

DATA SET CATALOG #178

68-110A-01A magnetic tape

0A0-A2 CELESCOPE CATALOG

68-110A-01F program package

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1. INTRODUCTION:

The documentation for this data set was originally on paper, kept in NSSDC's Data Set Catalogs (DSCs). The paper documentation in the Data Set Catalogs have been made into digital images, and then collected into a single PDF file for each Data Set Catalog. The inventory information in these DSCs is current as of July 1, 2004. This inventory information is now no longer maintained in the DSCs, but is now managed in the inventory part of the NSSDC information system. The information existing in the DSCs is now not needed for locating the data files, but we did not remove that inventory information.

The offline tape datasets have now been migrated from the original magnetic tape to Archival Information Packages (AIP's).

A prior restoration may have been done on data sets, if a requestor of this data set has questions; they should send an inquiry to the request office to see if additional information exists.

2. ERRATA/CHANGE LOG:

NOTE: Changes are made in a text box, and will show up that way when displayed on screen with a PDF reader.

When printing, special settings may be required to make the text box appear on the printed output.

Version	Date	Person	Page	Description of Change
01				
02				

3 LINKS TO RELEVANT INFORMATION IN THE ONLINE NSSDC
INFORMATION SYSTEM:

<http://nssdc.gsfc.nasa.gov/nmc/>

[NOTE: This link will take you to the main page of the NSSDC Master Catalog. There you will be able to perform searches to find additional information]

4. CATALOG MATERIALS:

- a. Associated Documents To find associated documents you will need to know the document ID number and then click here.
<http://nssdcftp.gsfc.nasa.gov/miscellaneous/documents/>

- b. Core Catalog Materials

0AO 2

CELESCOPE CATALOGUE - MAG TAPE

68-110A-01A

ASUV 00029

This data set has been restored. There was originally one 7-track, 556 BPI tape written in Binary. There is one restored tape. The DR tape is a 3480 cartridge and the DS tape is 9-track, 6250 BPI. The original tape was created on a 6400 computer and the restored tape was created on an IBM 9021 computer. The DR and DS numbers along with the corresponding D number are as follows:

DR#	DS#	D#	FILES	TIME SPAN
-----	-----	-----	-----	-----
DR004910	DS004910	D007108	1	12/08/68 - 04/30/70

o D007108: Read error occurred in record 5749 of file 1.

ASUV-00005

OA0 2

CDC UTILITY PRINT PROGRAM ON TAPE

68-110A-01F

This data set has been restored. There was originally one 7-track, 556 BPI tape written in BCD. There is one restored tape written in ASCII. The DR tape is a 3480 cartridge and the DS tape is 9-track, 6250 BPI. The original tape was created on a 7094 computer and the restored tape was created on an IBM 9021 computer. The DR and DS numbers along with the corresponding D number are as follows:

DR#	DS#	D#	FILES
-----	-----	-----	-----
DR004821	DS004821	D012765	1 - 2

0A0-A2

CELESCOPE CATALOGUE

68-110A-01A

MAGNETIC TAPE

This data set consists of one 556 BPI, binary, 7 track tape that was produced on a CDC-6400. The tape contains 1 file of data with variable length records. For the time spans we used the beginning and ending right ascension

<u>D#</u>	<u>C#</u>			
D-07108	C-07026			
R.A. (1950)	HR.	MIN.	SEC.	
Start:	0	0	9	
Stop:	23	59	51	

68-110A-01F

PROGRAM PACKAGE

This data set consists of one 556 BPI, BCD, 7 track tape that contains 1^{*} file.

This tape contains the package of programs that accompanies the magnetic tape version of the telescope catalogue. These routine correspond to the 60 bit word size of the control data 6400.

<u>D#</u>	<u>C#</u>
D-12765	C-09906

* A SECOND FILE WAS ADDED TO THIS TAPE
WHICH CONTAINS THE PACKAGE OF PROGRAMS
THAT CORRESPOND TO THE 36 BIT WORD-SIZE
OF THE IBM 7094.

Celescope Catalog Tape Format

This document describes the magnetic tape version of the Telescope Catalog. The tape was written on the Control Data 6400 at the Smithsonian Astrophysical Observatory. The tape has the following characteristics:

1. Binary
2. 7-track
3. 556 bpi
4. Variable length records

Each record contains the data for all observations of a given star. The length of the record depends on the number of observations of the star. Each record was written with a FORTRAN binary BUFFER OUT statement.

In the following format description of the records on the tape, a "word" consists of 60 bits of information numbered 59-0 from left to right:

59 _____ 0

All values on the tape are either alphanumeric or integer. Decimal values such as the ultraviolet magnitudes, standard deviations, and composite weights have been multiplied by 100 and rounded to obtain integers. Alphanumeric quantities such as spectral type, ground-based magnitudes, etc. are given in CDC 6000 console display code. See Appendix A for the octal equivalents. Since a character occupies 6 bits, there is a maximum of 10 characters per 60 bit word.

Whole word signed integer (and rounded decimal) quantities are given with the sign in bit 59 and the absolute value right justified in bits 58-0. The sign convention is:

<u>Bit 59</u>	<u>Sign of quantity</u>
0	+
1	-

Unsigned quantities are always right justified in the allocated bits. Although for ease of programming on the CDC 6400 we have allotted 60 bits for many items on the tape, the absolute value never occupies more than the rightmost 24 bits of the word.

The checksum in word #1 of the record is the exclusive OR of the words in the record. It would only be useful for reading the tape on a CDC 6000 machine.

Appendix A

6000 Series Fortran Character Codes

<u>Source Language Character</u>	<u>Console Display Code</u>
A	01
B	02
C	03
D	04
E	05
F	06
G	07
H	10
I	11
J	12
K	13
L	14
M	15
N	16
O	17
P	20
Q	21
R	22
S	23
T	24
U	25
V	26
W	27
X	30
Y	31
Z	32
0	33
1	34
2	35
3	36
4	37
5	40
6	41
7	42
8	43
9	44
+	45
-	46
*	47
/	50
(	51
)	52
\$	53
=	54
blank(space)	55
,	56
.	57

APPENDIX B--TELESCOPE CATALOG TAPE FORMAT

BINARY
7-TRACK
556 BPI
VARIABLE LENGTH RECORDS
1 RECORD/ STAR

WORD	CONTENTS		BITS
1	CHECKSUM	UNSIGNED	INTEGER 59-00
2	R.A. (1950) IN SECONDS OF TIME	UNSIGNED	INTEGER 59-00
3	DEC. (1950) IN TENTHS OF MIN. OF ARC	SIGNED	INTEGER 59-00
4	R.A. (2000) IN SECONDS OF TIME	UNSIGNED	INTEGER 59-00
5	DEC. (2000) IN TENTHS OF MIN. OF ARC	SIGNED	INTEGER 59-00
6	DM ZONE SIGN	UNSIGNED	INTEGER 59
6	DM ZONE ABSOLUTE VALUE	UNSIGNED	INTEGER 47-24
6	DM NUMBER	UNSIGNED	INTEGER 23-00
6	ASTIGMUS I.D. FLAG (1 CHARACTER)	UNSIGNED	ALPHA 16-11
7	MERGED IMAGE FLAG (1 CHARACTER)	UNSIGNED	ALPHA 10-05
7	UT CODE	UNSIGNED	INTEGER 04-01
7	NON-STAR CODE	UNSIGNED	INTEGER 00-00
8	NGC-IC DESIGNATION (4 CHARACTERS)	UNSIGNED	ALPHA 43-20
8	HD NUMBER	UNSIGNED	INTEGER 19-00
8	PECULIARITY CODES 1-10	UNSIGNED	ALPHA 59-00
9	PECULIARITY CODES 11-20	UNSIGNED	ALPHA 59-00
10	PECULIARITY CODE 21	UNSIGNED	ALPHA 53-48
11	MIX100 (4 CHARACTERS)	SIGNED	ALPHA 47-24
11	M2X100 (4 CHARACTERS)	SIGNED	ALPHA 23-00
11	M3X100 (4 CHARACTERS)	SIGNED	ALPHA 48-25
12	MAGNITUDE CODE FOR M1,M2,M3	UNSIGNED	INTEGER 24-18
12	SPECTRAL CLASS AND SUBCLASS (2 CHAR.)	UNSIGNED	ALPHA 17-06
12	LUMINOSITY (1 CHARACTER)	UNSIGNED	ALPHA 05-00
13	REFERENCE 1 (3 CHARACTERS)	UNSIGNED	ALPHA 53-36
13	REFERENCE 2 (3 CHARACTERS)	UNSIGNED	ALPHA 35-18
13	REFERENCE 3 (3 CHARACTERS)	UNSIGNED	ALPHA 17-00
14	REFERENCES 4-6 SAME AS REF.1-3		
15	REFERENCES 7-9 SAME AS REF.1-3		
16	REFERENCES 10-12 SAME AS REF.1-3		
17	REFERENCES 13-15 SAME AS REF.1-3		
18	REFERENCES 16-18 SAME AS REF.1-3		
18	REFERENCES 19 (3 CHARACTERS)	UNSIGNED	ALPHA 53-36
19	REFERENCE 20 (3 CHARACTERS)	UNSIGNED	ALPHA 35-18
19	REFERENCE 21 (3 CHARACTERS)	UNSIGNED	ALPHA 59-00
20	NAME OR COMMENT (CHARACTERS 1-10)	UNSIGNED	ALPHA 59-00
21	NAME OR COMMENT (CHARACTERS 11-20)	UNSIGNED	ALPHA 59-00

.....1.....2.....3.....4.....5.....6.....7.....8

C	WORD	CONTENTS		BITS
C 22		U1 AVERAGE X 100	SIGNED	INTEGER 59-00
C 23		(COMPOSITE WEIGHT OF U1) X 100	SIGNED	INTEGER 59-00
C 24		(RMS DEVIATION OF U1) X 100	SIGNED	INTEGER 59-00
C 25		U2 AVERAGE X 100	SIGNED	INTEGER 59-00
C 26		(COMPOSITE WEIGHT OF U2) X 100	SIGNED	INTEGER 59-00
C 27		(RMS DEVIATION OF U2) X 100	SIGNED	INTEGER 59-00
C 28		U3 AVERAGE X 100	SIGNED	INTEGER 59-00
C 29		(COMPOSITE WEIGHT OF U3) X 100	SIGNED	INTEGER 59-00
C 30		(RMS DEVIATION OF U3) X 100	SIGNED	INTEGER 59-00
C 31		U4 AVERAGE X 100	SIGNED	INTEGER 59-00
C 32		(COMPOSITE WEIGHT OF U4) X 100	SIGNED	INTEGER 59-00
C 33		(RMS DEVIATION OF U4) X 100	SIGNED	INTEGER 59-00
C 34		NUMBER OF U1 MAGNITUDES TO FOLLOW	UNSIGNED	INTEGER 59-00
C 35		(FIRST U1 MAG.) X 100	SIGNED	INTEGER 59-00
C 36		IDENTIFIER OF FIRST U1 MAG.		
C 36		STATION (1 CHARACTER)	UNSIGNED	ALPHA 59-54
C 36		ORBIT	UNSIGNED	INTEGER 59-40
C 36		TAPE (4 CHARACTERS)	UNSIGNED	ALPHA 39-16
C 36		FRAME	UNSIGNED	INTEGER 15-09
C 36		OBJECT NUMBER	UNSIGNED	INTEGER 08-00
C 36		WEIGHT OF FIRST U1 MAG.	UNSIGNED	INTEGER 59-00
C 38-I		SAME AS 35-37 FOR OTHER U1 MAGNITUDES		
C I+1		NUMBER OF U2 MAGNITUDES TO FOLLOW		
C (I+2)-J		SAME AS 35-37 FOR U2 MAGNITUDES		
C J+1		NUMBER OF U3 MAGNITUDES TO FOLLOW		
C (J+2)-K		SAME AS 35-37 FOR U3 MAGNITUDES		
C (K+1)		NUMBER OF U4 MAGNITUDES TO FOLLOW		
C (K+2)-L		SAME AS 35-37 FOR U4 MAGNITUDES		
C L+1		NUMBER OF U1 MAGS. IN FILTER PROXIMITY TO FOLLOW		SEE 34
C L+2		(FIRST U1 MAG. IN FILTER PROX.) X 100	<i>signed int</i>	SEE 35
C L+3		IDENTIFIER OF FIRST U1 MAG. IN FILTER PROX.		SEE 36
C L+4		WEIGHT OF FIRST U1 MAG. IN FILTER PROX.	<i>unsigned int</i>	SEE 37
C L+5		(ETA OF FIRST U1 MAG. IN FILTER PROX.) X 100	SIGNED-INTEGER	59-00
C (L+6)-M		SAME AS (L+2)-(L+5) FOR OTHER U1 MAGS. IN FILTER PROX.		
C M+1		NUMBER OF U2 MAGS. IN FILTER PROX. TO FOLLOW		
C (M+2)-N		SAME AS (L+2)-(L+5) FOR U2 MAGS. IN FILTER PROX.		
C N+1		NUMBER OF U3 MAGS. IN FILTER PROX. TO FOLLOW		
C (N+2)-R		SAME AS (L+2)-(L+5) FOR U3 MAGS. IN FILTER PROX.		
C R+1		NUMBER OF U4 MAGS. IN FILTER PROX. TO FOLLOW		
C (R+2)-S		SAME AS (L+2)-(L+5) FOR U4 MAGS. IN FILTER PROX.		

1 DECKS. TOTAL

Celescope Catalog Printing Package

This document describes the package of programs that accompanies the magnetic tape version of the Telescope Catalog. The package is intended to allow users of the Catalog to access the tape with a minimum of programming effort. In the interest of making it as general as possible, we have sacrificed efficiency to generality. Therefore, users who will be reading and printing the tape repeatedly would do well to revise these routines appropriately. All routines have been written in USA Standard Fortran, except where otherwise noted. Several subroutines (reading and unpacking of records) must be written by the user to conform to the word size of his machine. The versions of these routines supplied with the package correspond to the 60 bit word size of the Control Data 6400.

This package consists of a driver subroutine (DRIVE) to be called by the user, plus several printing and processing subroutines optionally called by the driver for each star (USER, PRINT, VARPR, SELECT as specified on data cards). If the user elects to call PRINT, he will obtain the information for each star printed in the standard Telescope Catalog format. If he specifies a call to VARPR, the printout for each star will include only those items he has listed close packed on one or more lines. By specifying a call to USER for each star, he can write his own print or processing routine. In this case, USER will be called by the driver once for each star. The unpacked version of the record (See UNPAK write-up) is passed to USER, allowing the routine to print or otherwise access the data as desired.

We have assumed that all installations have at least a printer and one rewindable scratch file. This allows the following options in printing the catalog with routine PRINT:

- 1) All odd pages on one unit.
All even pages on another unit.
- 2) Odd/even, odd/even printed on one unit.
- 3) Only evens or only odds printed.

In addition, when using PRINT the user can specify if he wants either galactic coordinates or right ascension and declination given in another epoch printed on the even pages instead of the R.A., Dec. (2000) normally given there. Note that precession and galactic coordinate routines are included with this package.

Finally, the package will optionally call subroutine SELECT in addition to PRINT, VARPR or USER. This routine selects stars on the basis of:

- (1) R.A., Dec.
- (2) HD number
- (3) DM number

This allows the user to print or process only those records (stars) he wishes to see using PRINT, VARPR, or USER.

Use of Telescope Catalog Printing Package

1. Unless the user is working with a Control Data 6000 series machine, he must supply his own versions of the following subroutines:

IREAD - Read a record

UNPAK - Unpack a record into standard format

In addition, all users must supply a main program to call our driver subroutine (DRIVE) setting up the input/output unit numbers. DRIVE is called as follows:

CALL DRIVE (I1,I2,I3,I4,I5)

I1 - card reader unit number

I2 - printer unit number

I3 - tape drive unit number, for reading catalog

I4 - scratch file or another printer unit

I5 - scratch file

See following examples and data section #3 for more details on I2,I4,I5

Example Calls to DRIVE

Example #1

- a. The card reader is TAPE5.
- b. The printer is TAPE6.
- c. The tape drive with the catalog is TAPE10.
- d. The user has a disk on which he defines a scratch file TAPE99.
- e. The user has an extra tape drive (TAPE11) on which he will write even catalog pages to later copy to the printer (default option in data section #3).

CALL DRIVE(5,6,10,11,99)

Example #2

- a.-c. same as above
- d. The user has a disk or two extra tape drives on which he can define two scratch files, TAPE98 and TAPE99. He wishes the catalog printed directly to the printer in odd/even, odd/even page order (DOUBLE option in data sections #3).

CALL DRIVE(5,6,10,98,99)

Example #3

- a.-c. same as above
d. The user has only one scratch unit available (TAPE40), and he wishes to print only odd pages on his printer (option SINGLE ODD in data section #3).

CALL DRIVE(5,6,10,0,40)

Note that I4=0, but that I5 must always be defined when calling subroutine PRINT.

Example #4

- a.-c. same as above
d. The user wishes to print out selected catalog information using VARPR routine instead of PRINT. No scratch files are necessary.

CALL DRIVE(5,6,10,0,0)

II. Data Description

Input data for the package consists of several "sections" any of which may be omitted except the last. Each section has a default value that the program will use if no data card is encountered. If the user specifies more than one option card in a section, the last one encountered is used. All option cards begin in column 1 and must not have embedded blanks. All number quantities must be rightjustified in the columns provided.

Section #1

Card #1

- a. USER - Call user supplied routine USER
or
b. VARPR - Call variable print routine VARPR
c. Default is PRINT - Call standard Celestcope Catalog print routine PRINT

If option b. is chosen, the following cards are required after the VARPR card:

<u>Card</u>	<u>Columns</u>	<u>Contents</u>
2	1-5	# of items to be printed by VARPR
3-N	1-5	first item number

<u>Card</u>	<u>Columns</u>	<u>Contents</u>
	6-10	second item number
	76-80	Nth item number

See the write-up of subroutine VARP for the correspondence between the list of item numbers and items in the catalog.

Ordinarily VARPR does not separate items in the printout with blanks. However, a facility exists by which this can be done. If VARPR encounters a negative number in the list of item numbers, it prints as many blanks as the absolute value of the number in that position in the list. A zero is considered equal to -1 for this purpose. For example, the list below will produce the result shown:

List: 2 -1 4 -2 5 0

Result: Item #2, one blank, item #4, two blanks, item #5,
one blank

Section #2 (only used if PRINT is called)

Card #1

- a. GALACT - Print galactic coordinates on even pages
or
- b. PRECESS - Print precessed right ascension and declination
on even pages
- c. Default is right ascension and declination for epoch
2000 on even pages

If option b. is chosen, the following card is required after the PRECESS card:

<u>Card</u>	<u>Column</u>	<u>Contents</u>
2	1-4	Epoch for precession (e.g. 1975)

Section #3 (only used if PRINT is called)

Card #1

- a. DOUBLE - Write the two pages of catalog information on
one logical unit (12) in odd/even, odd/even order. 14
and 15 are used for scratch.

or

- b. SINGLE - Write only even or only odd pages on unit I2 with unit I5 used for scratch (I4 not used = 0)
- c. Default is to write all even pages on one unit (I4) and all odd pages on another unit (I2) with I5 used as scratch. I2 cannot equal I4.

If option b. is chosen, card #1 of this section must contain EVEN or ODD beginning in column 8 to specify whether even or odd pages are desired. The odd pages contain the ultra-violet magnitudes and most other "vital" information.

I1, I2, I3, I4, and I5 must be defined in the user supplied main program which calls our driver subroutine DRIVE.

Section #4

Card #1

- a. SELECT - Call routine SELECT to select certain stars to be printed or processed - ignore others. Selection is done by HD, DM and/or R.A., Dec. An HD number occupies one selection word, while DM and(R.A. and Dec.) each occupy two. The total number of selection words allowed per run is 297.
- b. Default is no selection.

If option a. is chosen, at least one of the following subsections is required after the SELECT card. The subsections must be in the order shown.

Subsection 1

<u>Card</u>	<u>Columns</u>	<u>Contents</u>
1	1-2	HD
	11-13	# of HD numbers to follow
2-N	1-6	HD number

Subsection 2

<u>Card</u>	<u>Columns</u>	<u>Contents</u>
1	1-2	DM
	11-13	# of DM numbers to follow
2-N	1-9	DM zone and number as +ZZbNNNNN

Subsection 3

<u>Card</u>	<u>Columns</u>	<u>Contents</u>
1	1-5	RADEC
	11-13	# of RA, Dec. pairs to follow

<u>Card</u>	<u>Columns</u>	<u>Contents</u>
2-N	1-8	RA in hrs., min., sec. of time (1950)
		HHbMMbSS
	11-18	Dec. in degrees, min., and tenths of min. of arc (1950)
		$\pm$ DDbMM.M

Section #4 must terminate with a card with FIN in col. 1-3.

Section #5

Card #1

- a. END
- b. No default - the END card must be present even if no other data cards are included. It must be the last data card.

Sample Data Set-Ups

A. To print in catalog format the whole tape with odd pages on one unit and even pages on another.

No data necessary except END card

B. To print in catalog format the whole tape with odd/even odd/even pages on one unit,

DOUBLE
END

C. To print in catalog format the whole tape, as in B. above, printing even page positions precessed to 1975.

DOUBLE
PRECESS
1975
END

D. To print in catalog format as in B. above, selecting only stars with particular HD numbers and printing even page positions in galactic coordinates.

GALACT
SELECT
HDbbbbbbbbbb3
234567
234568
234569
FIN
END

DRIVE
Diane Hills
12/15/71

Purpose

DRIVE is the main driver subroutine for the Telescope Catalog Printing Package. Its purpose is to call any of several subroutines to process or print information for stars on the catalog tape.

Calling Sequence

DRIVE is called by a user supplied program or routine which must pass to it in the calling sequence the logical unit numbers of all I/O units involved.

DRIVE(I1,I2,I3,I4,I5)

where:

I1 = card reader
I2 = printer
I3 = catalog tape
I4 = scratch or another printer or zero
I5 = scratch

Method

All subroutines called by DRIVE have the following calling sequence:

(IØ,IBUF,IFLAG)

where:

IØ is array of logical unit numbers for all I/O involved as defined by the user in his call to DRIVE. IØ is dimensioned 5.

IØ(1) = card reader unit
IØ(2) = printer unit
IØ(3) = catalog tape unit
IØ(4) = scratch unit or another printer unit or 0
IØ(5) = scratch unit or 0

Note that while $I\emptyset(1)$ - $I\emptyset(3)$ are standard, $I\emptyset(4)$ and $I\emptyset(5)$ may vary depending on the printout desired. For example, if VARPR is being called, $I\emptyset(4)$ and $I\emptyset(5)$ are never accessed and thus may be zero. However, if PRINT is being called, $I\emptyset(5)$ must always exist while $I\emptyset(4)$ may or may not, depending on page ordering option.

IBUF is the array of unpacked catalog items for a star with one integer (right justified) or one character (left justified with blank fill) per element. It is returned from routine IREAD. IBUF is dimensioned 3000.

IFLAG is the array of flags determining the purpose of the DRIVE routine. IFLAG is initially defined in INIT and subsequently altered by routines IREAD, SELCT, and FINAL. IFLAG is dimensioned 10. Default values for IFLAG are zero (0).

IFLAG(1) = 0 if PRINT is to be called
 = 1 if VARPR is to be called
 = 2 if USER is to be called

IFLAG(2) = 0 if SELCT is not to be called
 = 1 if SELCT is to be called for every record read

IFLAG(3) = 0 if even page positions are to be RA and DEC
 at epoch 2000.
 = 1 if even page positions are to be galactic
 coordinates.
 = epoch, if even page positions are to be precessed
 (as 1975).

IFLAG(4) = 0 if all odd pages are to be printed on unit $I\emptyset(2)$
 and all evenpages on unit $I\emptyset(4)$, with unit $I\emptyset(5)$ used
 as scratch. $I\emptyset(4) \neq I\emptyset(2)$. (default)
 = 1 if all pages are to be printed on one unit, $I\emptyset(2)$,
 in odd/even, odd/even order, with $I\emptyset(4)$ and $I\emptyset(5)$ used
 as scratch. $I\emptyset(4) \neq I\emptyset(2)$. (DOUBLE option)
 = 2 if only even pages are to be printed on unit
 $I\emptyset(2)$, with unit $I\emptyset(5)$ used as scratch. (SINGLE EVEN
 option)
 = 3 if only odd pages are to be printed on unit $I\emptyset(2)$,
 with unit $I\emptyset(5)$ used as scratch. $I\emptyset(4)$ not used. (SINGLE
 ODD option)

IFLAG(5) = 0 throughout run
 = 1 set by routine FINAL for the final call to PRINT
 or USER, on which was called. Note there is
 no final call to VARPR.

Note: IFLAG(3-5) are used only if PRINT is being called.

IFLAG(6) = 0 throughout run if SELECT not called
= 0 if SELECT routine rejects record
= 1 if SELECT routine accepts record

IFLAG(7)-(9) not defined

IFLAG(10) = 0 throughout run
= 1 when IREAD encounters an end of file on unit
IØ(3).

Subroutines

The routines called by DRIVE are:

1) INIT

to initialize by reading data cards from unit IØ(1) to set up array IFLAG. INIT is called only once, before any records are read.

2) FINAL

to finalize by making final calls to PRINT or USER and rewinding the catalog tape. FINAL is called only once, after an end of file is encountered on the catalog tape.

3) IREAD

to read a record from the catalog tape and return it in unpacked form in buffer IBUP. The unpacked format is defined in Appendix A of UNPAK. IREAD is called once for every record on the tape.

4) SELECT

to select only certain records from the tape according to the criteria given on the data cards in INIT. Selection can be made on HD, DM, and/or RA and Dec.

5) PRINT

to print a record in standard catalog format.

6) VARPR

to print a record in variable close packed format on one or more lines.

7) USER - user supplied routine

to print or process a record according to user's specifications. USER is called once for every record read (unless the record is not selected by SELECT).

DRIVE is written in USA Standard FORTRAN.

INIT
Diane Hills
12/15/71

Purpose

Subroutine INIT is a Celelescope Catalog Printing Package subroutine called by the routine DRIVE (see write-up DRIVE 12/15/71). Its purpose is to read data cards and set up array IFLAG. (See write-up called Celelescope Catalog Printing package for description of data cards read.)

The purpose of INIT is to determine:

- 1) which one of the following subroutine is to be called
 - a. PRINT (default)
 - b. USERor C. VARPR
- 2) whether or not routine SELECT is to be called. If SELECT is to be called, INIT also reads data cards specifying which catalog items are to be selected. Default is not to call SELECT.
- 3) whether galactic coordinates or precessed positions are to be printed on even pages (if PRINT is being called).
- 4) which page ordering option is to be used (if PRINT is being called).

Calling Sequence

INIT(IØ,IBUF,IFLAG)

where:

IØ is array of logical unit numbers.
IBUF is array of unpacked catalog items. Not used by INIT.
IFLAG is array of option flags to be defined by INIT. See write-up DRIVE for details of IFLAG array items.

Data Defined

INIT sets up the following data:

- 1) array IFLAG
 - IFLAG(1)-IFLAG(4) as determined by data cards
 - IFLAG(5)-IFLAG(10) = 0

- 2) $I\phi(4) = I\phi(2)$ if $IPLAG(4) = 2$ (SINGLE EVEN option)
- 3) array LIST as determined by data cards only if VARPR is to be called. See write-up of VARPR for further details.
- 4) item NUM as determined by data cards only if VARPR is to be called. See write-up of VARPR for further details.
- 5) array ISEL as determined by data cards only if routine SELCT is to be called. See write-up of SELCT for further details.
- 6) item MSEL maximum dimension of ISEL array (=300).

Items 3-6 above are in the following common blocks in INIT

```
COMMON/LDATA/NUM,LIST(200)
COMMON/SEL/ISEL(300),MSEL
```

FORTRAN

INIT is written in USA Standard FORTRAN.

IREAD
Diane Hills
12/15/71

Purpose

Subroutine IREAD is one of the Telescope Catalog Printing Package routines, called by subroutine DRIVE (see DRIVE write-up dated 12/15/71). Its purpose is to read one record (a star) from the catalog tape and return it to DRIVE in unpacked form (see UNPAK write-up for description of the unpacked format).

Calling Sequence

IREAD (IØ,IBUF,IFLAG)

where:

IØ is array of logical unit numbers. Note that the Catalog tape is on unit IØ(3). See DRIVE write-up for further details.

IBUF is the unpacked array of catalog items to be returned to DRIVE for further processing.

IFLAG is an array of flags. IREAD returns IFLAG(10)=1 if an end of file is encountered on the Catalog tape. No other IFLAG elements are accessed.

Method

IREAD, as written for the CDC 6400, uses a non USA standard FORTRAN BUFFER IN statement to obtain one record from the catalog tape. IREAD then calls routine UNPAK to "unpack" the record into the format necessary for all further processing (the unpacked array IBUF).

If IREAD encounters an end of file on unit IØ(3), the flag IFLAG(10) is set to one (1) prior to returning to DRIVE.

Comments

The user who wishes to write his own IREAD routine should note that the unpacked array has one character, or integer per element. Since characters are in CDC display code on the tape, the routine CONVT should be used to do the conversion to holerith equivalents.

Also, remember to return the end-of-file flag IFLAG(10) when necessary.

UNPAK
Diane Hills
12/15/71

Purpose

Subroutine UNPAK is a Celelescope Catalog Printing Package subroutine called by the read routine IREAD. Its purpose is to unpack the catalog record into an array containing one character (left justified with blank fill) or one integer (right justified) per element.

Calling Sequence

UNPAK (AREA, IBUF)

where:

IAREA is the packed array of catalog tape items as read by IREAD (Dimensioned 1000). See Appendix B of Celelescope Catalog Tape Format write-up for description of IAREA.

IBUF is the unpacked array of catalog tape items to be returned to DRIVE. (Dimensioned 3000) See APPENDIX A of UNPAK write-up for description of IBUF.

Method

UNPAK is to be used only on CDC 6000 series machines. It assumes a 60 bit word size, and utilizes the Celelescope Packing Routines (P. Collins). UNPAK also calls routine CONVT to convert alphanumeric items from CDC console display code to their holerith equivalent.

Treatment of Minus Zero DM Zone

In the case of DM zone, which may take on values of plus zero (+0) or minus zero (-0), there could be an ambiguity on machines which do not distinguish between the two. To alleviate this, the printing routines PRINT and VARPR have been written to consider a DM zone of plus or minus 666 as a true DM zone of minus zero (-0). Note that PRINT and VARPR will not recognize a minus zero (-0) DM zone, if the machine has such a number, as a true -0, but rather as +0. Thus, the routine UNPAK converts a minus zero (-0) DM zone into a -666 DM zone to be printed by PRINT or VARPR as a minus zero (-0).

The user who writes his own unpacking routine should follow this convention if he wishes to use either PRINT or VARPR.

Note also that routine SELCT stores DM zones of minus zero (-0) as -666.

APPENDIX A FORMAT OF UNPACKED ARRAY ITEMS

UNPACKED WORD	TAPE WORD	CONTENTS OF UNPACKED WORD
1	1	CHECKSUM (+ONLY) INTEGER
2	2	R.A. (1950) SECONDS OF TIME (+OR-) INTEGER
3	3	DEC (1950) 10THS OF MINUTES OF ARC (+OR-) INTEGER
4	4	R.A. (2000) SECONDS OF TIME (+OR-) INTEGER
5	5	DEC (2000) 10THS OF MINUTES OF ARC (+OR-) INTEGER
6	6	-DM ZONE (+OR-) INTEGER
7	6	-DM NUMBER (+ONLY) INTEGER
8	7	AMBIGUOUS I.D. FLAG LEFT JUST. ALPHANUMERIC CHAR.
9	7	MERGED IMAGE FLAG LEFT JUST. ALPHANUMERIC CHAR.
10	7	-DM CODE (+ONLY) INTEGER
11	7	-NONSTAR CODE (+ONLY) INTEGER
12	8	FIRST CHAR OF NGC-IC DESIG. LEFT JUST. ALPHANUMERIC
13	8	SECOND CHAR OF NGC-IC DESIG. LEFT JUST. ALPHANUMERIC
14	8	THIRD CHAR OF NGC-IC DESIG. LEFT JUST. ALPHANUMERIC
15	8	FOURTH CHAR OF NGC-IC DESIG. LEFT JUST. ALPHANUMERIC
16	8	-HD NUMBER (+ONLY) INTEGER
17	9	PECULIARITY CODE) LEFT JUST. ALPHA. CHAR.
.	.	.
36	10	PECULIARITY CODE21 LEFT JUST. ALPHA. CHAR
37	11	FIRST CHAR OF M1X100 LEFT JUST. ALPHANUMERIC
38	11	SECOND CHAR. M1X100 LEFT JUST. ALPHANUMERIC
39	11	THIRD CHAR. M1X100 LEFT JUST. ALPHANUMERIC
40	11	FOURTH CHAR. M1X100 LEFT JUST. ALPHANUMERIC
41	11	FIRST CHAR M2X100 LEFT JUST. ALPHANUMERIC
42	11	SECOND CHAR M2X100 LEFT JUST. ALPHANUMERIC
43	11	THIRD CHAR M2X100 LEFT JUST. ALPHANUMERIC
44	11	FOURTH CHAR M2X100 LEFT JUST. ALPHANUMERIC
45	11	FIRST CHAR M3X100 LEFT JUST. ALPHANUMERIC
46	12	SECOND CHAR M3X100 LEFT JUST. ALPHANUMERIC
47	12	THIRD CHAR M3X100 LEFT JUST. ALPHANUMERIC
48	12	FOURTH CHAR M3X100 LEFT JUST. ALPHANUMERIC
49	12	-MAGNITUDE CODE (+ONLY) INTEGER
50	12	SPECTRAL CLASS LEFT JUST. ALPHA. CHAR.
51	12	SPECTRAL SUBCLASS LEFT JUST ALPHANUMERIC CHAR.
52	12	LUMINOSITY LEFT JUST. ALPHANUMERIC CHAR
53	13	FIRST CHAR. OF REF1 LEFT JUST. ALPHANUMERIC
54	13	SECOND CHAR OF REF1 LEFT JUST. ALPHANUMERIC
55	13	THIRD CHAR OF REF1 LEFT JUST. ALPHANUMERIC
56	13	.
.	.	.
111	19	FIRST CHAR OF REF25 LEFT JUST. ALPHANUMERIC
112	19	SECOND CHAR OF REF25 LEFT JUST. ALPHANUMERIC
113	19	THIRD CHAR OF REF25 LEFT JUST. ALPHANUMERIC
114	20	FIRST CHAR OF COMMENT LEFT JUST. ALPHANUMERIC
.	.	.
.	.	.
135	21	TWENTIETH CHAR COMMENT LEFT JUST. ALPHANUMERIC

134	22	U1 AVERAGE X 100	(+OR-) INTEGER
135	23	WT U1 X 100	(+ONLY) INTEGER
136	24	RMS DEV U1X100	(+ONLY)
.			
.			
143	31	U4 AVERAGE X 100	(+OR-) INTEGER
144	32	WT U4 X 100	(+ONLY) INTEGER
145	33	RMS DEV U4X100	(+ONLY) INTEGER
146	34	NUMBER OF U1 MAGNITUDES	
147	35	U1(I)X100	(+OR-) INTEGER
148	36	STATION LEFT JUST.	ALPHA.
149	36	ORBIT	(+ONLY) INTEGER
150	36	FIRST CHAR. OF TAPE	LEFT JUST ALPHANUMERIC
151	36	SECOND CHAR. OF TAPE	LEFT JUST ALPHANUMERIC
152	36	THIRD CHAR. OF TAPE	LEFT JUST ALPHANUMERIC
153	36	FOURTH CHAR. OF TAPE	LEFT JUST ALPHANUMERIC
154	36	FRAME	(+ONLY) INTEGER
155	36	OBJECT NUMBER	(+ONLY) INTEGER
156	37	WEIGHT U1(I)	(+ONLY) INTEGER

N	I+1	NUMBER U2 MAGNITUDES
.	.	
.	.	
NN	J+1	NUMBER U3 MAGNITUDES
.	.	
.	.	
MM	K+1	NUMBER U4 MAGNITUDES
.	.	
.	.	
MM	L+1	NUMBER OF U1 MAGNITUDES IN FILTER PROXIMITY
.	.	
MM+4	L+5	ETA OF U1(I)X 10 ⁴ (+OR-) INTEGER

CONVT
Diane Hills
12/15/71

Purpose

Subroutine CONVT is a Telescope Catalog Printing Package subroutine UNPAK. Its purpose is to convert alphanumeric characters from CDC display code (on tape) to their holerith equivalents (for printing).

Calling Sequence

CONVT(ID)

where:

ID is input with the character in CDC display code right justified with zero fill in the word

ID is output with the character left justified with blank fill in the word.

Method

CONVT is written in USASI FORTRAN and is independent of word size. It utilizes the numeric correspondence between the CDC display codes on the tape (octal 01-57) and the characters A-Z, 0-9, +, -, *, /, (,), \$, =, blank, comma, and period.

It assumes a binary machine.

See Appendix A of Telescope Catalog Tape Format write-up for listing of console display codes.

SELECT
Linda Kirschner
12/23/71

Purpose

Subroutine SELECT is the star selection routine for the Telescope Catalog Printing Package. It selects stars on the basis of:

HD number
DM zone and number
and/or Right ascension & declination

Calling Sequence

SELECT(I₀, IEUF, IFLAG)

where

I₀ is an array containing the input/output unit numbers. It is not used by SELECT.

IEUF is the unpacked array of catalog items. See UNPAK writeup.

IFLAG is an array of various flags. Only IFLAG(6) is used by SELECT.

Method

SELECT is called once by the driver subroutine DRIVE for each record (star). If the star satisfies any of the conditions specified on the selection data cards, SELECT returns with IFLAG(6)=1 (accept star). Otherwise IFLAG(6) = 0 (reject star).

COMMON Statements

SELECT contains a labelled common block

COMMON ISEL/ISEL(300),MSEL

ISEL contains the selection information. It is set up by subroutine INIT from the selection data cards. It is described in comment cards at the beginning of SELECT. The size of ISEL can be changed simply by changing its dimension and the value of variable MSEL to correspond to its length. Increasing the size of ISEL will allow more selection data cards.

Further Comments

Note that selection depends on exact equality of the quantities.

Also note that right ascension and declination are stored in ISEL in seconds of time and tenths of a minute of arc respectively (altho specified on data cards in hours, minutes, seconds, and degrees and minutes). The epoch is 1950.0.

If the user is selecting stars by EM number, he should be aware that routine INIT actually stores a -666 for EM zones given on the data card as minus zero (-0). This is to distinguish between plus zero and minus zero. Note that the routine UNPAK, which unpacks a record into array IBUF, follows the same convention.

FØRTRAN

SEICT is written in USA standard FØRTRAN

PRINT
Peter Collins
12/15/71

Purpose

Subroutine PRINT is one of the Telescope Catalog Printing Package routines called by the Driver routine DRIVE (see DRIVE write-up of 12/15/71). Its purpose is to print, in 'standard catalog format', information for stars on the Catalog tape.

Calling Sequence

PRINT(IØ,IBUF,IFLAG)

where:

IØ is array of logical unit numbers

IØ(1) = card reader (not used by PRINT)

IØ(2) = printer (always used by PRINT)

IØ(3) = catalog tape (not used by PRINT)

IØ(4) = 0 if only odd pages are being printed by PRINT on unit IØ(2) (SINGLE ODD option in data) (i.e., IØ(4) not accessed)

= IØ(2) if only even pages are being printed by PRINT on unit IØ(4) (=printer) (SINGLE EVEN option in data). Note, subroutine INIT sets IØ(4)=IØ(2) in this case.

= scratch unit number or another printer if all even pages are to follow all odd pages in the printout. In this case IØ(4) will contain all the even pages and, if a scratch unit, must be copied to the printer after job termination to obtain the even pages printouts. (Default option in data) Note IØ(4) cannot equal IØ(2).

= scratch unit number if odd/even, odd/even page ordering is desired. In this case IØ(4) is used as scratch. (DOUBLE option in data)

IØ(5) = scratch unit number. PRINT always accesses this scratch file, regardless of which page ordering option is used.

IBUF is the unpacked array of catalog items to be printed.

IFLAG is an array of flags. PRINT accesses only the following IFLAG elements:

IFLAG(3) for precession or galactic coordinates
IFLAG(4) for page ordering option
IFLAG(5) for termination (if $\neq 0$, then this is final call, flush buffers)

Method

PRINT is called once for every star. It stores information for five stars at a time before printing. This is to insure a multiple of 5 stars per page, except on the last. Each page is printed with headings.

Treatment of DM Zone Equal to Minus Zero (-0)

PRINT will not recognize a minus zero (-0) in the DM zone element of the unpacked array IBUF as a true minus zero, but rather will print it as a plus zero (+0). PRINT will recognize a -666 in the DM zone element as a minus zero (-0) and print it as such. Note that routine UNPAK converts minus zero zones on the tape to -666 zones as it fills IBUF.

FORTRAN

PRINT is written in USA Standard FORTRAN.

Subroutine VARPR
Diane Hills
12/15/71

Purpose

Subroutine VARPR is a Telescope Package subroutine called by the driver routine DRIVE (see write-up DRIVE dated 12/15/71). Its purpose is simply to call subroutine VARP to print, in user supplied variable order, a number of items from the catalog tape. (See write-up VARP dated 12/15/71).

Calling Sequence

(IØ,IBUF,IFLAG)

where

IØ is array of logical units used by DRIVE (IØ(2) is the printer)

IBUF is array of unpacked catalog items returned from routine IREAD

IFLAG is an array of flags used by DRIVE

COMMON Statements

VARPR contains a labelled common block:

COMMON/LDATA/NUM,LIST(200)

set up in routine INIT. also called by DRIVE

FORTRAN

VARPR is written in USA Standard FORTRAN.

Subroutine VARP
Diane Hills
12/15/71

Purpose

To print, in close packed format with no labels, any number of Telescope Catalog tape items, on one or more lines. This routine uses a variable format to print.

Method

Obtain in array IBUF, the unpacked record items, one character (left justified) or integer per element in the array. (See UNPACK Appendix for description of IBUF array)

Obtain in a list LIST, a set of NUM pointers to the particular items to be printed. (See ^{VARP}Appendix for description of valid pointers and the items to which they refer.) The order of item numbers in LIST determines the order of printed output.

Set up one line of information to be printed at a time. If the user attempts to print more items than will fit on a line (119 char), overflow items will appear on a subsequent line of print. (See ^{VARP}Appendix for the individual formats associated with each item to be printed).

The appearance of any of item numbers 74-109 in LIST will initiate a new line, regardless of the existence of the item(s) about to be printed.

If in a record a particular item 2-73 is non-existent and an attempt is made to print it, blanks are printed in the space available.

If, in a record no value(s) exists for a particular item 74-109 and an attempt is made to print the item, no line is printed.

Comments on Format

Since VARP will print as many items as will fit on a line before starting a new line, the user may determine his output format to a certain extent by making several calls to print with different LIST arrays instead of just one call.

Calling Sequence

VARP is called with

(IPR,IBUF,LIST,NUM)

where

IPR is the logical unit number of the printer or file on which all printed output appears.

IBUF is the array of unpacked record items. Each element in the array contains either a single holerith character, left justified with blank fill, or right justified integer.

LIST is an array of pointers to record items to be printed. Item pointers may be positive numbers from 1 to 109, or negative numbers,* or 999.

NUM is the number of pointers appearing in LIST, i.e. the number of items to be printed.

*Note, the appearance of a negative number in LIST will cause the absolute value of that number of blanks to be printed at that point. For example, to insert 3 spaces between HD number (pointer 16) and DM number (pointer 6) LIST would contain the three elements 16 -3 6.

Special Comments

VARP is written in USASI FORTRAN but makes the following restrictions on the user's system.

- 1) capability of printing with variable format. (non USASI)
- 2) capability of equivalencing an integer and a real array.
- 3) capability of printing an integer variable with an F-Format conversion as long as contents of the integer variable is real (obtained through (2) above).

Treatment of DM zones of minus zero (-0)

VARP will not recognize minus zero(-0) as a DM zone. It will consider it to be plus zero (+0). VARP will recognize -666 as a minus zero (-0) DM zone and will print it as such. The routine UNPAK is written to convert occurrences of minus zero DM zones on the tape to -666 DM zones in the unpacked catalog array IBUF. The user who writes his own IREAD and unpacking routines should be aware of this.

The following DRIVE output gives a data card set up for VARPR showing 73 LIST elements.

DATA CARDS READ

VARPR

73														
2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
47	48	49	50	51	52	53	54	55	56	57	58	59	60	61
62	63	64	65	66	67	68	69	70	71	72	73	74	75	76
77	78	79	80	81	82	83	84	85	86	87	88	89	90	91
92	93	94	95	96	97	98	99	100	101	102	103	104	105	106
107	108	109	110	111	112	113	114	115	116	117	118	119	120	121

END

It would produce the following printout for a typical star on the catalog tape.

9 5941.1 243 09517.59 2319 1 9.4 4.5 4 AD 397
17.19 1.00 0.00

17.19
094551 3 14
0

.VARP
APPENDIX

Formats of items and how to reference them

Refer to Item	To print	In resultant format of
1	checksum	not to be printed-will result in one blank
2	R.A. (1950)	I6 (HHMMSS)
3	Dec (1950)	I6 ($\pm$ DDMM)
4	R.A. (2000)	I6 (HHMMSS)
5	Dec (2000)	I6 ($\pm$ DDMM)
6	DM number	I3,I5 ($\pm$ ZZNNNNN)
7	Ambiguous I D	A1
8	Merged Image	A1
9	DM code	I1
10	NONSTAR code	I1
11	NGC-IC desig	4A1
12	HD number	I6
13	Peculiarity code 1	A1
.		
.		
33	Peculiarity code 21	A1
34	M1	5A1 (MM.MM)
35	M2	5A1 (MM.MM)
36	M3	5A1 (MM.MM)
37	Magnitude Code	I1
38	Spectrum	2A1
39	Luminosity	A1
40	Reference 1	3A1
.		
.		
59	Reference 20	3A1
60-61	Comment	20A1
62	U_1 average	F6.2 ($\pm$ XX.XX)
63	Composite weight U_1	F6.2 (XXX.XX)
64	RMS Dev of U_1	F6.2 ($\pm$ XX.XX)
65	U_2 average	F6.2 ($\pm$ XX.XX)
66	Composite Weight of U_2	F6.2 (XXX.XX)
67	RMS dev os U_2	F6.2 ($\pm$ XX.XX)
68	U_3 average	F6.2 ($\pm$ XX.XX)
69	Composite weight U_3	F6.2 (XXX.XX)

70	RMS dev of U_3	F6.2 (+XX.XX)
71	U_4 average	F6.2 (+XX.XX)
72	Composite Weight	F6.2 (XX.XX)
73	RMS dev of U_4	F6.2 (+XX.XX)
74	number of U_1 mags	I3
75	all $U_1(I)$	F6.2 (+XX.XX)
76	all ID $U_1(I)$	1X,A1,I4,4A1,I2,I3
77	all WT $U_1(I)$	I6
78	number of U_2 mags	I3
.		
.		
.		
90	number of U_1 mags	I3
.	in filter proximity	
.		
.		
94	all Eta $U_1(I)$	F6.2 (+XX.XX)
.		
.		
.		
109	all Eta $U_4(I)$	F6.2 (+XX.XX)

Note: to print blanks between items, enter an item number of -N where, N=number of blanks to be printed at that points on line. An item number = 0 will give one blank space.

To start a new line, enter an item number of 999.

FINAL
Diane Hills
12/15/71

PURPOSE

Subroutine FINAL is a Telescope Catalog Printing Package routine called by the driver routine DRIVE (see DRIVE write-up 12/15/71). It's purpose is to rewind the Catalog tape and, if necessary, make a final call to routine PRINT or USER.

FINAL is called only once, after an end of file has been encountered on the catalog tape.

Calling Sequence

FINAL (IØ,IBUF,IFLAG)

where:

IØ is array of logical unit numbers.

IBUF is array of unpacked catalog items.

IFLAG is array of flags.

Comments

FINAL sets IFLAG(5)=1 and makes a final call to PRINT (if PRINT has been called throughout run), or a final call to USER (if USER has been called throughout run).

FORTRAN

FINAL is written in USA Standard FORTRAN.

Sample USER
Diane Hills
12/15/71

Purpose

This subroutine is a sample of a user supplied subroutine (USER) called by the Telescope Catalog Printing Package driver routine DRIVE (see DRIVE write-up 12/15/71). Its purpose is to count the number of A0 stars in the Telescope Catalog and print this total.

Calling Sequence

USER is called with

(IØ,IBUF,IFLAG)

where:

IØ is array of logical unit numbers

IBUF is the unpacked array of catalog items

IFLAG is an array of flags.

Comments

The user should note the following when writing his own routine USER:

1) IFLAG(5) will equal zero every time USER is called by DRIVE. When an end of file is encountered on the catalog tape, USER is called one last time from FINAL with IFLAG(5)=1. On each call to USER except the last, IBUF contains information about one star in the catalog. The last call to USER allows printing of totals and other such final processing.

2) Any initializing necessary may be done on the first call to USER as shown below:

SUB USER(IØ,IBUF,IPLAG) .

DATA IFIRST/0/

IF(IFIRST.EQ.1) GØ TØ 30

initializing (print headings etc.)

IFIRST=1

30 CONTINUE

3) The user may call routine VARPR (or VARP) from USER if the proper LIST elements are defined. Calls to PRINT, however, may be hazardous if other printing is done within routine USER. Calling PRINT from USER is not recommended.

SUBROUTINE USER(10,IBUF,IFLAG)

C
C USER ROUTINE TO COUNT THE NUMBER OF A0 STARS IN THE CATALOG

C
C DIMENSION 10(5),IBUF(3000),IFLAG(10)
C DATA 1A,1ZERO/1HA,1KO/
C DATA 1KO/6/

C
C CHECK FOR FINAL CALL
C (FROM FINAL)

C
C IF (IFLAG(5),NE.0) GOTO900

C
C CHECK FOR A0 STAR

C
C SPECTRAL CLASS
C IF (IBUF(5),NE.1A) RETURN

C
C SPECTRAL SUB CLASS
C IF (IBUF(52),NE.1ZERO) RETURN

C
C 1KO=1KO+1
C RETURN

C
C FINALIZE
C PRINT TOTAL

C
C
C 900 CONTINUE
C LUPR=10(2)
C WRITE(LUPR,905) 1KO
C 905 FORMAT(1H1,5HFOUND,15,9H, A0 STARS)
C RETURN
C END

AUTOMATIC COMPUTER REDUCTION OF ASTRONOMICAL
TELEVISION IMAGES

W. A. Deutschman

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the International Astronomical Union
Colloquium No. 11
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AUTOMATIC COMPUTER REDUCTION OF ASTRONOMICAL TELEVISION IMAGES

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During the 15 months that we operated the Telescope experiment on the Orbiting Astronomical Observatory, we acquired 8700 television frames of star fields containing a total of approximately 10,000 stars.

Figure 1 shows an example of one of these frames. Note the target ring, an aluminum deposit on the target of the tube, in each corner of the picture; the shadow in the upper left corner; the calibration lamp just below the center of the picture; and its ghost slightly below and to the left. All other objects are stars. Each frame consists of 256 scan lines designated by the number k , with each line containing 251 pixels designated by the number i , making a total of 65,000 intensity points $I(k, i)$. The frames are divided into two spectral regions by two filters — lines 1 to 128 have one spectral range, lines 129 to 256 have a different one. Hence, each frame is reduced as two half frames in the first portion of the reduction system.

Because of this volume of data, it was necessary to create an automatic reduction system that requires a minimum of manual intervention. Figure 2

shows a schematic diagram of this system. I will briefly describe each of its main parts and then return to Phase 1, the heart of the system.

Phase 0 is an editing and reformatting program that gathers the necessary data from the tapes supplied to us by the Goddard Space Flight Center Data-Processing Division and creates our master archive tape. Phase 1 separates the stars from the background and calculates the raw intensity of each star. Phase 3 uses the experiment calibration data to reduce the raw intensities to absolute units. Phase 4 identifies all the known engineering objects in the field, such as target blemishes, the calibration lamp, and its ghost. Phase 5 matches the positions of observed objects with catalog positions of known stars and computes the right ascension and declination of all stars in the frame. It also associates all the astrophysical information about the star contained in the catalog with the observed data. Phase 6 provides an output that an astronomer can review and check for errors, and Phase 7 creates the final output format, ready to send to the presses for publication.

This entire system relies on Phase 1 to find all the stars in each frame and all the intensities $I(k, f)$ associated with each star. We assume that the stars are relatively sharp spikes on a smooth background and that we can fit a general cubic equation, $A + Bk^3 + Ck^2 + Dk + Ek^2l + Fkl + Gkl^2 + Hl + Il^2 + Jl^3$, to the background. Any intensity points that are significantly above the fitted background are regarded as parts of stars.

The actual program has three distinct parts: the first section fits the background, the second decides which points are signal and to which star they

The third portion of the program calculates the center of intensity of the star, subtracts the calculated background from the individual points, and adds them together. Based on its shape and the density of points in the object, the program then decides whether the object is a star, an object that may be either a star or noise, or just plain noise. If it is a star, the information is written on the output tape and printed. If it is a questionable object, Phase 1 only prints the output page and punches a card with all the data so the object may easily be added to the output tape. If the object is noise, it is dropped. Figure 4 shows examples of the first two classes of objects, a star and a large spurious object. Note the message on the second object - THIS OBJECT IS NOT ON THE OUTPUT TAPE. The program then prints a computer picture of all points above the significance level and numbers each star at its center of intensity so that we can easily find the star in the printed output. Figure 5 shows an example of this printed picture for the sample frame.

This program has been used successfully on over 4000 frames of data and provides the automation necessary to reduce the data with a minimal amount of hand manipulation.

In closing, I wish to thank Mrs. L. Kirschner and Mr. N. Hall for their programing support and ideas that made Phase 1 work and to acknowledge the support provided by the National Aeronautics and Space Administration via contract NAS 5-1535.

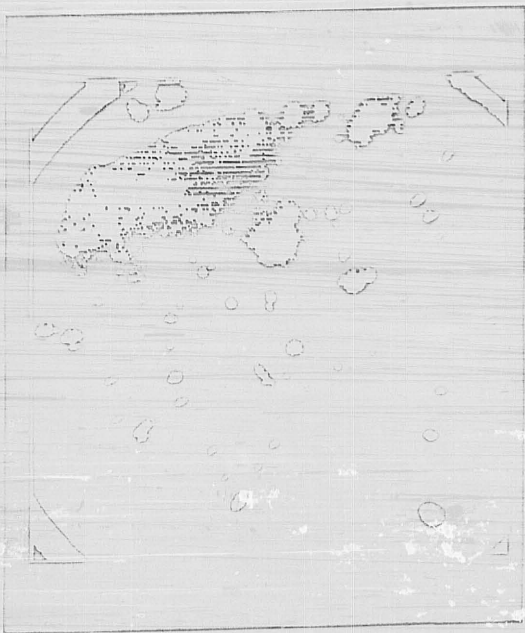


Figure 1. A sample camera 3 picture.

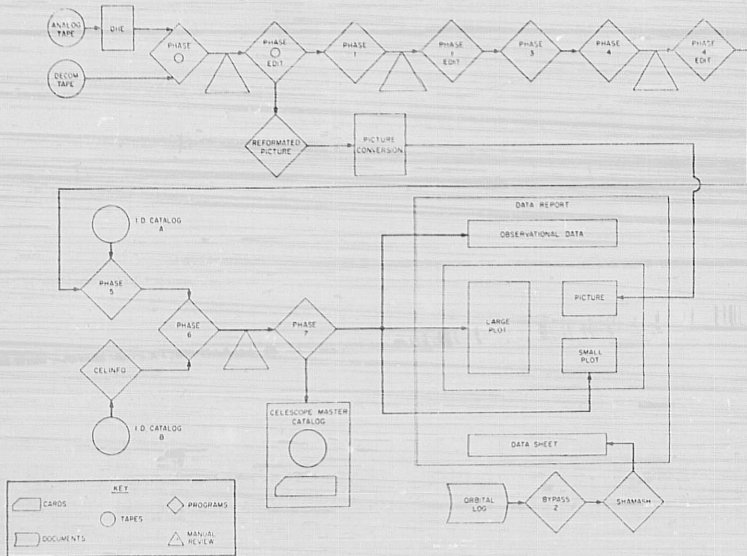


Figure 2. A schematic representation of the Celestcope data-reduction system.

ROW	COLUMN															
	8	24	40	56	72	88	104	120	136	152	168	184	200	216	232	248
8	10	13	15	17	18	19	20	20	20	19	19	18	18	17	17	17
24	14	17	19	21	22	23	23	23	23	22	22	21	20	20	19	19
40	18	20	22	24	25	26	26	26	25	24	24	23	22	21	21	20
56	21	23	25	26	27	28	28	27	27	26	25	24	23	22	21	21
72	23	25	27	28	29	29	29	28	28	27	25	24	23	22	21	20
88	24	26	28	29	29	29	29	28	27	26	25	23	22	20	19	19
104	24	25	27	28	28	28	27	26	25	24	22	21	19	18	16	16
120	17	17	18	18	18	17	17	16	16	15	14	14	13	13	13	12
136	15	16	16	16	16	16	16	15	15	14	14	13	13	12	12	12
152	14	15	15	15	15	15	15	14	14	14	13	13	12	12	12	12
168	13	14	14	14	14	14	14	14	14	14	13	13	12	12	12	12
184	12	13	13	14	14	14	14	14	13	13	13	12	12	12	12	12
200	11	12	12	13	13	13	13	13	13	13	12	12	12	12	12	12
216	10	11	11	12	12	13	13	13	12	12	12	12	12	12	12	12
232	8	9	10	11	11	11	11	11	11	11	11	11	11	11	12	12
248	6	7	8	9	9	9	10	10	10	10	10	10	10	10	10	11

Figure 3. Significance level for camera 3, contact Rosman, orbit 413.

Tape	FM	UPPER LEFT CORNER(ROW,COL)	CENTER INTENSITY	N	LENGTH	FAC	SEQ.NUM
TEST	2	118 109	121 112	727	31 6 7	2.50	59

BACKGROUND AVERAGE= 11.23 K,L AND RAW INTENSITY OF THE PEAK ARE 121 113 73

```

0 0 19 24 22 0 0
0 20 36 42 33 24 0
17 24 42 68 64 40 19
0 24 42 69 73 44 23
0 17 35 58 63 33 18
0 0 16 27 23 16 0

```

TAPE	FM	UPPER LEFT CORNER(ROW,COL)	CENTER INTENSITY	N	LENGTH	FAC	SEQ.NUM
TEST	2	121 55	123 56	31	5 4 3	2.50	61

BACKGROUND AVERAGE= 12.07 K,L AND RAW INTENSITY OF THE PEAK ARE 124 55 20

```

0 18 0
0 0 18
0 17 0
20 0 18

```

- THIS OBJECT IS NOT ON THE OUTPUT TAPE --

Figure 4. Output from the program that separates the stars from the background.



CAMERA 3 ROSMAN 413 RAW DATA

Figure 5. Example of printed picture for sample frame.

A CALIBRATION MODEL FOR A STELLAR PHOTOMETER USING A
SEC VIDICON

W. A. Dutschman

Presented at the Conference on
Advanced Electronics Systems for Astronomy
at Santa Cruz, September 1 and 2, 1971

September 1971

Smithsonian Institution
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A CALIBRATION MODEL FOR A STELLAR PHOTOMETER USING A SEC VIDICON

W. A. Deutschman

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Cambridge, Massachusetts 02138

I will describe the model of an SEC Vidicon that we used to calculate the intensities of stars observed in the ultraviolet with the Celelescope experiment.

In this paper, I describe the model we used to represent the response of the Secondary Electron Conduction (SEC) Vidicons used in the Celelescope experiment on the OAO. First, however, I briefly describe the SEC tube for those not familiar with it.

Figure 1 shows a schematic diagram of a SEC television tube. The tube has four major parts: a photocathode, an electronic imaging section, a storage target, and a readout gun. The photocathode converts the incoming photons to photoelectrons, which are then accelerated and focused onto the target by the imaging section. The target consists of an aluminum oxide supporting layer covered with a thin aluminum signal layer and a 20 μ layer of low-density potassium chloride. The photoelectrons produce secondary electrons in the target that migrate to the signal plate, leaving a net positive charge on the target. The target integrates and stores the positive charges until the high voltage in the imaging section is turned off. The readout gun then digitally scans the target to neutralize the charge and produces an output signal.

We use these tubes only as a stellar filter photometer. The model that I will describe is applicable for point sources. The intensity of any observed star is

$$I = V_{\Sigma} / U \cdot Gc \cdot t_{\text{ex}} ,$$

where V_{Σ} , the net integrated signal for the star, is the sum of the digital counts in the object minus the background divided by the net gain in the preamplifier, the amplifier, and the analog-to-digital converters; U is the combined gains of the photocathode, the filter, and the reflectivity of the telescope and is a function of position and wavelength; G_e , the target's gain, is a function of the parameters V_{Σ} , target coordinates k and l , the temperature and the past history of the intensity at that point. I will subsequently discuss how we determined G_e for a star. The exposure time, t_{ex} , is the photoelectron integration time. We separate the photocathode and target gains because the positions of the photon image on the photocathode and the electron image on the target move relative to each other with time and with changing magnetic field. We are able to determine the shift by assuming we know the position of the calibration lamp on the photocathodes and measuring its position on the target. The extreme limits for this shift were $\pm 5\%$.

The target gain is the most complicated gain function of the tube. I will not discuss the photocathode gain, because my discussion of the target gain is easily extended to it. Figure 2 shows a three-dimensional view of the positional dependence of the target gain, with all other parameters constant. Note the nonuniformity from tube to tube and the irregular shape of the surface. The tubes used were the first-production ultraviolet sensitive SEC Vidicons; current production tubes may be better. Figure 3 plots the target gain versus V_{Σ} for a 9×9 grid of points spaced at regular intervals on the target. Again note the nonlinearity of the curves. Faced with this type of surface, we needed a technique to calculate the gain for a specified k, l point with a given V_{Σ} and temperature. We experimented extensively with both curve- or surface-fitting techniques and with extrapolation-interpolation procedures. The curve-fitting techniques were unsuccessful because equations that had enough parameters to fit the known points deviated radically from other control points. We therefore used interpolation techniques to calculate the target gain. We first defined a regular 9×9 array of grid points. At each of these points, we determined the gain at three different temperatures for 10 equally spaced values of $\log V_{\Sigma}$. The target gain was therefore known for 2,430 parameters — that is, (9×9) grid $\times 10 V_{\Sigma}$ points $\times 3$ temperatures.

To find the value of G_e at any other value of the parameters, we determine the grid points that surround the desired point and then the gain value at the values of V_{Σ}

and temperature that surround the point. We then linearly interpolate first in temperature and then in $\log V_{\Sigma}$ to find the value of the gain for the given V_{Σ} and temperature. We next interpolate in k and ℓ positions to determine the gain for the object. For this procedure, we used a second-order ruled-surface interpolator.

Our second-order interpolation scheme is best introduced by the short description of a first-order ruled-surface interpolator that follows. To find the value of the gain $G(k, \ell)$ shown in Figure 4, we choose the surrounding four points $G_1(k_1, \ell_1)$, $G_2(k_2, \ell_2)$, $G_3(k_3, \ell_3)$, and $G_4(k_4, \ell_4)$ at which the gain is known and draw straight lines through G_1 and G_2 and through G_3 and G_4 (the same value results if the pairing is G_1 - G_4 and G_2 - G_3). Then we "roll" the line AA' along the lines G_1G_2 and G_3G_4 such that the fractional distances along each line are equal ($G_4A/G_3G_4 = G_1A'/G_1G_2$). The gain $G(k, \ell)$ is defined when the line AA' passes over the point. Our second-order ruled-surface interpolator uses the additional four surrounding quadrangles shown in Figure 5. It then extrapolates from those surfaces to find the gain at the same point. The five gains (four by extrapolation and one from interpolation) are appropriately weighted and averaged. This ensures that the slope of the surface is continuous and provides some curvature to the surface.

This procedure works very well with 61 grid points, and with an increase of the density of grid points can achieve any desired accuracy of fit to the surface. The same interpolation procedure is used for the photocathode.

Using this model of the SEC tubes, we were able to measure the ultraviolet intensities of 5,000 stars. The internal accuracy of our results is better than 0.1 mag for short periods of time and better than 0.2 mag for our entire 1 year in orbit. Modern SEC tubes should be able to produce even better accuracy if more calibration points are used.

I wish to thank all the Telescope staff who helped me with this project - in particular, Dr. E. Avrett, who supplied the interpolation scheme, and Dr. C. Lundquist and Dr. R. J. Davis, who provided much needed support. I also wish to acknowledge the support of NASA Contract NAS 5-1535.

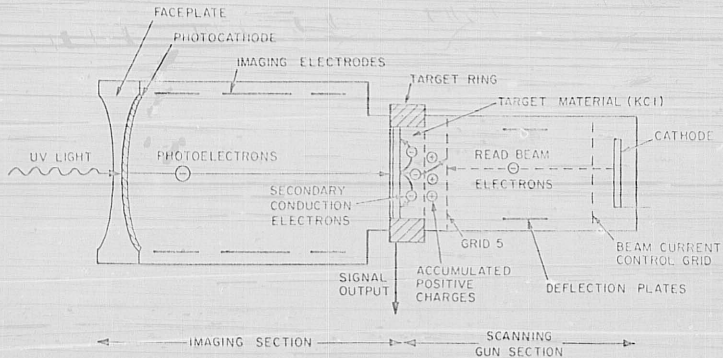


Fig. 1. - A schematic diagram of a SEC vidicon tube.

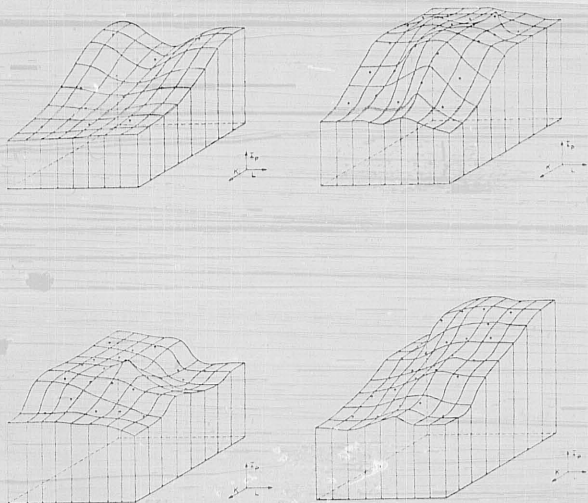
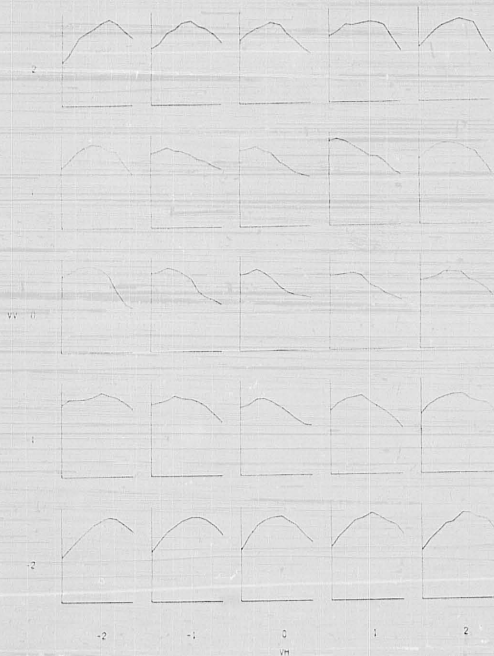


Fig. 2. - A view of the Ge surfaces at a constant V_{Σ} . Dots indicate positions of actual measurements.



FINAL DCS CAMERA : TEMP. = -45. 7/20/71

Fig. 3. — The variation in G_c (ordinate) vs. V_Σ (abscissa) for the central 25 grid points.

Explanation of Columns on the Odd Catalog Pages

<u>Column Heading</u>	<u>Contents</u>
-	Page sequence #
HD	Henry Draper Catalogue number (reference 922).
DM	Durchmusterung number: B BD, Bonner Durchmusterung (reference 898). C CD, or CoD, Cordoba Durchmusterung (reference 899). P CPD, Cape Photographic Durchmusterung (reference 900).

R.A.(1950)DEC.

The position is taken from the SAO Star Catalog if the first reference number is 897. The position is the precessed DM position if the star was not in the SAO Catalog and one of the DM Catalogs (898, 899, 900) is the first reference number. The position is the average of all of the positions given by the references if neither the SAO or DM positions are available. If the star was not identified with a known object, the position was determined from the Celestcope data and has an accuracy of about 1 arcmin. If the "star" is the merged image of two stars and is merged in all observations, then the more probable star is used. Average positions are used to distinguish between unique combinations if the stars images are merged in different manners on different frames.

V

The photoelectric V magnitude of the UBV system, when available. Otherwise, in order of preference, M_V , M_{BV} , M_{pg} . To distinguish among these possibilities, the magnitude given may be followed by N(M_V), P(M_{BV}), or G(m_{pg}). In compiling these data, if different sources agreed to within 0^m10 , the arithmetic mean is given. An astronomer resolved any disagreements larger than 0^m10 magnitudes. If the star has any type of magnitudes listed in the Naval Observatory Catalogue (reference A19 is always the first or second reference

Column Headings

Contents

V (cont.)

in the reference list) then that data is used in preference to any other data. Magnitudes given to one decimal place required a consistency of ± 0.05 in the source material and imply that no source listed the magnitude to more than one decimal place. Magnitudes given to two decimal places required a consistency of ± 0.005 from those sources reporting the magnitude to two decimal places and disregarded magnitudes given to only one place.

B-V

The photoelectric B-V color of the UBV system, otherwise the magnitude m_{pg} if available. If m_{pg} is given, the magnitude is followed by G. The same conventions used in the V column with regard to accuracy and the use of reference A19 apply.

U-B

The photoelectric U-B color of the UBV system, when available. Otherwise, in order of preference, U-V or (U-B)_C. To distinguish between these possibilities, the magnitude given may be followed by V or C. The same conventions for accuracy and use of A19 apply as in the V column.

S-L

Spectrum and Luminosity. If different sources agreed to within ± 2 subclasses, the arithmetic mean was taken, otherwise a decision was made on which spectrum to use. Intermediate spectral subclasses and luminosities have been truncated; i.e., a star of spectral type B0.5II-III as listed as B0II.

Peculiarity Flag

An asterisk in this column signifies that a peculiarity that effects the spectrum-luminosity appears on the second page.

U1

U1 magnitude. The weighted mean of the Celestial Observational results in the U1 color band (2100 to 3200 Å). Celestial magnitudes are based on spectral irradiance in MKS units: $U_1 = -2.5 \log I$, where I is spectral irradiance from the observed star at the effective wavelength of the color band, in units of watts per square meter per meter of wavelength. The U1 magnitude is derived from the formula

Column Heading

Contents

U1 (cont.)

$$U1 = \frac{\sum [1/(1 + w_i)] U1_i}{\sum [1/(1 + w_i)]}$$

where $U1_i$ is the i th observation of the $U1$ magnitude. w_i is the weighting factor and is equal to zero except:

$w=3$ if the object could not be separated from a neighboring object by our standard computer program and was separated manually.

$w=5$ if the object was within 15 arcmin of the line, through the center of the field, separating the two different optical filters that were rigidly mounted in front of each television camera.

$w=6$ if the object was both manually split and near the filter split line.

$w=\infty$ if the object was within 5 arcmin of the filter split line, if the object was in a part of the picture having a bright background, or if the object touched the edge of the picture.

SD1

The root mean square deviation of $U1$, based on the formula

$$SD1 = \left\{ \frac{\sum [1/(1 + w_i)] (U1_i - U1)^2}{\sum [1/(1 + w_i)]} \right\}^{1/2}$$

If $U1$ is based on a single observation, the standard deviation is blank.

U2

$U2$ magnitude. The weighted mean of the Celestscope observational results in the $U2$ color band (1550 to 3200 Å). Calculated the same way as $U1$.

SD2

The RMS deviation of $U2$, computed in the same way as $SD1$.

<u>Column Heading</u>	<u>Contents</u>
U3	U3 magnitude. The weighted mean of the Cele- scope observational results in the U3 color band (1350 to 2150 Å). Calculated in the same way as U1.
SD3	The RMS deviation of U3, computed in the same way as SD1.
U4	U4 magnitude. The weighted mean of the Cele- scope observational results in the U4 color band (1050 to 2150 Å). Derivation calculated in the same way as U1. Very few U4 magni- tudes are given because of interference from the bright Lyman-alpha background of the geocorona.
SD4	The RMS deviation of U4, computed in the same way as SD1.

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CELESCOPE BIBLIOGRAPHY

1968 - 1971

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Explanation of the Columns on the Even Catalog Pages

<u>Column Heading</u>	<u>Contents</u>
-	Page sequence # (the same # as on the matching Odd Page).
NS	The NGC, IC, 3C number or other designation for the object. Association names will also appear in these columns.
RA(2000)DEC	The star's right ascension and declination from the odd page precessed to 2000 Epoch.
WT1	The composite weight of the observations of the object in filter 1 calculated with the equation $WT1 = \sum [1/(1 + w_1)]$ where w_1 is defined in the U1 column explanation.
WT2	The composite weight of the observations of the object in filter 2. Calculated in the same manner as WT1.
WT3	The Composite weight of the observations of the object in filter 3. Calculated in the same manner as WT1.
WT4	The Composite weight of the observations of the object in filter 4. Calculated in the same manner as WT1.
OBJ	Codes referring to the general type of object and primarily referring to non-star objects. More than one of the following letters may apply and the printed order is not significant. - B Barred spiral galaxy. - C Globular cluster. - D Diffuse emission nebula. - E Elliptical galaxy. - G Galactic cluster. - I Irregular galaxy. - N Reflection nebula. - O Object surrounded by or associated with nebulosity. - P Planetary nebula. - Q Quasi-stellar galaxy. - R Radio source. - S Spiral galaxy. - X Peculiar galaxy.

Column Heading

Contents

PHOTOM

One letter codes designating the known photometric properties of the star and a number code designating variability. More than one of the following letters or numbers may apply. The order is not significant.

- A Member of an OB association.
- B Visual binary.
- H High-velocity star.
- M Multiple star.
- P Polarization data available.
- S Standard on MK or UBV system.
- U Observed in the ultraviolet below 3000 Å wavelength.
- X X-ray source.
- Z X-ray source also observed in the ultraviolet.

- 0 Suspected variable.
- 1 RW Aurigae variable.
- 2 Eclipsing variable.
- 3 Early-type irregular variable (type Ia of Kukarkin and Parenago).
- 4 Variable star of unspecified type.
- 5 Beta Canis Majoris variable.
- 6 Alpha Canum Venaticorum variable.
- 7 Delta Scuti variable.
- 8 W Ursae Majoris variable.
- 9 Peculiar variable.
- 10 Classical Cepheid variable.
- 11 Flare star.
- 12 Irregular variable other than type Ia of Kukarkin and Parenago.
- 13 Semiregular variable.
- 14 RR Lyrae variable.
- 15 Mira Ceti and long-period variables.
- 16 Nova-like variable.
- 17 Nova.
- 18 R Coronae Borealis variable.
- 19 Supernova.
- 20 T Tauri variable.
- 21 U Geminorum variable.
- 22 RV Tauri variable.
- 23 W Virginis variable.
- 24 Z Camelopardalis variable.

Column Headings

S-PEC

Contents

One column codes that refer to the spectral characteristics of the star. One or more of the following letters may apply. Their printed order is not significant.

- A Peculiar A-type star.
- B Spectroscopic binary.
- C Composite spectrum.
- D Interstellar D lines of sodium.
- E Any type of emission
- G Magnetic field.
- H Interstellar H and K lines of Calcium II.
- M Metallic-line star.
- N Nebulous lines.
- P Peculiar spectrum.
- R Measured axial rotation.
- S Sharp lines.
- W Broad lines.
- Y Shell spectrum.
- 4 Interstellar 4430 Å absorption band.

REMARKS

Any remarks about the observation. This includes:

W/+XXXXXX signifies that the image of the object is inseparably merged with the stars listed by DM or HD #;

Variable star names

References

The identification numbers of the references used in compiling the ground-based astrophysical information about the star. They are arranged in numerical and then alphabetic order, except the SAO Star Catalog (Ref. # 897) always is first if it is in the references. If it is absent, the reference # of the DM Catalog (898, BD; 899, CD; 900, CPD) will be first if it is in the references. The second reference (first if references 897, 898, 899 and 900 are all missing) is the Naval Observatory Catalog of UBV Photometry (A19) if it is in the references. The reference numbers continue on multiple lines until the maximum of twenty references are listed.

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[illegible]

FILE 0001 REC 0002 CH 0450

[illegible]

5M 6 5234 250 2003 CH 6450

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[illegible]

0433 0000

[illegible]

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0525	000000000000	000000000000						

FILE 0001 REC 0007 CH 0510

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0097	555552200055	554344455333	375500011467	027601023334	004344420134	443333353033	343513343633	344000363644
0145	364033443535	000133420137	350137430071	424155555555	555500555555	555500555555	005555555555	550000005555
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0337	000000010000	000000000000	233522013330	701007003554	000000000000	000000000000	000000000000	000000000000
0385	000000002414	220101317010	070310170000	000000000000	000000000000	000000000000	000000000000	000200000000
0433	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0481	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000

FILE 0001 REC 0008 CH 0510

0001	231621424227	256620230000	000000000000	012600000000	000000107004	000000000000	000003610000	000000000010
0045	725300000000	007400005150	000000000000	002666420000	026666666400	000055555555	555555555555	555555555555
0097	555555550055	554436555555	555500013333	333206555555	004344435555	555555550055	555535555555	555505555555
0145	555555555555	005555555555	555555550055	553355555555	555500555555	555555555555	005555555555	550000005555
0193	555555555555	555555555555	555555555555	000000000000	000023710000	000000000000	014400000000	000000000000
0241	000000000000	000025470000	000000000000	031000000000	000000000000	000000000000	000000000000	000000000000
0245	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0337	000000010000	000000000000	257122010330	73107003045	000000000000	000000000000	000000000000	000200000000
0385	000000002541	220101317010	070310240000	000000000000	000000000000	000000000000	000000000000	000000000000
0433	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0481	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000

FILE 0001 REC 0009 CH 0402

0001	226062114476	071017350000	000000000000	014000000000	000000110456	000000000000	000003630000	000000000010
0045	072500000000	007501005031	000000000000	002666420000	026666666465	761055755555	555335555555	555555200355
0097	555555220055	554344455333	354700011467	047201174355	004344420134	443333340033	333533340033	343500333436
0145	333440363644	003636443637	353640330044	353501334201	373500013743	014130555555	005555555555	550000005555

FILE 0001 REC 0018 CH 0480
0001 331721023426 61745620000 000000000025 047100000000 000000112054 000000000000 000001230000 000000000011
0004 233200000000 007600004452 000000000000 002666666646 000055555555 555555555555 555555555555
0007 555555555555 554437445533 173600011333 333202024040 004344420134 44333340055 555555555555 555555555555
0115 555555555555 005555555555 555555555555 000000000000 000000000000 000000000000 000000000000
0122 555555555555 555555555555 555555555555 000000000000 000000000000 000000000000 000000000000
0124 000000000000 000025150000 000000000000 000000000000 000000000000 000000000000 000000000000
0284 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000
0337 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000
0365 0000000002552 220103002670 672010270000 000000000000 000000000000 000000000000 000000000000
0433 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000

FILE 0001 REC 0019 CH 0570
0001 010642145156 400460762000 000000000025 047200000000 000000106316 000001240000 000000000010
0004 656500000000 007300003374 000000000000 002666666646 000055555555 555555555555 555555555555
0007 555555555555 554337555541 405000113333 333204015555 004344423333 353636420044 555555555555 555555555555
0115 555555555555 025555555555 555555555555 555555555555 555555555555 555555555555 555555555555
0122 555555555555 555555555555 555555555555 000000000000 000000000000 000000000000 000000000000
0284 000000000000 000021640000 000000000000 000000000000 000000000000 000000000000 000000000000
0337 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000
0365 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000
0433 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000
0481 000000000000 000000270000 000000000000 000000000000 000000000000 000000000000 000000000000
0525 406230000000 000000000024 000000000000 000000000000 000000000000 000000000000 000000000000

FILE 0001 REC 0020 CH 0450
0001 236450472425 323132740000 000000000025 050700000000 000000107327 000000000000 000001410000 000000000010
0004 575000000000 007400005141 000000000000 002666666646 000055555555 555555555555 555555555555
0007 555555555555 554404255533 334000143334 333202633335 004344420134 443333400555 555555555555 555555555555
0115 013735013743 005555555555 555555555555 555555555555 555555555555 555555555555 555555555555
0122 555555555555 555555555555 555555555555 000000000000 000000000000 000000000000 000000000000
0284 000000000000 000020000000 000000000000 000000000000 000000000000 000000000000 000000000000
0337 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000
0365 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000
0433 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000
0481 000000000000 000000270000 000000000000 000000000000 000000000000 000000000000 000000000000
0525 406230000000 000000000024 000000000000 000000000000 000000000000 000000000000 000000000000

FILE 0001 REC 0021 CH 0540
0001 237041173002 532351340000 000000000025 051100000000 000000106300 000000000000 000001430000 000000000010
0004 656500000000 007300003374 000000000000 002666666646 000055555555 555555555555 555555555555
0007 555555555555 554437445533 443600011467 002010234040 004344420134 443333400555 555555555555 555555555555
0115 334443363734 004734444435 350133420011 373555555555 555555555555 555555555555 555555555555
0122 555555555555 555555555555 555555555555 000000000000 000000000000 000000000000 000000000000
0284 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000
0337 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000
0365 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000
0433 011700747471 110000000000 000000000000 000000000000 000000000000 000000000000 000000000000
0481 220103007010 675046500000 000000000000 000000000000 000000000000 000000000000 000000000000
0525 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000

FILE 0001 REC 0022 CH 0480
0001 011722736730 371701750000 000000000025 052000000000 000000107113 000000000000 000001520000 000000000010
0004 436200000000 007300003374 000000000000 002666666646 000055555555 555555555555 555555555555
0007 555555555555 554433335533 353700113333 333202024040 004344420134 443333400555 555555555555 555555555555
0115 555555555555 555555555555 555555555555 555555555555 555555555555 555555555555 555555555555
0122 555555555555 555555555555 555555555555 000000000000 000000000000 000000000000 000000000000
0284 000000000000 000026500000 000000000000 000000000000 000000000000 000000000000 000000000000
0337 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000
0365 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000
0433 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000

FILE 0001 REC 0023 CH 0450
0001 132116714103 127174110000 000000000025 053400000000 000000115420 000000000000 000001660000 000000000010
0004 566700000000 007300003374 000000000000 002666666646 000055555555 555555555555 555555555555
0007 555555555555 554436335533 353700113333 333202024040 004344420134 443333400555 555555555555 555555555555
0115 555555555555 555555555555 555555555555 555555555555 555555555555 555555555555 555555555555
0122 555555555555 555555555555 555555555555 000000000000 000000000000 000000000000 000000000000
0284 000000000000 000026500000 000000000000 000000000000 000000000000 000000000000 000000000000
0337 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000
0365 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000
0433 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000

CDC VERSION
FILE 1

```

30 CONTINUE
   CALL PRINT(IO,IBUF,IFLAG)
   GOTO 1

40 CONTINUE
   IF(IFLAG(1)-1) 90,50,60

CALL VARIABLE FORMAT PRINT ROUTINE

50 CONTINUE
   CALL VARPR(IO,IBUF,IFLAG)
   GOTO 1

60 CONTINUE
   IF(IFLAG(1)-2) 90,70,90

CALL USER SUPPLIED ROUTINE

70 CONTINUE
   CALL USER(IO,IBUF,IFLAG)
   GOTO 1

ERROR IN IFLAG ARRAY - PROB ILLEGAL DATA

90 CONTINUE
   WRITE(12,95)(IFLAG(I),I=1,10)
95 FORMAT(28H ILLEGAL DATA IN IFLAG ARRAY,1X,10I6)
   STOP

END OF FILE ON CATALOG TAPE
FINALIZE

100 CONTINUE
   CALL FINAL(IO,IBUF,IFLAG)

RETURN

END
SUBROUTINE INIT(IO,IBUF,IFLAG)

   L.KIRSCHNER 12/17/71 USA STANDARD FORTRAN
   THIS SUBROUTINE READS THE DATA CARDS FOR THE
   GENERAL PRINTING PACKAGE FOR THE CELESCOPE CATALOG
   INIT SETS UP ARRAY IFLAG ELEMENTS 1-4

   DIMENSION IN(10)
   DIMENSION IO(5),IFLAG(10)
   COMMON/LDATA/NUM,LIST(200)
   COMMON /SEL/ISEL(300),MSEL
   DATA MSEL/300/
   DATA 1A,1B,1C,1D,1E,1F,1G,1H,1I,1J,1K,1L,1M,1N,100,1P,1Q,1R,1S,
11T,1U,1V,1W,1X,1Y,1Z,1HA,1HB,1HC,1HD,1HE,1HF,1HG,1HH,1HI,1HJ,
21HK,1HL,1HM,1HN,1HO,1HP,1HQ,1HR,1HS,1HT,1HU,1HV,1HW,1HX,1HY,1HZ/
   DATA MINUS/1H-/

   IO(1) CONTAINS THE LOGICAL UNIT NO. FOR THE CARD READER
   LU=IO(1)
   IO(2) IS PRINTER L.U. -- ERROR MESSAGES WRITTEN HERE
   LUPR=IO(2)

   SET DEFAULT VALUES

```

```

DRIVE 60
DRIVE 61
DRIVE 62
DRIVE 63
DRIVE 64
DRIVE 65
DRIVE 66
DRIVE 67
DRIVE 68
DRIVE 69
DRIVE 70
DRIVE 71
DRIVE 72
DRIVE 73
DRIVE 74
DRIVE 75
DRIVE 76
DRIVE 77
DRIVE 78
DRIVE 79
DRIVE 80
DRIVE 81
DRIVE 82
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DRIVE 84
DRIVE 85
DRIVE 86
DRIVE 87
DRIVE 88
DRIVE 89
DRIVE 90
DRIVE 91
DRIVE 92
DRIVE 93
DRIVE 94
DRIVE 95
DRIVE 96
DRIVE 97
INIT 2
INIT 3
INIT 4
INIT 5
INIT 6
INIT 7
INIT 8
INIT 9
INIT 10
INIT 11
INIT 12
INIT 13
INIT 14
INIT 15
INIT 16
INIT 17
INIT 18
INIT 19
INIT 20
INIT 21
INIT 22
INIT 23
INIT 24
INIT 25
INIT 26
INIT 27

```



```

CALL PRINT RATHER THAN USER OR VARPR      (IFLAG(1)) INIT 28
NO SELECTION (DO NOT CALL SELECT)          (IFLAG(2)) INIT 29
NO PRECESSION OR GALACTIC                 (IFLAG(3)) INIT 30
PRINT EVEN AND ODD PAGES ON SEPARATE UNITS(IFLAG(4)) INIT 31

WRITE(LUPR,1)                             INIT 32
1 FORMAT(1H1)                             INIT 33
WRITE(LUPR,2)                             INIT 34
2 FORMAT(16H DATA CARDS READ./)          INIT 35
DD 10 1=1,10                             INIT 36
IFLAG(1)=0                                INIT 37
10 CONTINUE                              INIT 38

READ DATA CARDS                          INIT 39
5 CONTINUE                              INIT 40
READ(LU,90) (IN(1),I=1,10)               INIT 41
WRITE(LUPR,91)(IN(1),I=1,10)              INIT 42
91 FORMAT(1X,10A1)                        INIT 43
90 FORMAT(10A1)                           INIT 44
IF(IN(1).EQ.1U) GO TO 100                 INIT 45
IF(IN(1).EQ.1V) GO TO 200                 INIT 46
IF(IN(1).EQ.1G) GO TO 300                 INIT 47
IF(IN(1).EQ.1P) GO TO 400                 INIT 48
IF(IN(1).EQ.1S) GO TO 500                 INIT 49
IF(IN(1).EQ.1D) GO TO 700                 INIT 50
IF(IN(1).EQ.1E) GO TO 800                 INIT 51
GO TO 900                                 INIT 52
                                           INIT 53
                                           INIT 54
                                           INIT 55
                                           INIT 56
                                           INIT 57
CALL USER SUPPLIED ROUTINE INSTEAD OF PRINT OR VARPR(USER)
100 CONTINUE                             INIT 58
IFLAG(1)=2                               INIT 59
GO TO 5                                   INIT 60
                                           INIT 61
                                           INIT 62
                                           INIT 63
CALL VARPR INSTEAD OF PRINT OR USER(VARPR)
200 CONTINUE                             INIT 64
IFLAG(1)=1                               INIT 65
READ LIST OF ITEMS FOR VARPR             INIT 66
READ(LU,210) NUM                          INIT 67
210 FORMAT(15)                           INIT 68
WRITE(LUPR,211) NUM                       INIT 69
211 FORMAT(1X,15)                         INIT 70
IF(NUM.LE.200) GO TO 230                  INIT 71
WRITE(LUPR,220) NUM                       INIT 72
220 FORMAT(1X,36H TOO MANY ITEM NUMBERS FOR VARPR-NUM=,15)
STOP                                     INIT 73
230 CONTINUE                             INIT 74
READ(LU,240)(LIST(I),I=1,NUM)             INIT 75
240 FORMAT(15I5)                          INIT 76
WRITE(LUPR,241) (LIST(I),I=1,NUM)         INIT 77
241 FORMAT(1X,16I5)                       INIT 78
GO TO 5                                   INIT 79
                                           INIT 80
                                           INIT 81
                                           INIT 82
PRINT EVEN PAGE POSITIONS IN GALACTIC COORDINATES(GALACT)
300 CONTINUE                             INIT 83
IFLAG(3)=1                               INIT 84
GO TO 5                                   INIT 85
                                           INIT 86
                                           INIT 87
PRECESS POSITION ON EVEN PAGE TO EPOCH GIVEN ON NEXT CARD
PRECESS                                  INIT 88
400 CONTINUE                             INIT 89
                                           INIT 90
                                           INIT 91

```

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```

DEFINE MINUS ZERO AS 666
IF(ISEL(1).NE.0) GOT0534
IF(KS.EQ.MINUS) ISEL(1)=666
534 CONTINUE
IF(KS.EQ.MINUS) ISEL(1)=-ISEL(1)
533 CONTINUE
KL=KM
READ(LU,515)((IN(1),I=1,10),NNUM
WRITE(LUPR,516) ((IN(1),I=1,10),NNUM
GOT0518
SELECT RA DEC
540 CONTINUE
ISEL(KL)=NNUM*2
KM=NNUM*2+KL
KL=KL+1
IF(KM.GT.MSEL) GOT0551
DO 545 I=KL,KM,2
READ(LU,541) IHR5,IMIN,ISEC,ISGN,IDEG,DMIN
541 FORMAT(I2,1X,I2,1X,I2,2X,A1,I2,1X,F4,1)
WRITE(LUPR,542) IHR5,IMIN,ISEC,ISGN,IDEG,DMIN
542 FORMAT(1X,I2,1X,I2,1X,I2,2X,A1,I2,1X,F4,1)
ISEL(1)=IHR5*3600+IMIN*60+ISEC
ISEC=DMIN*10+.5
ISEL(1+1)=IDEG*600+ISEC
IF(ISGN.EQ.MINUS) ISEL(1+1)=-ISEL(1+1)
545 CONTINUE
READ(LU,515)((IN(1),I=1,10),NNUM
WRITE(LUPR,516) ((IN(1),I=1,10),NNUM
GOT05519
551 CONTINUE
MM=MSEL-3
WRITE(LUPR,552)MM
552 FORMAT(28H ATTEMPT TO SELECT MORE THAN,14,6H ITEMS)
STOP

PRINT ONLY EVEN OR ONLY ODD PAGES (SINGLE)
600 CONTINUE
EVEN ONLY (EVEN)
IF((IN(8).EQ.1E) IFLAG(4)=2
ODD ONLY (ODD)
IF((IN(8).EQ.100) IFLAG(4)=3
IF(IFLAG(4).EQ.2) IO(4)=IO(2)
GO TO 5

PRINT ALL PAGES ON 1 UNIT ALTERNATING PAGES(DOUBLE)
700 CONTINUE
IFLAG(4)=1
GO TO 5

ERROR
900 CONTINUE
WRITE(LUPR,910) ((IN(1),I=1,10)
910 FORMAT(1X,39HILLEGAL DATA CARD -- FIRST 10 COLS. ARE,5X,10A1)
STOP

END OF DATA CARDS (END)
800 CONTINUE
WRITE(LUPR,1)
RETURN
END

```

```

INIT 156
INIT 157
INIT 158
INIT 159
INIT 160
INIT 161
INIT 162
INIT 163
INIT 164
INIT 165
INIT 166
INIT 167
INIT 168
INIT 169
INIT 170
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INIT 172
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INIT 210
INIT 211
INIT 212
INIT 213
INIT 214
INIT 215
INIT 216
INIT 217
INIT 218
INIT 219

```


5

```

GOTO30
29 CONTINUE
  IBUF(1)=- (IBUF(1),A..N.MASK)
30 CONTINUE
  DO 50 I=1,5
50 IARY(I)=IBUF(I)
  IARY(6)=IRSHFT(IBUF(6),24),A.7777777B
  IX=IRSHFT(IBUF(6),59),A.1B
  IF(IX.EQ.1) IARY(6)=-IARY(6)
CONVERT -0 TO -666 FOR DM ZONE
  IF(IARY(6)) IF(IARY(6)) 52,51,52
  GOTO52
51 IARY(6)=-666
52 CONTINUE
  IARY(7)=IBUF(6),A.7777777B
  IARY(8)=IRSHFT(IBUF(7),1),A.77B
  IARY(9)=IRSHFT(IBUF(7),5),A.77B
  CALL CONVT(IARY(8))
  CALL CONVT(IARY(9))
  IARY(10)=IRSHFT(IBUF(7),1),A.17B
  IARY(11)=IBUF(7),A.1B
412 CALL UNPKC(IBUF(8),IARY(12))
  DO 365 I=12,133
    IF(1.EQ.16.0,1.EQ.50 ) GOTO365
  IARY(1)=IARY(1),A.77B
  CALL CONVT(IARY(1))
365 CONTINUE
  DO 40 I=22,33
  IF(IBUF(1)) IF(IBUF(1)) 39,40,40
  GOTO40
39 CONTINUE
  IBUF(1)=- (IBUF(1),A..N.MASK)
40 IARY(I+112)=IBUF(1)
  IL=33
  IN=145
  DO 730 I=1,4
  IL=IL+1
  IN=IN+1
  IK=IBUF(IL)
  IARY(IN)=IK
  IF(IK.EQ.0) GOTO730
  IK=IK*3
  DO 721 J=1,IK,3
  IF(IBUF(IL+J)) IF (IBUF(IL+J)) 719,719,720
  GOTO720
719 CONTINUE
  IBUF(IL+J)=- (IBUF(IL+J),A..N.MASK)
720 CONTINUE
  IN=IN+1
  IARY(IN)=IBUF(IL+J)
  IN=IN+1
  IARY(IN)=IRSHFT(IBUF(IL+J+1),54),A.77B
  CALL CONVT(IARY(IN))
  IN=IN+1
  IARY(IN)=IRSHFT(IBUF(IL+J+1),40),A.37777B
  M=A0
  DO 725 II=1,4
  IN=IN+1
  M=M-5
  IARY(IN)=IRSHFT(IBUF(IL+J+1),M),A.77B
  CALL CONVT(IARY(IN))
725 CONTINUE
  IN=IN+1
  IARY(IN)=IRSHFT (IBUF (IL+J+1),9),A.177B

```

```

UNPAK 45
UNPAK 46
UNPAK 47
UNPAK 48
UNPAK 49
UNPAK 50
UNPAK 51
UNPAK 52
UNPAK 53
UNPAK 54
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UNPAK 92
UNPAK 93
UNPAK 94
UNPAK 95
UNPAK 96
UNPAK 97
UNPAK 98
UNPAK 99
UNPAK100
UNPAK101
UNPAK102
UNPAK103
UNPAK104
UNPAK105
UNPAK106
UNPAK107
UNPAK108

```


BLANK FILL IN THE FIELD
THE DIRECT ASSOCIATION OF THE CDC CODES (BINARY 01 THROUGH 57)
AND THE NUMBERS (DECIMAL 1 THROUGH 47) ALLOW THIS

DIMENSION ICHAR(47)

DATA ICHAR/

1 1HA,1HB,1HC,1HD,1HE,1HF,1HG,1HH,1HI,1HJ,1HK,1HL,1HM,1HN,1HO,1HP,
2 1HQ,1HR,1HS,1HT,1HU,1HV,1HW,1HX,1HY,1HZ,
3 1HO,1HI,1H2,1H3,1H4,1H5,1H6,1H7,1H8,1H9,1H+,1H-,1H*,1H/,1H(,1H),
4 1H,1H=,1H<,1H>,1H%./

IF(ID.LT.1) ID=45

IF(ID.GT.47) ID=45

ID=ICCHAR(ID)

RETURN

END

SUBROUTINE SELECT(ID,IBUF,IFLAG)

L.KIRSCHNER 12/23/71

SUBROUTINE FOR CELESCOPE CATALOG PRINTING PACKAGE

SELECTS RECORDS(STARS) ON THE BASIS OF--

HD

DM

RA,DEC

IFLAG(5)=0 REJECT RECORD FOR PRINTING OR PROCESSING

IFLAG(6)=1 ACCEPT RECORD FOR PRINTING OR PROCESSING

DIMENSION ID(5), IBUF(3000),IFLAG(10)

COMMON/SEL/ISEL(300),MSEL

ISEL CONTAINS THE SELECTION INFORMATION READ IN BY INIT.

IT IS ARRANGED AS FOLLOWS--

ISEL(1)= NO. OF HD NOS. TO FOLLOW=N

ISEL(N+1)= N-TH HD NO.

ISEL(N+2)= NO. OF DM ZONE, NUM WORDS TO FOLLOW=M

ISEL(N+3)= FIRST DM ZONE

ISEL(N+4)= FIRST DM NO.

ISEL(N+M+1)= M-TH DM ZONE

ISEL(N+M+2)= M-TH DM NO.

ISEL(N+M+3)=NO. OF RA,DEC WORDS TO FOLLOW=MM

ISEL(N+M+4)=FIRST R.A.

+5)=FIRST DEC

+6 =SECOND R.A.

+7 =SECOND DEC.

.

.

ISEL(N+M+MM+2)= MM-TH RA

ISEL(N+M+MM+3)= MM-TH DEC

IFLAG(6)=0

N=ISEL(1)

M=ISEL(N+2)

MM=N+M

MM=ISEL(MM+3)

HD SELECT

IF(N.EQ.0) GOTD101

I1=2

I2=N+1

DO 100 I=I1,I2

IF(IBUF(16).EQ.ISEL(I)) GO TO 500

100 CONTINUE

CONVT 15

CONVT 16

CONVT 17

CONVT 18

CONVT 19

CONVT 20

CONVT 21

CONVT 22

CONVT 23

CONVT 24

CONVT 25

CONVT 26

CONVT 27

CONVT 28

CONVT 29

CONVT 30

SELECT 2

SELECT 3

SELECT 4

SELECT 5

SELECT 6

SELECT 7

SELECT 8

SELECT 9

SELECT 10

SELECT 11

SELECT 12

SELECT 13

SELECT 14

SELECT 15

SELECT 16

SELECT 17

SELECT 18

SELECT 19

SELECT 20

SELECT 21

SELECT 22

SELECT 23

SELECT 24

SELECT 25

SELECT 26

SELECT 27

SELECT 28

SELECT 29

SELECT 30

SELECT 31

SELECT 32

SELECT 33

SELECT 34

SELECT 35

SELECT 36

SELECT 37

SELECT 38

SELECT 39

SELECT 40

SELECT 41

SELECT 42

SELECT 43

SELECT 44

SELECT 45

SELECT 46

SELECT 47

SELECT 48

SELECT 49

```

DM SELECT
101 CONTINUE
  IF(M.EQ.0) GOTO201
  I1=N+3
  I2=N+M+1
  DO 200 I=I1,I2,2
  IF(IBUF(6).NE.ISEL(I)) GO TO 200
  IF(IBUF(7).EQ.ISEL(I+1)) GO TO 500
200 CONTINUE
  RA,DEC SELECT
301 CONTINUE
  IF(MM.EQ.0) GOTO301
  I1=N+M+4
  I2=N +M+MM+2
  DO 300 I=I1,I2,2
  IF(IBUF(2).NE.ISEL(I)) GO TO 300
  IF(IBUF(3).EQ.ISEL(I+1)) GO TO 500
300 CONTINUE
301 CONTINUE
  RETURN

```

ACCEPT RECORD

```

500 CONTINUE
  IFLAG(6)=1
  RETURN
  END
  SUBROUTINE PRINT(ID,IBUF,IFLAG)
  DIMENSION IO(5),IBUF(2500),IFLAG(10)
  THIS SUBROUTINE GENERATES THE STANDARD CELESCOPE CATALOGUE
  PRINTOUT.
  PRINTOUT FOR EACH STAR CONSISTS OF 2 GROUPS OF PRINT LINES, 1
  GROUP APPEARING ON ODD(LEFT-HAND) PAGES, THE 2ND APPEARING
  ON EVEN (RIGHT-HAND ) PAGES
  THE STRUCTURE OF THE ODD PAGE IS AS FOLLOWS

```

COL	ITEM
1	CONTROL CHARACTER(ALWAYS BLANK)
2-3	STAR NUMBER FOR THIS PAGE
4	BLANK
5-10	HD NUMBER
11	BLANK
12	DM CATALOGUE CODE
13-15	DM ZONE
16	BLANK
17-21	DM NUMBER
22	BLANK
23-24	RA HOURS(1950.0)
25	BLANK
26-27	RA MINUTES
28	BLANK
29-30	RA SECONDS
31	BLANK
32-34	DEC DEGREES
35	BLANK
36-39	DEC MINUTES
40-41	BLANK
42-46	M1
47	MAGNITUDE CODE
48	BLANK
49-53	M2
54	MAGNITUDE CODE
55	BLANK
56-60	M3

SELECT 50
SELECT 51
SELECT 52
SELECT 53
SELECT 54
SELECT 55
SELECT 56
SELECT 57
SELECT 58
SELECT 59
SELECT 60
SELECT 61
SELECT 62
SELECT 63
SELECT 64
SELECT 65
SELECT 66
SELECT 67
SELECT 68
SELECT 69
SELECT 70
SELECT 71
SELECT 72
SELECT 73
SELECT 74
SELECT 75
SELECT 76
PRINT 2
PRINT 3
PRINT 4
PRINT 5
PRINT 6
PRINT 7
PRINT 8
PRINT 9
PRINT 10
PRINT 11
PRINT 12
PRINT 13
PRINT 14
PRINT 15
PRINT 16
PRINT 17
PRINT 18
PRINT 19
PRINT 20
PRINT 21
PRINT 22
PRINT 23
PRINT 24
PRINT 25
PRINT 26
PRINT 27
PRINT 28
PRINT 29
PRINT 30
PRINT 31
PRINT 32
PRINT 33
PRINT 34
PRINT 35
PRINT 36
PRINT 37
PRINT 38

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PRINT 39
PRINT 40
PRINT 41
PRINT 42
PRINT 43
PRINT 44
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PRINT 46
PRINT 47
PRINT 48
PRINT 49
PRINT 50
PRINT 51
PRINT 52
PRINT 53
PRINT 54
PRINT 55
PRINT 56
PRINT 57
PRINT 58
PRINT 59
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PRINT 60
PRINT 61
PRINT 62
PRINT 63
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PRINT 64
PRINT 65
PRINT 66
PRINT 67
PRINT 68
PRINT 69
PRINT 70
PRINT 71
PRINT 72
PRINT 73
PRINT 74
PRINT 75
PRINT 76
PRINT 77
PRINT 78
PRINT 79
PRINT 80
PRINT 81
PRINT 82
PRINT 83
PRINT 84
PRINT 85
PRINT 86
PRINT 87
PRINT 88
PRINT 89
PRINT 90
PRINT 91
PRINT 92
PRINT 93
PRINT 94
PRINT 95
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PRINT 96
PRINT 97
PRINT 98
PRINT 99
PRINT:100
PRINT101
PRINT102
```

ON THE EVEN PAGE, THE POSITION MAY BE EPOCH 2000, USERS EPOCH,
OR IN GALACTIC COORDINATES.
THESE OPTIONS ARE SELECTED THROUGH PROPER SETUP OF THE ARRAYS
IO AND IFLAG
DATA FROM THE CATALOGUE IS TRANSMITTED THROUGH THE ARRAY
IUOF.
SEE THE WRITEUP FOR THE STRUCTURE OF THESE ARRAYS

	NR=(NCOL-1)/40+1	REF10 13
	NEVEN(NTRY)=MAX0(NR,NP,NS,NO,1)	PRINT157
200	CONTINUE	PRINT158
	HAVE WE ACCUMULATED 5 STARS ON THE SCRATCH FILE	PRINT159
	IF(NTRY .LT. 5) RETURN	PRINT160
210	CONTINUE	PRINT161
	COMPUTE TOTAL LINES TO BE PRINTED FOR THIS GROUP	PRINT162
	NEWL=0	PRINT163
	IF(NTRY .EQ. 0) GO TO 400	PRINT164
	DO 220 J=1,NTRY	PRINT165
	NEWL=NEWL+MAX0(NODD(J),NEVEN(J))	PRINT166
220	CONTINUE	PRINT167
	DOES THIS GROUP FIT ON THE CURRENT PAGE	PRINT168
	IF((NEWL+NLN) .LE. LIMIT) GO TO 300	PRINT169
	NO,TERMINATE PRESENT PAGE(S)	PRINT170
		PRINT171
	IF(NLN .EQ. 100) GO TO 250	PRINT172
	ALTERNATING PAGES REQUIRE SPECIAL HANDLING	PRINT173
	IF(IFLAG(4) .NE. 1) GO TO 250	PRINT174
230	CONTINUE	PRINT175
	LUN=ID(4)	PRINT176
	LUN=ID(2)	PRINT177
	REWIND LUN	PRINT178
	DO 240 J=1,NLN	PRINT179
	READ(LUN,1) (LINE(I),I=1,LIM)	REF10 14
1	FORMAT(124A1)	REF10 15
	WRITE(LUN,1) (LINE(I),I=1,LIM)	REF10 16
240	CONTINUE	PRINT183
	REWIND LUN	PRINT184
	IF(1516 .NE. 0) RETURN	PRINT185
250	CONTINUE	PRINT186
	RESET LINE COUNT FOR NEW PAGE	PRINT187
	NLN=0	PRINT188
	IPAGE=IPAGE+1	PRINT189
	ISTAR=0	PRINT190
	ODD OUTPUT CHECK	PRINT191
	IF(IFLAG(4) .EQ. 2) GO TO 270	PRINT192
	LUN=ID(2)	PRINT193
	JPAGE=IPAGE*2-1	PRINT194
	WRITE(LUN,2) JPAGE	PRINT195
2	FORMAT(1H1,I3,1X,2HHD,7X,2HDM,8X,1CHR,A,(1950),1X,3HDEC,5X,1HV,5X,PRINT196	
	13HB-V,4X,3HU-B,7X,3HS-L,4X,2HU1,3X,3HSD1,3X,2HU2,3X,3HSD2,3X,2HU3,PRINT197	
	23X,3HSD3,3X,2HU4,3X,3HSD4,9X,1H)	PRINT198
	BLANK LINE	PRINT199
	WRITE(LUN,3) B1,B2	PRINT200
3	FORMAT(A1,118X,A1)	PRINT201
270	CONTINUE	PRINT202
	CHECK FOR EVEN PAGE OUTPUT	PRINT203
	IF(IFLAG(4) .EQ. 3) GO TO 290	PRINT204
	LUN=ID(4)	PRINT205
	IF(IFLAG(3)-1) 275,280,285	PRINT206
275	CONTINUE	PRINT207
	DEFAULT EPOCH OF 2000	PRINT208
	N=2000	PRINT209
	GO TO 288	PRINT210
280	CONTINUE	PRINT211
	GALACTIC COORDINATES HEADER	PRINT212
	JPAGE=IPAGE*2	PRINT213
	WRITE(LUN,4) JPAGE	PRINT214
4	FORMAT(1H1,I3,1X,2HNS,5X,5HL(I),2X,5HB(I),4X,3HWT1,1X,3HWT2, PRINT215	
	11X,3HWT3,1X,3HWT4,1X,3HOBJ,1X,4HPHOT,3X,5HS=PEC,2X,6(1H-),7HREMARKPRINT216	
	25,7(1H-),1X,12(1H-),10HREFERENCES,18(1H-))	REF10 17
	GO TO 289	PRINT218
285	CONTINUE	PRINT219

```

USER EPOCH
N=IFLAG(3)
288 CONTINUE
  JPAGE=IPAGE*2
  WRITE(LUN,5) JPAGE,N
  5 FORMAT(1H1,13,1X,2HNS,3X,SHR,A,(,14,5H) DEC,4X,3HWT1,1X,3HWT2,
    11X,3HWT3,1X,3HWT4,1X,3HOBJ,1X,4MPHOT,3X,5MS-PEC,2X,6(1H-),7HREMARK,
    25,7(1H-),1X,12(1H-),10HREFERENCES,18(1H-))
289 CONTINUE
  WRITE(LUN,3) B1,B2
290 CONTINUE
  NLN=NLN+2
300 CONTINUE
  PRINT THE NEXT GROUP OF STARS
  FIRST, ODD PAGE
  IF(IFLAG(4) .EQ. 2) GO TO 335
  LUN=IO(5)
  LUNA=IO(2)
  REWIND LUN
  DO 330 J=1,NTRY
    N=NODD(J)
    FETCH THE ODD LINES FOR STAR J AND WRITE THEM ON IO(2)
    DO 320 K=1,N
      READ(LUN,1) ((LINE(I),I=1,120)
      PERFORM SOME EDITING- CHECK FOR NONEXISTENT HD,DM, U MAGNITUDES,
      AND STANDARD DEVIATIONS, WHICH WILL BE MARKED BY SPECIAL VALUES
      OF -9, -9.00 OR -.9
      IF S.D. HAS LEADING ZERO, CHANGE IT TO A BLANK
      IF(LINE(9) .EQ. MN ) CALL CLEAR(LINE(5),-6,1H )
      IF(LINE(20) .EQ. MN ) CALL CLEAR(LINE(12),-10,1H )
      DO 312 L=68,101,11
        IF((LINE(L) .EQ. MN ).AND.(LINE(L+1).EQ. NIN)) CALL CLEAR(
1 LINE(L),-5,1H )
        IF((LINE(L+6) .EQ. MN ).AND.(LINE(L+8) .EQ. NIN)) CALL CLEAR(
1 LINE(L+6),-4,1H )
        IF(LINE(L+6).EQ.1H0) LINE(L+6)=1H
312 CONTINUE
      NOW PRINT THE ODD LINE-INCLUDE STAR NUMBER IF IT IS THE FIRST
      IF(K .NE. 1) GO TO 315
      NS=1STAR+J
      WRITE(LUNA,6) NS,(LINE(I),I=4,120)
      6 FORMAT(1X,12,121A1)
      GO TO 320
315 CONTINUE
      WRITE(LUNA,1) ((LINE(I),I=1,120)
320 CONTINUE
      IF THERE WERE MORE LINES ON THE EVEN PAGE, WRITE BLANK LINES
      N=NEVEN(J)-NODD(J)
      IF(N .LE. 0) GO TO 327
      DO 325 K=1,N
        WRITE(LUNA,3) B1,B2
325 CONTINUE
      NOW SKIP THE EVEN PAGE LINES ON INFO(5)
327 CONTINUE
      IF(IFLAG(4) .EQ. 3) GO TO 330
      CALL SKIP(LUN,NEVEN(J))
330 CONTINUE
      REWIND LUN
      ADD A BLANK LINE, IF POSSIBLE
      IF((NEWL+NLN) .LT. LIMIT) WRITE(LUNA,3) B1,B2
      NOW DO THE EVEN PAGES
      IF(IFLAG(4) .EQ. 3) GO TO 400
335 CONTINUE
      LUN=IO(5)

```

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PRINT220
PRINT221
PRINT222
PRINT223
PRINT224
PRINT225
PRINT226
REF10 18
PRINT228
PRINT229
PRINT230
PRINT231
PRINT232
PRINT233
PRINT234
PRINT235
PRINT236
PRINT237
PRINT238
PRINT239
PRINT240
PRINT241
PRINT242
PRINT243
PRINT244
PRINT245
PRINT246
LRK02 1
PRINT247
PRINT248
PRINT249
PRINT250
PRINT251
PRINT252
PRINT253
LRK02 2
PRINT254
PRINT255
PRINT256
PRINT257
PRINT258
DEF10 19
PRINT260
PRINT261
PRINT262
PRINT263
PRINT264
PRINT265
PRINT266
PRINT267
PRINT268
PRINT269
PRINT270
PRINT271
PRINT272
PRINT273
PRINT274
PRINT275
PRINT276
PRINT277
PRINT278
PRINT279
PRINT280
PRINT281

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C
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C

C

C

C

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C

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LUNA=ID(4)
REWIND LUN
DO 360 J=1,NTRY
SKIP ODD LINES FOR THE JTH STAR
IF(IFLAG(4) .EQ. 2) GO TO 338
CALL SKIP(LUN,NODD(J))
338 CONTINUE
N=NEVEN(J)
DO 350 K=1,N
READ(LUN,1) (LINE(I),I=1,LIM)
EDITING= BLANK NON-EXTENT WEIGHTS
DO 340 L=29,41,4
IF(LINE(L) .NE. MN ) GO TO 340
CALL CLEAR(LINE(L),-3,1H )
340 CONTINUE
ADD STAR NUMBER TO THE FIRST LINE
IF(K .NE. 1) GO TO 345
NS=ISTAR+J
WRITE(LUNA,6) NS,(LINE(1),I=4,LIM)
GO TO 350
345 CONTINUE
WRITE(LUNA,1) (LINE(I),I=1,LIM)
350 CONTINUE
CHECK FOR MORE LINES ON ODD PAGE
N=NODD(J)-NEVEN(J)
IF(N .LE. 0) GO TO 360
DO 355 K=1,N
WRITE(LUNA,3) B1,B2
355 CONTINUE
360 CONTINUE
REWIND LUN
IF((NEWL+NLN) .LT. LIMIT) WRITE(LUNA,3) B1,B2
400 CONTINUE
RESET LINE AND STAR COUNTS
NL=NLN+1
NLN=NLN+1
ISTAR=ISTAR+5
NTRY=0
CALL CLEAR(NODD,5,0)
CALL CLEAR(NEVEN,5,0)
IF((IFLAG(4) .NE. 1) .OR. (IFLAG(5) .EQ. 0)) RETURN
ISIG=1
GO TO 230
END
SUBROUTINE ODLIN(LUN,IBUF,IFLAG,NLIN)
THIS ROUTINE GENERATES THE ODD PAGE OUTPUT FOR 1 STAR
LUN IS THE LOGICAL UNIT ON WHICH 1 OR MORE 120 CHARACTER LINES
ARE WRITTEN.

NOTE THAT AT PRESENT ROUTINE INVARIABLY GENERATES 1 LINE

IBUF IS THE STANDARD ARRAY OF UNPACKED CATALOGUE ITEMS
IFLAG IS THE STANDARD OPTIONS ARRAY
NLIN IS THE NUMBER OF LINES GENERATED IN THIS CALL

THE STRUCTURE OF THE ODD PAGE IS AS FOLLOWS

COL      ITEM
1        CONTROL CHARACTER(ALWAYS BLANK)
2-3      STAR NUMBER FOR THIS PAGE
4        BLANK
5-10     HD NUMBER
11       BLANK
12       DM CATALOGUE CODE
13-15    DM ZONE

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PRINT282
PRINT283
PRINT284
PRINT285
PRINT287
PRINT288
PRINT289
PRINT290
REF10 20
PRINT292
PRINT293
PRINT294
PRINT295
PRINT296
PRINT297
PRINT298
PRINT299
REF10 21
PRINT301
PRINT302
REF10 22
PRINT304
PRINT305
PRINT306
PRINT307
PRINT308
PRINT309
PRINT310
PRINT311
PRINT312
PRINT313
PRINT314
PRINT315
PRINT316
PRINT317
PRINT318
PRINT319
PRINT320
PRINT321
PRINT322
PRINT323
PRINT324
ODLIN 2
ODLIN 3
ODLIN 4
ODLIN 5
ODLIN 6
ODLIN 7
ODLIN 8
ODLIN 9
ODLIN 10
ODLIN 11
ODLIN 12
ODLIN 13
ODLIN 14
ODLIN 15
ODLIN 16
ODLIN 17
ODLIN 18
ODLIN 19
ODLIN 20
ODLIN 21
ODLIN 22

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        IVALU(2)=ICAT(N)
        IF(IABS(IBUF(6)) .NE. 666) GO TO 110
        IVALU(3)=0
        SIGN2=SMINUS
        GO TO 115
110  CONTINUE
        SIGN2=SPLUS
        IF(IBUF(6) .LT. 0) SIGN2=SMINUS
        IVALU(3)=IABS(IBUF(6))
115  CONTINUE
        IVALU(4)=IBUF(7)
        TF(IVALU(2) .EQ. ICAT(1)) IVALU(4)=-9
        RA 1950
        CALL RAHMS (IBUF(2),IVALU(5))
        DEC 1950
        CALL DECDM(IBUF(3),IVALU(8),SIGN1)
        NOW HANDLE 3 GROUND BASED MAGNITUDES
        DO 150 J=10,22,6
        MOVE CHARACTERS
        L=(J/6)**3+34
        COMPARE MAGNITUDES CODE WITH TABLE
        M=IBUF(50)*3+J/6
        IF(J.NE.10) GOTD139
        IF(IBUF(50).EQ.5) GOTD138
        IF(IBUF(50).EQ.30) GOTD138
        IF(IBUF(50).EQ.31) GOTD138
        GOTD139
        PUT MPG (IN M2 COL) IN M1 COL
138  CONTINUE
        L=42
139  CONTINUE
        CALL EQARY(IBUF(L),IVALU(J),2)
        CALL EQARY(IBUF(L+2),IVALU(J+3),2)
        IS MAGNITUDE NON-EXISTENT
        IF(MAGTAB(M) .EQ. IBLNK) GO TO 140
        IVALU(J+2)=IDP
        IVALU(J+5)=MAGTAB(M)
        IF(MAGTAB(M) .EQ. IDP) IVALU(J+5)=IBLNK
        GO TO 150
140  CONTINUE
        CALL CLEAR(IVALU(J),-6,1H )
150  CONTINUE
        NOW PROCESS SPECTRUM AND LUMINOSITY
        CALL EQARY(IBUF(51),IVALU(28),3)
        IF LUMINOSITY IS 1HN OR 1HC, WE MUST REVERSE SPECTRUM
        AND LUMINOSITY
        IF((LUM(1) .NE. IBUF(53)).AND.(LUM(2).NE. IBUF(53))) GO TO 160
        IVALU(29)=IBUF(53)
        IVALU(30)=IBUF(52)
160  CONTINUE
        LK=0
        CHECK FOR SPECTRAL PECULIARITIES
        IVALU(31)=IBLNK
        CALL SSPEC(IBUF(17),LCHAR,M)
        IF(M.LE.0) GO TO 310
        LK=LK+1
        IVALU(31)=IPLUS
        CHECK FOR PHOT PECUL.
310  CONTINUE
        CALL PHOT(IBUF(17),LCHAR,M)
        IF(M.LE.0) GO TO 320
        LK=LK+1
        IVALU(31)=ISLASH
        CHECK FOR COMMENT

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        DDIN 85
        DDIN 86
        DDIN 87
        DDIN 88
        DDIN 89
        DDIN 90
        DDIN 91
        DDIN 92
        DDIN 93
        DDIN 94
        DDIN 95
        DDIN 96
        DDIN 97
        DDIN 98
        DDIN 99
        DDIN100
        DDIN101
        DDIN102
        DDIN103
        DDIN104
        DDIN105
        DDIN106
        DDIN107
        DDIN108
        DDIN109
        DDIN110
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        DDIN112
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        DDIN114
        DDIN115
        DDIN116
        DDIN117
        DDIN118
        DDIN119
        DDIN120
        DDIN121
        DDIN122
        DDIN123
        DDIN124
        DDIN125
        DDIN126
        DDIN127
        DDIN128
        DDIN129
        DDIN130
        DDIN131
        DDIN132
        DDIN133
        DDIN134
        LRK02 5
        LRK02 6
        LRK02 7
        LRK02 8
        LRK02 9
        LRK02 10
        LRK02 11
        LRK02 12
        LRK02 13
        LRK02 14
        LRK02 15
        LRK02 16
        LRK02 17
        LRK02 18

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320 CONTINUE
DO 325 I=114,133
IF(IBUF(I).EQ.0) GO TO 325
LK=LK+1
IVALU(31)=IDOL
GO TO 330
325 CONTINUE

CHECK FOR MORE THAN ONE OF THE ABOVE
330 CONTINUE
IF(LK.GT.1) IVALU(31)=IAST

PROCESS U MAGNITUDES
CALL CMAG(IBUF,NU)
DO 200 J=32,38,2
N=(J-30)/2
L=N*3+131
STORE(J)=IBUF(L)
STORE(J)=STORE(J)/100.
IF(NU(N).LE.-0) STORE(J)=-9.00
STORE(J+1)=IBUF(L+2)
STORE(J+1)=STORE(J+1)/100.
IF(NU(N).LE.1) STORE(J+1)=-.9
200 CONTINUE

NOW OUTPUT THE RESULTS
WRITE(LUN,1) STORE(1),STORE(2),SIGN2,(STORE(I),I=3,7),SIGN1,
1(STORE(1),I=8,39),BLNK
1 FORMAT(4X,16,1X,2A1,12,1X,15,1X,3(12,1X),A1,F2.0,1X,
1F4.1,2X,3(6A1,1X),4A1,1X,4(F5.2,1X,F4.2,1X),9X,A1)
NLIN=1
RETURN
END

SUBROUTINE EVLIN(LUN,IBUF,IFLAG,NLIN)
THIS ROUTINE GENERATES THE EVN PAGE OUTPUT FOR 1 STAR
DIMENSION IBUF(2500),IFLAG(9),STORE(120),IVALU(120),NONS(4),NU(4)
LUN IS THE LOGICAL UNIT ON WHICH 1 OR MORE 120 CHARACTER LINES
ARE WRITTEN.

IBUF IS THE STANDARD ARRAY OF UNPACKED CATALOGUE ITEMS
IFLAG IS THE STANDARD OPTIONS ARRAY
NLIN IS THE NUMBER OF LINES GENERATED IN THIS CALL

THE EVEN PAGES ARE STRUCTURED AS FOLLOWS

COL      ITEM
1        BLANK
2-3      STAR NUMBER FOR THIS PAGE
4        BLANK
5-8      NGC-IC OR AHNON*
9        BLANK
10-11    RA HRS (USERS EPOCH)
12       BLANK
13-14    RA MINS
15       BLANK
16-17    RA SECS
18       BLANK
19-21    DEC DEGREES
22       BLANK
23-26    DEC MINUTES
27       BLANK
28-31    WT1
32-35    WT2

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LRK02 19
LRK02 20
LRK02 21
LRK02 22
LRK02 23
LRK02 24
LRK02 25
LRK02 26
LRK02 27
LRK02 28
LRK02 29
LRK02 30
LRK02 31
ODLIN139
ODLIN140
ODLIN141
ODLIN142
ODLIN143
ODLIN144
ODLIN145
ODLIN146
ODLIN147
ODLIN148
ODLIN149
ODLIN150
ODLIN151
ODLIN152
ODLIN153
ODLIN154
ODLIN155
ODLIN156
ODLIN157
ODLIN158
EVLIN 2
EVLIN 3
EVLIN 4
EVLIN 5
EVLIN 6
EVLIN 7
EVLIN 8
EVLIN 9
EVLIN 10
EVLIN 11
EVLIN 12
EVLIN 13
EVLIN 14
EVLIN 15
EVLIN 16
EVLIN 17
EVLIN 18
EVLIN 19
EVLIN 20
EVLIN 21
EVLIN 22
EVLIN 23
EVLIN 24
EVLIN 25
EVLIN 26
EVLIN 27
EVLIN 28
EVLIN 29
EVLIN 30
EVLIN 31
EVLIN 32

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36-39	WT3	EVLIN 33	
40-43	WT4	EVLIN 34	C
44	BLANK	EVLIN 35	C
45-47	OBJ	EVLIN 36	C
48	BLANK	EVLIN 37	C
49-54	PHOT	EVLIN 38	C
55	BLANK	EVLIN 39	C
56-61	S-PEC	EVLIN 40	C
62	BLANK	EVLIN 41	C
63-82	COMMENT	EVLIN 42	C
83	BLANK	EVLIN 43	C
84-119	REFERENCES	EVLIN 44	C
120	BLANK	EVLIN 45	C
	COMMON/A/ STORE	EVLIN 46	C
	EQUIVALENCE(STORE(1),IVALU(1))	EVLIN 47	
	DATA IBLNK,NONS/1H,1HN,1HO,1HN,1H*/	EVLIN 48	
	TEST NGC-IC	EVLIN 49	
	DO 110 J=12,15	EVLIN 50	C
	IF(1BUF(J).NE. IBLNK) GO TO 115	EVLIN 51	
110	CONTINUE	EVLIN 52	
	CALL EQARY (NONS,IVALU,4)	EVLIN 53	
	IF(1BUF(11).EQ. 0) CALL CLEAR(IVALU,-4,1H)	EVLIN 54	
	GO TO 120	EVLIN 55	
115	CONTINUE	EVLIN 56	
	CALL EQARY(1BUF(12),IVALU(1),4)	EVLIN 57	
120	CONTINUE	EVLIN 58	
	COMPUTE DESIRED POSITION	EVLIN 59	
	IF(IFLAG(3)-1) 130,140,150	EVLIN 60	C
130	CONTINUE	EVLIN 61	
	EPOCH IS 2000- GET EXISTING WORDS	EVLIN 62	
	CALL RAHMS(:BUF(4),IVALU(5))	EVLIN 63	C
	CALL DECDM(1BUF(5),IVALU(8),SIGN1)	EVLIN 64	
	GO TO 200	EVLIN 65	
140	CONTINUE	EVLIN 66	
	GALACTIC COORDINATES	EVLIN 67	
	CONVERT 1950 POSITION TO RADIAN	EVLIN 68	C
	STORE(100)=1BUF(2)	EVLIN 69	C
	STORE(100)=(STORE(100)*3.14159)/(180.*240.)	EVLIN 70	
	STORE(101)=1BUF(3)	EVLIN 71	
	STORE(101)=(STORE(101)*3.14159)/(180.* 600.)	EVLIN 72	
	CALL GALAC(STORE(100),STORE(101),STORE(6),STORE(5))	EVLIN 73	
	STORE(5)=STORE(5)*180./3.14159	EVLIN 74	
	STORE(6)=STORE(6)*180./3.14159	EVLIN 75	
	GO TO 200	EVLIN 76	
150	CONTINUE	EVLIN 77	
	PRECESS TO USERS EPOCH	EVLIN 78	
	STORE(100)=1BUF(2)	EVLIN 79	C
	STORE(100)=(STORE(100)*3.14159)/(180.*240.)	EVLIN 80	
	STORE(101)=1BUF(3)	EVLIN 81	
	STORE(101)=(STORE(101)*3.14159)/(180.*600.)	EVLIN 82	
	CALL SETPRC(IFLAG(3),STORE(100))	EVLIN 83	
	CONVERT BACK TO SECONDS OF TIME AND MINUTES OF ARC	EVLIN 84	
	IVALU(100)=((STORE(100)*180.*240.)/3.14159)+.5	EVLIN 85	C
	STORE(101)=(STORE(101)*180.*600.)/3.14159	EVLIN 86	
	STORE(102)=.5	EVLIN 87	
	IF(STORE(101).LT. 0.) STORE(102)=-.5	EVLIN 88	
	IVALU(101)=STORE(101)*STORE(102)	EVLIN 89	
	NOW CONVERT TO HMS AND DM	EVLIN 90	
	CALL RAHMS(IVALU(100),IVALU(5))	EVLIN 91	C
	CALL DECDM(IVALU(101),IVALU(8),SIGN1)	EVLIN 92	
200	CONTINUE	EVLIN 93	
	PROCESS WEIGHTS	EVLIN 94	
	CALL CMAG(1BUF,NU)	EVLIN 95	C
		EVLIN 96	

```

DD 300 J=10,13
N=J-9
L=N*3+132
STORE(J)=IBUF(L)
STORE(J)=STORE(J)/100.
IF(NU(N) .LE. 0) STORE(J)=-.9
CONTINUE
GET THE CHARACTERS FOR THE FIRST LINE OF OBJ,PHOT. AND S-PEC
CALL CLEAR(IVALU(14),-3,1H )
CALL OBJ(1BUF(17),IVALU(14),NO)
CALL CLEAR(IVALU(17),-6,1H )
CALL PHOT(1BUF(17),IVALU(17),NP)
CALL CLEAR(IVALU(23),-6,1H )
CALL SSPEC(1BUF(17),IVALU(23),NS)
PROCESS COMMENT
CALL EQARY(1BUF(114),IVALU(29),20)
PROCESS REFERENCES
CALL EQARY(1BUF(54),IVALU(49),30)
WRITE FIRST LINE
IF(IFLAG(3) .NE. 1) GO TO 350
WRITE(LUN,1) (STORE(I),I=1,6),(STORE(I),I=10,78),IBLNK
1 FORMAT(4X,6A1,2X,F7.3,1X,F7.3,2X,4F4.1,1X,3A1,1X,6A1,1X,
16A1,1X,20A1,1X,10(3A1,1X),A1)
GO TO 400
350 CONTINUE
WRITE(LUN,2) (STORE(I),I=1,7),SIGN1.(STORE(I),I= 8,78),IBLNK
2 FORMAT(4X,6A1,1X,3(12,1X),A1,F2.0,F5.1,1X,4F4.1,1X,3A1,1X,
16A1,1X,6A1,1X,20A1,1X,10(3A1,1X),A1)
400 CONTINUE
REST OF ROUTINE PROCESSES OVERFLOW LINES
IO=3
IP=5
IS=6
IR=10
NIN=1
410 CONTINUE
DO %E NEED ANOTHER LINE
K=MIND(IP*3+56,113)
IF((MAXD(INO-IO,NP-IP,NS-IS) .LE. 0).AND.((IR .GE. 20) .OR.
1(1BUF(K) .EQ. IBLNK))) RETURN
YES
CALL CLEAR(IVALU,-42,1H )
CALL OBJ(1BUF(17),STORE(80),NO)
IF((INO-IO) .GT. 0) CALL EQARY(STORE(IO+80),IVALU(1),
1MINO(3,NO-IO))
IO=IO+3
CALL PHOT(1BUF(17),STORE(80),NP)
IF((NP-IP) .GT. 0) CALL EQARY(STORE(IP+80),IVALU(4),MIND(6,NP-IP))
IP=IP+6
CALL SSPEC(1BUF(17),STORE(80),NS)
IF((NS-IS) .GT. 0) CALL EQARY(STORE(IS+80),IVALU(10),MIND(6,NS-IS))
IS=IS+6
K=IR*3+56
IF(K .GT. 113) GO TO 420
IF(1BUF(K) .EQ. IBLNK) GO TO 420
CALL EQARY(1BUF(K-2),IVALU(16),MIND((20-IR)*3,30))
IR=IR+10
420 WRITE(LUN,3) (STORE(I),I=1,45),IBLNK
3 FORMAT(4X,3A1,1X,2(6A1,1X),21X,10(3A1,1X),A1)
NLIN=NLIN+1
GO TO 410
END
SUBROUTINE OBJ(IPEC,ICHAR,NCHAR)
THIS ROUTINE EXAMINES THE PECULIARITIES AND GENERATES A CHARACTER OBJ

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EVLIN 97
EVLIN 98
EVLIN 99
EVLIN100
EVLIN101
EVLIN102
EVLIN103
EVLIN104
EVLIN105
EVLIN106
EVLIN107
EVLIN108
EVLIN109
EVLIN110
EVLIN111
EVLIN112
EVLIN113
REF10 23
EVLIN115
EVLIN116
REF10 24
EVLIN118
REF10 25
EVLIN120
EVLIN121
REF10 26
EVLIN123
REF10 27
EVLIN125
EVLIN126
EVLIN127
EVLIN128
EVLIN129
REF10 28
EVLIN131
EVLIN132
EVLIN133
EVLIN134
EVLIN135
EVLIN136
EVLIN137
EVLIN138
EVLIN139
EVLIN140
EVLIN141
EVLIN142
EVLIN143
EVLIN144
EVLIN145
EVLIN146
EVLIN147
EVLIN148
EVLIN149
EVLIN150
EVLIN151
REF10 29
REF10 30
REF10 31
REF10 32
EVLIN156
EVLIN157
EVLIN158
OBJ 2

```

C

C

C

C

C

C

C

C

STRING FOR THE OBJ	COLUMNS OF THE TELESCOPE CATALOGUE PRINTOUT	OBJ	4	
IPEC IS AN ARRAY OF PECULIARITIES		OBJ	5	
ICHAR IS THE OUTPUT CHARACTER STRING		OBJ	6	
NCHAR IS THE NUMBER OF ELEMENTS OF ICHAR USED		OBJ	7	
		OBJ	8	
		OBJ	9	
CALL FIX(1,IPEC,ICHAR,NCHAR)		OBJ	10	
RETURN		OBJ	11	
END		OBJ	12	
SUBROUTINE FIX(K,IPEC,ICHAR,NCHAR)		FIX	2	
ACTUAL CONSTRUCTION OF CHARACTER STRINGS FOR OBJ,PHOT. AND SSPEC		FIX	3	
DIMENSION IPEC(20),ICHAR(20),ICONS(331)		FIX	4	
COMMON/B/ ICONS		FIX	5	
DATA IBLNK/1H /		FIX	6	
DATA IAST/1H/		FIX	7	
NCHAR=0		FIX	8	
NPEC=ICONS(K)		FIX	9	
IP=1+K		FIX	10	
DO 200 J=1,NPEC		FIX	11	
KPEC=ICONS(IP)		FIX	12	
IP=IP+1		FIX	13	
NPOS=ICONS(IP)		FIX	14	
DO 150 L=1,NPOS		FIX	15	
KP=IP+L*3-2		FIX	16	
IF(IPEC(KPEC).NE. ICONS(KP)) GO TO 150		FIX	17	
ICHAR(NCHAR+1)=ICONS(KP+1)		FIX	18	
ICHAR(NCHAR+2)=ICONS(KP+2)		FIX	19	
GO TO 160		FIX	20	
150 CONTINUE		FIX	21	
ICHAR(NCHAR+1)=IAST		FIX	22	
ICHAR(NCHAR+2)=IBLNK		FIX	23	
160 CONTINUE		FIX	24	
IP=IP+NPOS*3+1		FIX	25	
I=0		FIX	26	
DO 170 L=1,2		FIX	27	
M=NCHAR+L		FIX	28	
IF(ICHAR(M).EQ. IBLNK) GO TO 170		FIX	29	
I=I+1		FIX	30	
170 CONTINUE		FIX	31	
NCHAR=NCHAR+I		FIX	32	
200 CONTINUE		FIX	33	
RETURN		FIX	34	
END		FIX	35	
BLOCK DATA		BLKDATA2		
DIMENSION ICONS(331)		BLKDATA3		
COMMON/B/ ICONS		BLKDATA4		
DIMENSION LCONS(63),JCONS(153),KCONS(115)		BLKDATA5		
EQUIVALENCE(LCONS(1),ICONS(1)),(JCONS(1),ICONS(64)),		BLKDATA6		
1(KCONS(1),ICONS(217))		BLKDATA7		
DATA LCONS(4),10,5,3*1H ,1HE,1HD,1H ,1HR,1HN,1H ,2*1HP,1H ,2*1HO,		BLKDATA8		
11H ,11,4,3*1H ,1HA,2*1H ,2*1HC,1H ,2*1HG,1H ,12,7,3*1H ,2*1HE,1H ,		BLKDATA9		
22*1HB,1H ,2*1HI,1H ,2*1HS,1H ,1HP,1HX,1H ,2*1HQ,1H ,18,2,3*1H ,		BLKDATA10		
32*1HR,1H /		BLKDATA11		
DATA JCONS(7),		BLKDATA12		
A 7,4,3*1H ,2*1HU,1H ,2*1HX,1H ,2*1HZ,1H ,8,2,3*1H ,		BLKDATA13		
12*1HS,1H ,9,6,1HV,1HD,1H ,1HS,2*1H ,1HE,1H2,1H ,1HC,2*1H ,2*1HM,		BLKDATA14		
24*1H ,11,4,3*1H ,2*1HA,1H ,1HC,2*1H ,1HG,2*1H ,13,26,3*1H ,		BLKDATA15		
31HA,1HS,1H ,1HD,1HS,1H ,1HC,1HI,1HO,1HD,1H7,1H ,1HE,1H8,1H ,1HF,		BLKDATA16		
42*1HI,1HG,1H2,1H ,1HI,1HI,1H1,1H2,1HJ,1H1,1H ,1HH,1HO,1H ,1HK,1H1,1H3,		BLKDATA17		
51HL,1HI,1HA,1HM,1HI,1HS,1HN,1HI,1HG,1HP,1HS,1H ,1HO,1HI,1H7,1HR,		BLKDATA18		
61HI,1H8,1HS,1HI,1H9,1HI,1H2,1HO,1HU,1H2,1HI,1HV,2*1H2,1HW,1H2,1H3,		BLKDATA19		
71HX,1H3,1H ,1HY,1HA,1H ,1HZ,1H2,1HA,14,2,3*1H ,2*1HP,1H ,19,2,		BLKDATA20		
83*1H ,2*1HI,1H /		BLKDATA21		
DATA KCONS(12),		BLKDATA22		

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A      1,2,3*1H ,2*1HP,1H ,2,2,3*1H ,2*1HE,1H ,3,4,3*1H ,1HBBLKDAT23
B.                                           BLKDAT24
11HW,1H ,2*1HN,1H ,2*1HS,1H ,4,2,3*1H ,2*1HA,1H ,5,2,3*1H ,2*1HM. BLKDAT25
21H ,6,2,1HS,1HY,4*1H ,9,6,3*1H ,1HS,1HB,1H ,2*1HC,1H ,1HV,2*1H . BLKDAT26
31HE,2*1H ,1HM,2*1H ,15,2,3*1H ,1HC,1HH,1H ,16,2,3*1H ,1HS,1HD,1H ,BLKDAT27
417,2,3*1H ,1HA,1HA,1H ,20,2,3*1H ,2*1HR,1H ,21,2,3*1H ,1HM,1HG. BLKDAT28
51H /                                           BLKDAT29
END                                           BLKDAT30
SUBROUTINE PHOT(IPEC,ICHAR,NCHAR)           PHOT 2
THIS ROUTINE EXAMINES THE PECULIARITIES AND GENERATES A CHARACTER PHOT 3
STRING FOR THE PHOT COLUMNS OF THE CELESCOPE CATALOGUE PRINTOUT PHOT 4
IPEC IS AN ARRAY OF PECULIARITIES           PHOT 5
ICHAR IS THE OUTPUT CHARACTER STRING         PHOT 6
NCHAR IS THE NUMBER OF ELEMENTS OF ICHAR USED PHOT 7
                                           PHOT 8
                                           PHOT 9
                                           PHOT 10
DIMENSION IPEC(21)                          PHOT 11
DATA IG,IE,1HG,1HE/                        PHOT 12
DATA IBLNK/1H /                             PHOT 13
ISIG=0                                       PHOT 14
WE CORRECT THE CASE OF DOUBLE ENTRY OF ECLIPSING BINARY PHOT 15
IF((IPEC(9) .NE. IE).OR.(IPEC(13).NE. IG)) GO TO 110 PHOT 16
IPEC(9)=IBLNK                               PHOT 17
ISIG=1                                       PHOT 18
110 CONTINUE                                PHOT 19
CALL FIX(64,IPEC,ICHAR,NCHAR)              PHOT 20
IF(ISIG .NE. 0) IPEC(9)=IE                 PHOT 21
RETURN                                      PHOT 22
END                                           SSPEC 2
SUBROUTINE SSPEC(IPEC,ICHAR,NCHAR)          SSPEC 3
THIS ROUTINE EXAMINES THE PECULIARITIES AND GENERATES A CHARACTER SSPEC 4
STRING FOR THE SSPEC COLUMNS OF THE CELESCOPE CATALOGUE PRINTOUT SSPEC 5
IPEC IS AN ARRAY OF PECULIARITIES          SSPEC 6
ICHAR IS THE OUTPUT CHARACTER STRING        SSPEC 7
NCHAR IS THE NUMBER OF ELEMENTS OF ICHAR USED SSPEC 8
                                           SSPEC 9
                                           SSPEC 10
CALL FIX(1217,IPEC,ICHAR,NCHAR)           SSPEC 11
RETURN                                      SSPEC 12
END                                           CLEAR 2
SUBROUTINE CLEAR(IARAY,NCL,ISET)            CLEAR 3
DIMENSION IARAY(1)                         CLEAR 4
IF NCL .GT. 0, SET NCL LOCATIONS STARTING AT IARAY TO 0 CLEAR 5
IF NCL .EQ. 0, DO NOTHING                  CLEAR 6
IF NCL .LT. 0, SET /NCL/ LOCATIONS STARTING AT IARAY TO ISET CLEAR 7
NNCL=IABS(NCL)                             CLEAR 8
ICL=0                                       CLEAR 9
IF(NCL) 30,20,10                           CLEAR 10
10 CONTINUE                                CLEAR 11
DO 15 J=1,NNCL                             CLEAR 12
IARAY(J)=ICL                               CLEAR 13
15 CONTINUE                                CLEAR 14
20 CONTINUE                                CLEAR 15
RETURN                                      CLEAR 16
30 CONTINUE                                CLEAR 17
ICL=ISET                                    CLEAR 18
GO TO 10                                    CLEAR 19
END                                           SKIP 2
SUBROUTINE SKIP(LUN,KOUNT)                  SKIP 3
SKIPS KOUNT CODED LINES ON LOGICAL UNIT LUN SKIP 4
DO 10 J=1,KOUNT                            SKIP 5
READ(LUN,1) DUMMY                          SKIP 6
10 CONTINUE                                SKIP 7
RETURN

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ISKIP=0
ISTORE=1
300 IDONE=IDONE+NUPK+1
    NOW JUMP BACK
    CALL INST(0400B,30,1,RETURN,0,NW,IProg)
    IF(NW.GT. NPROG) GO TO 900
    CALL FINST
    NUSE=NW
    RETURN
900 PRINT 2,NPROG
2 FORMAT(*1 MESSAGE FROM PCK OVERFLOW WITH ASSIGNED PROGRAM AREA OF
1 *,1X,14)
1000 CALL ABTRACE(10LPCK ERRORS )
    END
    SUBROUTINE INST(ICODE,LENG,IADD,IUP,NWD,IBLOCK)
    ROUTINE PACKS 6400 INSTRUCTIONS INTO IBLOCK, KEEPING ITS OWN
    WORD AND BIT COUNTS.
    LENG IS THE INSTRUCTION LENGTH IN BITS, EITHER 15 OR 30.
    ICODE IS EITHER A 15 BIT INSTRUCTION OR THE FIRST 12 BITS OF A
    30 BIT INSTRUCTION-RIGHT JUSTIFIED.
    IADD IS THE RIGHT-JUSTIFIED ADDRESS FIELD
    IF IUP= C, THE INSTRUCTION WILL BE FORCED UPPER.
    NWD IS RETURNED GIVING THE WORD POSITION IN IBLOCK OF THE LATEST
    INSTRUCTION

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    DIMENSION IBLOCK(1)
    DATA IWD,IBT/1,0/
    WRITE NO-OPS FOR FORCE UPPER REQUEST OR NON-FITTING INSTRUCTION
    IF((IUP.NE. C).AND.((LENG+IBT).GT. 60)) 50,100
    FORCE UPPER REQUEST MEANINGLESS IF WE ARE ALREADY THERE
50 IF( (IBT.EQ.0) GO TO 100
    CALL STRING(NOPP,1,IBLOCK(IWD),IBT+1,60-IBT)
    DATA NOPP/4600046000460004600046000B/
    IWD=IWD+1
    IBT=0
100 NWD=IWD
    IF(LENG.EQ.15) 200,300
200 CALL STRING(ICODE,46,IBLOCK(IWD),IBT+1,15)
    IBT=IBT+15
210 IF( (IBT.LT.60) RETURN
    IWD=IWD+1
    IBT=0
    RETURN
300 CALL STRING(ILSHFT(ICODE,18)+0,IADD,31,IBLOCK(IWD),IBT+1,30)
    IBT=IBT+30
    GO TO 210
    ENTRY FINST
    RESET POINTERS FOR CLOSE
    IWD=1
    IBT=0
    RETURN
    END

    IDENT BADGER
    SUBROUTINE BADGER(ICONT,IADD)
    WRITES ICONT ONTO CELL WHOSE ADDRESS IS IN IADD

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    ENTRY BADGER
    VFD 4277LBADGER ,18/2
    DATA 0
    BADGER SAI 81+0

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RUBY 376
RUBY 377
RUBY 378
RUBY 379
RUBY 380
RUBY 381
RUBY 382
RUBY 383
RUBY 384
RUBY 385
RUBY 386
RUBY 387
RUBY 388
RUBY 389
RUBY 390
RUBY 391
RUBY 392
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RUBY 424
RUBY 425
RUBY 426
RUBY 427
RUBY 428
RUBY 429
RUBY 430
RUBY 431
RUBY 432
RUBY 433
RUBY 434
RUBY 435
RUBY 436
RUBY 437
RUBY 438
RUBY 439

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DIMENSION NODD(5), NEVEN(5)
DATA 1STAR, NTRY, NODD, NEVEN/12*0/
DATA LIMIT, NLN, B1, B2/S4, 100, 2*1H / , MZ/1H0/
DATA MN, NIN/1H-1H9/
DATA 1PAGE/0/
DATA 1SIG/0/
IF(IFLAG(5) .NE. 0) GO TO 210
NTRY=NTRY+1
NOTE THAT THE ODD PAGE ALWAYS HAS 1 LINE PER STAR
NODD(NTRY)=1
DO WE WANT AN ODD ENTRY
IF(IFLAG(4) .EQ. 2) GO TO 120
YES- WRITE IT ON SCRATCH
CALL UDLIN(10(5), IBUF, IFLAG, NODD(NTRY))
120 CONTINUE
DO WE WANT AN EVEN ENTRY
IF(IFLAG(4) .EQ. 3) GO TO 140
CALL EVLIN(10(5), IBUF, IFLAG, NEVEN(NTRY))
GO TO 200
140 CONTINUE
ALTHOUGH NO EVEN ENTRY IS GENERATED, WE MUST KNOW ITS LENGTH
CHECK ON PHOT OVERFLOW
CALL PHOT(IBUF(17), L, LINE, NCOL)
NP=(NCOL-1)/6+1
CHECK ON OBJ OVERFLOW
CALL OBJ(IBUF(17), L, LINE, NCOL)
ND=(NCOL-1)/3+1
CHECK ON SPEC OVERFLOW
CALL SSPEC(IBUF(17), L, LINE, NCOL)
NS=(NCOL-1)/6+1
CHECK ON REFERENCES OVERFLOW
DO 160 J=53, 110, 3
DO 150 K=1, 3
L=K+J
IF(IBUF(L) .NE. B1) GO TO 160
150 CONTINUE
NCOL=((J-53)/3)+4
GO TO 170
160 CONTINUE
NCOL=80
170 CONTINUE
NR=(NCOL-1)/36 +1
NEVEN(NTRY)=MAX0(NR, NP, NS, ND, 1)
200 CONTINUE
HAVE WE ACCUMULATED 5 STARS ON THE SCRATCH FILE
IF(NTRY .LT. 5) RETURN
210 CONTINUE
COMPUTE TOTAL LINES TO BE PRINTED FOR THIS GROUP
NEWL=0
IF(NTRY .EQ. 0) GO TO 400
DO 220 J=1, NTRY
NEWL=NEWL+MAX0(NODD(J), NEVEN(J))
220 CONTINUE
DOES THIS GROUP FIT ON THE CURRENT PAGE
IF((NEWL+NLN) .LE. LIMIT) GO TO 300
NO, TERMINATE PRESENT PAGE(5)

IF(NLN .EQ. 100) GO TO 250
ALTERNATING PAGES REQUIRE SPECIAL HANDLING
IF(IFLAG(4) .NE. 1) GO TO 250
230 CONTINUE
LUN=10(4)
LUNA=10(2)
REWIND LUN

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CELPRI148
CELPRI149

CELPRI151
DEBUG 2
ROACH 1
CELPRI152
CELPRI153
CELPRI154
CELPRI155
CELPRI155
CELPRI157
CELPRI158
CELPRI159
CELPRI160
CELPRI161
CELPRI162
CELPRI163
CELPRI164
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CELPRI166
CELPRI167
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CELPRI187
CELPRI188
CELPRI189
CELPRI190
CELPRI191
CELPRI192
CELPRI193
CELPRI194
ROACH 2
CELPRI196
CELPRI197
CELPRI198
CELPRI199
CELPRI200
CELPRI201
CELPRI202
CELPRI203
CELPRI204
CELPRI205
ROACH 3
CELPRI206
CELPRI207
CELPRI208

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REFERENCES

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BLANK

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COMMON/4/ STORE
EQUIVALENCE(STORE(1),IVALU(1))
DATA IBLNK,NONS/1H,1HN,1HD,1HN,1H*/
TEST NGC-1C
DO 110 J=12,15
IF(IBUF(J) .NE. IBLNK) GO TO 115
110 CONTINUE
CALL EGARY (NONS,IVALU,4)
IF(IBUF(11) .EQ. 0) CALL CLEAR(IVALU,-4,1H)
GO TO 120
115 CONTINUE
CALL EGARY(IBUF(12),IVALU(1),4)
120 CONTINUE
COMPUTE DESIRED POSITION
IF(IFLAG(3)-1) 130,140,150
130 CONTINUE
EPOCH IS 2000- GET EXISTING WORDS
CALL RAHMS(IBUF(4),IVALU(5))
CALL DECDM(IBUF(5),IVALU(3),SIGN1)
GO TO 200
140 CONTINUE
GALACTIC COORDINATES
CONVERT 1950 POSITION TO RADIAN
STORE(100)=IBUF(2)
STORE(100)=(STORE(100)*3.14159)/(180.*240.)
STORE(101)=IBUF(3)
STORE(101)=(STORE(101)*3.14159)/(180.*600.)
CALL GALAC(STORE(100),STORE(101),STORE(6),STORE(5))
STORE(5)=STORE(5)*180./3.14159
STORE(10)=STORE(10)*180./3.14159
GO TO 200
150 CONTINUE
PROCESS TO USERS EPOCH
STORE(100)=IBUF(2)
STORE(100)=(STORE(100)*3.14159)/(180.*240.)
STORE(101)=IBUF(3)
STORE(101)=(STORE(101)*3.14159)/(180.*600.)
CALL SETPRC(IFLAG(3),STORE(100))
CONVERT BACK TO SECONDS OF TIME AND MINUTES OF ARC
IVALU(100)=((STORE(100)*180.*240.)/3.14159)+.5
STORE(101)=(STORE(101)*180.*600.)/3.14159
STORE(102)=.5
IF(STORE(101) .LT. 0.) STORE(102)=-.5
IVALU(101)=STORE(101)+STORE(102)
NOW CONVERT TO HMS AND PM
CALL RAHMS(IVALU(100),IVALU(5))
CALL DECDM(IVALU(101),IVALU(3),SIGN1)
200 CONTINUE
PROCESS WEIGHTS
CALL CMAG(IBUF,NU)
DO 300 J=10,13
NEJ=.9
LEPM=.132
STORE(J)=IBUF(L)
STORE(J)=STORE(J)/100.
IF(NU(N) .LE. 0) STORE(J)=-.9
300 CONTINUE
GET THE CHARACTERS FOR THE FIRST LINE OF OBJ.PHOT, AND S-PEC
CALL CLEAR(IVALU(14),-3,1H)
CALL OBJ(17),IVALU(15),ND1
CALL CLEAR(IVALU(17),-5,1H)

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CELPR544

C

CELPR545

C

CELPR546

CELPR547

CELPR548

CELPR549

C

CELPR550

CELPR551

CELPR552

CELPR553

CELPR554

CELPR555

CELPR556

CELPR557

CELPR558

CELPR559

C

CELPR560

CELPR561

C

CELPR562

CELPR563

CELPR564

CELPR565

CELPR566

C

CELPR567

C

CELPR568

CELPR569

CELPR570

CELPR571

DEBUG 11

CELPR573

CELPR574

CELPR575

CELPR576

CELPR577

C

CELPR578

CELPR579

CELPR580

CELPR581

CELPR582

CELPR583

C

CELPR584

CELPR585

CELPR586

CELPR587

CELPR588

CELPR589

C

CELPR590

CELPR591

CELPR592

CELPR593

C

CELPR594

CELPR595

CELPR596

CELPR597

CELPR598

CELPR599

CELPR600

CELPR601

CELPR602

C

CELPR603

CELPR604

CELPR605

PIA		PUT S1 IN AC
XEC	1,5	ADJUST BIT INDEX
TGT TXH	*+3,2,-37	DID IT PASS 7054 WORD BOUNDARY
TXI	*+1,2,35	IF SO, SUBTRACT 7094 WORD LENGTH
TXI	*-2,1,-1	AND USE NEXT WORD, THEN TEST AGAIN
TRA	1,6	RETURN
SPACE	3	

ROUTINE TO SET SIGN, STORE RESULT, ADJUST INDEX, AND RETURN

STORE	LFT	400000	IS IT MINUS
SSM			IF SO, SET AC MINUS
STO	0,3		STORE RESULT
TXI	*+1,3,-1		ADJUST INDEX
TRA	3,5		
SPACE	3		

ROUTINE TO GET AND STORE BITS

BIT	TSX	*LOAD,6	GET ARGUMENT
	XEC	2,5	SHIFT LOW BIT TO MQ BIT 35
	STO	0,3	STORE RESULT
	TXI	*+1,3,-1	ADJUST INDEX
	TRA	3,5	RETURN
EJECT			

ROUTINE FOR IBM 360 INTEGERS

136IN	TSX	*LOAD,6	GET ARGUMENT
	LFT	400000	IS IT MINUS
	CUM		IF SO, COMPLEMENT BITS
	XEC	2,5	SHIFT UNIT BIT TO 35
	LNT	400000	IS IT PLUS
	TRA	*STORE+2	IF SO, FINISH
	ADD	=1	ELSE ADD ONE TO CORRECT TWO'S COMPLEMENT
	TRA	*STORE+1	FINISH
SPACE	3		

ROUTINE FOR CDC INTEGERS

CDCIN	TSX	*LOAD,6	GET ARGUMENT
	LFT	400000	IS IT MINUS
	TSX	*CDCNG,5	IF SO, COMPLEMENT
	XEC	2,5	SHIFT LAST 35 BITS TO MQ
	TNZ	*OVFLD	IF AC NOT ZERO, INTEGER OVERFLOW
	LGL	35	SHIFT LAST 35 BITS TO AC
	TRA	*STORE	FINISH
SPACE	3		

ROUTINE FOR IBM 360 REALS

136FL	TSX	*LOAD,6	GET ARGUMENT
	TZE	*STORE+2	IF ZERO, STORE
	ANA	2,5	MASK OUT SIGN & UNUSED BITS
	LGR	28	PUT MANTISSA IN MQ
	ALS	2	MAKE EXPONENT A POWER OF TWO
	SUB	=0000000000000000	SUBTRACT 360 BIAS
	TRA	*FLEND	FINISH
SPACE	3		

ROUTINE FOR CDC REALS

CDCFL	TSX	*LOAD,5	GET ARGUMENT
	LFT	400000	IS IT MINUS
	TSX	*CDCNG,5	IF SO, COMPLEMENT
	TZE	*STORE+2	IF ZERO, STORE
	LGR	24	PUT MANTISSA IN MQ
	LAS	=000000001777	IS EXPONENT NEG
	TRA	*+3	IF NOT
	TRA	*OVFLD	IF INDEFINITE
	ADD	=1	IF NEG
	SUB	2,5	SUBTRACT APPROPRIATE BIAS
	TRA	*FLEND	FINISH
SPACE	3		

ROUTINE TO FORM 7054 REAL

FLEND	LAS	=0000000000014	MIGHT THIS CHAR CAUSE UNDERFLOW
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GOTO200

PRINT WEIGHTS DIFFERENTLY

10 CONTINUE

IK=10

GOTO1003

1002 CONTINUE

IK=11

1003 CONTINUE

IF(NUMB(N),EQ,C) GOTO200

KK=IPT(N)*10

KL=KK+NUMB(N)*IK-1

WRITE(1PR,320)(LARR(J),J=KK,KL,IK)

320 FORMAT(3X,1716)

GOTO311

PRINT IC DIFFERENTLY

11 CONTINUE

IK=10

GOTO1103

1102 CONTINUE

IK=11

1103 CONTINUE

IF(NUMB(N),EQ,C) GOTO200

JL=0

NUMBER=NUMB(N)*IK

DO 325 J=1,NUMBER,IK

IP=IPT(N)

JL=JL+1

DO 324 JJ=1,8

IX=IP+JJ+J

IARR(JJ,JL)=LARR(IX)

324 CONTINUE

325 CONTINUE

WRITE(1PR,330)((IARR(JJ,J),JJ=1,8),J=1,JL)

330 FORMAT(3X,A1,14,4A1,12,13)

GOTO311

PRINT ETAS DIFFERENTLY

12 CONTINUE

IK=11

NN=11

GOTO9011

NUMBER OF U(1)

13 CONTINUE

IF(LL.LT,74) GOTO1000

IX=IPT(N)

WRITE(1PR,335)LARR(IX)

335 FORMAT(1X,13)

GOTO311

CHECK LENGTH OF LINE

20 CONTINUE

IF(LL.LE,1) XPAS(INUM)=FLOAT(IPAS(INUM))/100.

200 CONTINUE

FINISHED SETTING UP FORMAT FOR LINE

```
IF(INUM.LE.0)RETURN
IVAR(I+1)=IPAR
WRITE(IPR,IVAR)(IPAS(J),J=1,INUM)
RETURN
END
```

DATA
DOUBLE
ND

29-30 RA SECONDS
31-32 BLANK
33-36 DEC. DEGREES
37 BLANK
38-41 DEC. MINUTES
42-43 BLANK
44-46 M1

CELPR 56

\$
D
E
C
C
C
C
C