$ bis $-22°$ Sternverzeichnis, dritte Auflage (Bonn: Ferd. Dümmlers Verlag).

Schönfeld, E. 1886, *Bonner Sternverzeichniss*, vierte Sektion, *Astronomische Beobachtungen auf der Sternwarte der Königlichen Rheinischen Friedrich-Wilhelms-Universität zu Bonn* **8**, Part IV (Bonn: Adolph Marcus).

Sticker, B. 1935, *Astron. Nach.* **256**, 341 (Nr. 6139).

Wagner, M. J. 1984, *Inf. Bull. CDS* No. 26, p. 87.

Wagner, M. J. 1986, *Inf. Bull. CDS* No. 30, p. 117.

Warren, W. H. Jr. 1987, *Inf. Bull. CDS* No. 32, p. 67.

# Appendix A. Changes to Catalog Data

As mentioned previously, all changes made to SD data and known to us have been incorporated into the present machine-readable version. Unlike the *Bonner Durchmusterung*, where there had been numerous stars added and deleted, changes in supplemental entries from version to version, and a large number of data corrections, the changes to the SD are relatively few and can be documented in a single table. There were two stars added as supplementary entries ("a" suffix), two stars deleted, and one star published as "missing" by Pickering (1907) and subsequently verifed by R. A. Downes of Applied Research Corporation. A small list of corrections was also included in the introduction to the original published catalog. These modifications to the printed catalog are flagged by codes in byte 11 of the affected records and are listed in Table 4 below.

| Star | Datum | For | Read | Remarks |
|---|---|---|---|---|
| −06 5412 | δ | 28.8 | 28.3 | |
| −07 5419 | δ | 43.0 | 53.0 | |
| −09 553a | | | | Added by Küstner (1918). |
| −09 743 | δ | 45.2 | 54.2 | |
| −09 4403 | $m_v$ | 8.9 | 9.3 | |
| −10 4102a | | | | Added by Küstner (1918). |
| −12 404 | δ | 12.6 | 42.6 | Sticker (1935). |
| −14 133 | δ | 32.1 | 33.1 | |
| −14 5658 | δ | 46.1 | 45.1 | |
| −15 1427 | δ | 26.9 | 25.9 | |
| −15 4676 | | | | "Missing" star (Pickering 1907) flagged with "M". |
| −16 4872 | δ | 50.4 | 54.0 | |
| −18 4706 | δ | 52.8 | 53.2 | |
| −19 270 | δ | 38.9 | 34.5 | |
| −19 6001 | $\alpha^s$ | 32.0 | 34.4 | |
| −20 475 | δ | 2.0 | 6.9 | |
| −20 477 | δ | 54.2 | 58.6 | |
| −20 1041 | | | | Deleted by Küstner (1918). |
| −20 1697 | $\alpha^s$ | 23.6 | 26.4 | |
| −20 1697 | δ | 28.3 | 28.0 | |
| −20 2161 | δ | 28.4 | 23.8 | |
| −20 3648 | $\alpha^s$ | 39.0 | 46.2 | |
| −20 3950 | $\alpha^s$ | 48.5 | 45.3 | Puts out of order with 3949. |
| −20 4293a | | | | Deleted by Küstner (1925). |
| −20 5349 | $\alpha^s$ | 11.3 | 9.6 | |
| −20 5671 | $\alpha^s$ | 26.4 | 27.2 | |
| −21 957 | $m_v$ | 8.9 | 8.8 | |
| −22 3885 | $\alpha^s$ | 14.1 | 11.3 | |
| −22 5735 | $\alpha^s$ | 45.5 | 55.5 | |

**Table 4. Changes Made to SD Catalog Data**

# *A.1 Zone Statistics*

The changes that have been made to the SD since the original work of Schönfeld have resulted in a situation that can be very confusing to a catalog user who wishes to verify that disagreements between the published catalog and the machine version are valid. For example, one usually checks the number of logical records in a sequentially numbered catalog with the highest sequential number in order to verify that no objects are missing or that there are no duplicate records, etc. Because of the supplemental SD stars, this is not possible in some zones of the SD nor for the total.

It is also useful to be able to determine how many objects have been added, deleted, etc. without having to process the whole catalog. Therefore, we summarize the zone statistics for the SD in Table 5 for the convenience of users of this new machine version. Note that, for some zones, the highest SD number does not determine the star count, but, since records for deleted stars have been flagged rather than removed, the number of deleted stars has no influence on the record count. The "Stars Added" column shows how many stars have been added to the catalog as a result of the corrigenda, while the "Stars Deleted" column provides a count of the number of stars flagged with a "D" in each zone. The number of supplemental stars for each zone is the total (1886 plus corrigenda), hence the highest star number added to the number of supplemental stars should produce the record count. The "M" star ( − 15° 4676) is still counted in the last column.

| Zone | Number of Records | Highest Star Number | Stars Added | Stars Deleted | Stars Missing | Supplemental Stars | Number of "Active" Stars |
|---|---|---|---|---|---|---|---|
| −01 | 692 | 692 | - | - | - | - | 692 |
| −02 | 6099 | 6099 | - | - | - | - | 6099 |
| −03 | 5763 | 5763 | - | - | - | - | 5763 |
| −04 | 6026 | 6026 | - | - | - | - | 6026 |
| −05 | 6117 | 6117 | - | - | - | - | 6117 |
| −06 | 6365 | 6365 | - | - | - | - | 6365 |
| −07 | 6153 | 6153 | - | - | - | - | 6153 |
| −08 | 6247 | 6247 | - | - | - | - | 6247 |
| −09 | 6327 | 6326 | 1 | - | - | 1 | 6327 |
| | | | | | - | | |
| −10 | 6231 | 6230 | 1 | - | - | 1 | 6231 |
| −11 | 6206 | 6206 | - | - | - | - | 6206 |
| −12 | 6617 | 6617 | - | - | - | - | 6617 |
| −13 | 6521 | 6521 | - | - | - | - | 6521 |
| −14 | 6621 | 6621 | - | - | - | - | 6621 |
| −15 | 6545 | 6545 | - | - | 1 | - | 6545 |
| −16 | 6419 | 6419 | - | - | - | - | 6419 |
| −17 | 6878 | 6878 | - | - | - | - | 6878 |
| −18 | 6429 | 6429 | - | - | - | - | 6429 |
| −19 | 6570 | 6570 | - | - | - | - | 6570 |
| −20 | 6724 | 6724 | - | 2 | - | - | 6722 |
| −21 | 6538 | 6538 | - | - | - | - | 6538 |
| −22 | 6265 | 6265 | - | - | - | - | 6265 |
| −23 | 481 | 481 | - | - | - | - | 481 |
| Totals | 134834 | 134832 | 2 | 2 | 1 | 2 | 134832 |

**Table 5. Zone Statistics for the SD**

# Appendix B. 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).

# 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: Southern Durchmusterung

Records 1 To 20

Data File 2

Record Length 32 bytes

Input VOLSER WHW017

```
C O L U M N
H E A D I N G
I N D E X      1111111111222222222233333333334444444444555555555566666666667777777777888888888899999999990000000001111111111
          12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234
```

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Record | 1 | SD-01 | 1 | 9.0 | 0 | 126.4-0156.6 |
| Record | 2 | SD-01 | 2 | 7.8 | 0 | 4 6.3-0155.7 |
| Record | 3 | SD-01 | 3 | 9.5 | 0 | 655.4-0159.6 |
| Record | 4 | SD-01 | 4 | 10. | 0 | 727.5-0156.8 |
| Record | 5 | SD-01 | 5 | 9.7 | 0 | 1112.5-0157.4 |
| Record | 6 | SD-01 | 6 | 10. | 0 | 1857.9-0159.3 |
| Record | 7 | SD-01 | 7 | 10. | 0 | 1913.0-0155.8 |
| Record | 8 | SD-01 | 8 | 7.3 | 0 | 2229.2-0154.8 |
| Record | 9 | SD-01 | 9 | 9.8 | 0 | 2445.9-0154.1 |
| Record | 10 | SD-01 | 10 | 9.1 | 0 | 3134.4-0157.9 |
| Record | 11 | SD-01 | 11 | 9.7 | 0 | 3739.1-0156.3 |
| Record | 12 | SD-01 | 12 | 8.6 | 0 | 3820.4-0159.2 |
| Record | 13 | SD-01 | 13 | 9.0 | 0 | 3947.4-0156.6 |
| Record | 14 | SD-01 | 14 | 9.5 | 0 | 4011.5-0158.0 |
| Record | 15 | SD-01 | 15 | 4.5 | 0 | 4535.9-0155.8 |
| Record | 16 | SD-01 | 16 | 8.5 | 0 | 5210.1-0158.7 |
| Record | 17 | SD-01 | 17 | 9.8 | 0 | 5318.9-0155.1 |
| Record | 18 | SD-01 | 18 | 9.5 | 0 | 5320.1-0157.9 |
| Record | 19 | SD-01 | 19 | 10. | 0 | 5345.5-0154.5 |
| Record | 20 | SD-01 | 20 | 10. | 0 | 5423.3-0154.5 |

# 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: Southern Durchmusterung

Records 134815 To 134834

Data File 2

Record Length 32 bytes

Input VOLSER WHWQ17

```
C O L U M N
H E A D I N G          1111111111222222222233333333334444444444555555555566666666667777777777888888888899999999990000000001111
I N D E X      12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123
```

```
Record  134815 SD-23  462  9.4224127.1-23 3.2
Record  134816 SD-23  463  9.4224342.2-23 4.8
Record  134817 SD-23  464  9.3224549.8-23 4.8
Record  134818 SD-23  465  8.32253 4.7-23 2.4
Record  134819 SD-23  466  9.1225532.9-23 5.2
Record  134820 SD-23  467  7.1225624.4-23 0.6
Record  134821 SD-23  468  9.1225842.5-23 4.0
Record  134822 SD-23  469  8.2225917.0-23 0.2
Record  134823 SD-23  470  9.723 126.1-23 5.1
Record  134824 SD-23  471  9.123 4 5.4-23 0.2
Record  134825 SD-23  472  8.823 759.1-23 3.1
Record  134826 SD-23  473  8.92313 3.9-23 5.9
Record  134827 SD-23  474  9.2231510.6-23 3.6
Record  134828 SD-23  475  9.12323 3.0-23 4.7
Record  134829 SD-23  476  7.5233954.5-23 4.8
Record  134830 SD-23  477  9.0234156.6-23 0.6
Record  134831 SD-23  478  9.12342 4.6-23 0.2
Record  134832 SD-23  479  8.0234255.4-23 2.8
Record  134833 SD-23  480  9.62343 9.7-23 5.0
Record  134834 SD-23  481  9.8234712.9-23 0.2
```