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NRL Report 7930

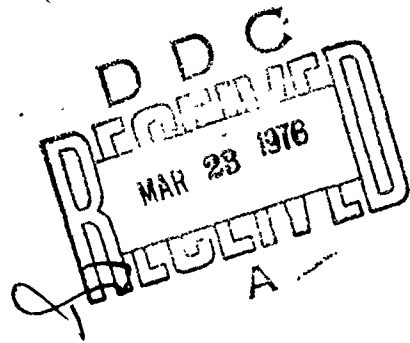
FB.

A Program to Plot an Annotated Track or a Track and Bathymetry or Magnetic Profile on a Mercator Projection

MARILYN L. BLODGETT AND JAMES V. MASSINGILL

*Propagation Branch
Acoustics Division*

February 27, 1976



NAVAL RESEARCH LABORATORY
Washington, D.C.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM	
14	1. REPORT NUMBER NRL 7938	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
6	4. TITLE (and Subtitle) A PROGRAM TO PLOT AN ANNOTATED TRACK OR A TRACK AND BATHYMETRY OR MAGNETIC PROFILE ON A MERCATOR PROJECTION	5	5. TYPE OF REPORT & DATES COVERED Final report on one phase of a continuing NRL problem.
10	7. AUTHOR(s) Marilyn L. Blodgett James V. Massingill	6	6. PERFORMING ORG. REPORT NUMBER
		15	8. CONTRACT OR GRANT NUMBER(s) ARPA Order-1787
	9. PERFORMING ORGANIZATION NAME AND ADDRESS Naval Research Laboratory Washington, D.C. 20375	10	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS NRL Problem S01-47 Project ZF 52-552-001; 62759N Arpa Order 1787
	11. CONTROLLING OFFICE NAME AND ADDRESS Naval Material Command Via Arctic Submarine Command Naval Undersea Center San Diego, CA 92132	11	11. REPORT DATE 27 Feb 1976
16	12. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) NRL-S41-47, ZF52-552	12	12. NUMBER OF PAGES 41 p.
		13	13. SECURITY CLASS. (of this report) Unclassified
		15a	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
17	14. DISTRIBUTION STATEMENT (of this Report) ZF52-552-001 Approved for public release; distribution unlimited.		
	17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
	18. SUPPLEMENTARY NOTES		
	19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Oceanographic data Magnetic surveys Geophysics Navigation Profiles Mercator projection Bathymetry		
	20. ABSTRACT (Continue on reverse side if necessary and identify by block number) A program has been written for plotting an annotated track or for plotting a track and the superimposed bathymetry or magnetic profile on a Mercator projection. The program reads the data (navigation, bathymetry, or magnetics) from a magnetic tape in BCD form. The program will annotate every point or every nth point. Navigation is annotated with fix numbers, bathymetry will uncorrected fathoms, meters, or corrected meters, and magnetics with the residual magnetic intensity. - next page (Continued)		

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→ The profile series is plotted perpendicular to the track, using uncorrected fathoms or meters for bathymetry and residual magnetic intensity for magnetics.)

→ The program was written in Fortran IV for use on a CDC 3800 computer; however, the program can be converted to run on other systems with little difficulty.



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**A PROGRAM TO PLOT AN ANNOTATED TRACK
OR A TRACK AND BATHYMETRY
OR MAGNETIC PROFILE ON A
MERCATOR PROJECTION**

1.0 IDENTIFICATION

- 1.1 Title
A Program to Plot an Annotated Track or a Track and Bathymetry or Magnetic Profile on a Mercator Projection.
- 1.2 Identification Name
Mercator.
- 1.3 Classification Code
None.
- 1.4 RCC Identification Number
None.
- 1.5 Entry Points
MERCATOR.
- 1.6 Programming Language
Language: CDC 3600/3800 Fortran.
Routine Type: Program.
Operating System: Drum Scope 2.1.
- 1.7 Computer and Configuration
CDC 3800.
- 1.8 Contributor or Programmer
Marilyn L. Blodgett, Code 8176MB, Propagation Branch, written for the Environmental Sciences Section, Acoustics Division.
- 1.9 Contributing Organization
NRL — Naval Research Laboratory, Washington, D.C. 20375.
- 1.10 Program Availability
If supplied with a magnetic tape, the Environmental Sciences Section, Acoustics Division, will make a copy of this program.

Manuscript submitted September 3, 1975.

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1.11 Verification

This program has been used and tested by the Environmental Sciences Section, Acoustics Division, for several months.

1.12 Date

May 1976.

2.0 PURPOSE

2.1 Description of the Routine

This program reads the data collected by an oceanographic or geophysical experiment from a magnetic tape and plots an annotated track or plots the track and bathymetric or magnetic value perpendicular to the track as a profile. We use the format recommended by the National Research Council of the National Academy of Sciences with one slight modification for the input data tape. There is one logical record (of 80 characters) for each data point. The different types of data (navigation, bathymetry, and magnetics) are separated by an end-of-file mark with a double end-of-file mark at the end of all the data.

Before the program reads this input tape, it reads three cards. The first card specifies the minimum and maximum latitude and longitude in degrees and minutes. The second card specifies the kind of plot desired, the number of tick marks between the meridians and parallels, the spacing between the meridians and the parallels, the height of the map to be drawn, the dates of the data on the first input tape to be considered for plotting, the actual values to be plotted, and the units per inch for plotting the bathymetric or magnetic profiles along the track. The third card defines the actual data format on the input tape (the format varies for the three types of data).

With all the required parameters defined, the program starts to read the input tape one record at a time. Each record is checked to see that the fix falls on the defined grid and that it was taken on or between the two specified dates. Only those points which meet both requirements are plotted. The program continues reading the input tape until it reads an end-of-file mark or a fix taken after the last specified date. If there are additional input tapes, the program reads them in a similar manner. The beginning and end dates for each new input tape are required on an Extra card. A maximum of four input tapes can be used. When all the input tapes have been read, the program prepares to plot the track or annotated track and, if required, prepares to plot the profiling values for either bathymetry or magnetics.

The track is plotted on a Mercator projection which is drawn exactly to scale. The grid may be blown up to any reasonable size. Since the projection is drawn exactly to scale, a mosaic can later be built of the entire area.

2.1.1 Navigation Data

The program reads the date (month and day), time (hour and whole minutes), latitude, longitude, and fix number from the input tape according to the specified format. The southern latitudes and the western longitude are preceded by a negative sign. Normally, the track is plotted in a continuous line with every nth fix marked with a square symbol and annotated with the fix number.

2.1.2 Bathymetry Data

The program reads the date (month and day), time (hour and whole minutes), latitude, longitude, and uncorrected fathoms or corrected meters from the input tape according to the specified format. The southern latitudes and the western longitudes are preceded by a negative sign. The program can convert uncorrected fathoms to uncorrected meters. If an annotated track is desired, each fix is plotted with a small plus symbol and annotated with uncorrected fathoms, meters, or corrected meters. If a profile is desired, the track is plotted in a continuous straight line, and the profiling series is multiplied by -1 to drop it below the track.

2.1.3 Magnetic Data

The program reads the date (month and day), time (hour, and whole minutes), latitude, longitude, and residual magnetic intensity from the input tape according to the specified format. The southern latitudes and the western longitudes are preceded by a negative sign. If an annotated track is desired, each fix is plotted with a small plus symbol and annotated with the residual magnetic intensity. If a profile is desired, the track is plotted in a continuous straight line, and the profiling series is residual magnetic intensity.

2.2 Problem Background

This program allows the researcher to plot vast numbers of bathymetric and/or magnetic data on a Mercator chart. There are two ways of plotting the data: plot an annotated track (data value plotted according to geographical coordinates) or plot a profile of the data using the track as a reference point.

3.0 USAGE

3.1 Calling Sequence or Operation Procedure

Not applicable.

3.2 Arguments, Parameters, and/or Initial Conditions

Not applicable.

3.3 Space Required (Decimal and Octal)

3.3.1 Unique Storage:

7074 octal (3644 decimal) locations exclusive of system library functions.

3.3.2 Common Blocks:

/MAPSYS/, /INPT/, /RATCOM/, /CHTLBL/.

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3.3.3 Temporary Storage:

None.

3.4 Messages and Instructions to the Operator

None.

3.5 Error Return, Messages, and Codes

Insufficient information to complete plot.

3.6 Informative Messages to the User

None.

3.7 Input

The actual format of the data on the input tape, the kind of plot desired, and the map specifications are read in via input cards. The track and the actual data to be annotated or profiled is read in via magnetic tape on logical units 10 through 13. Appendix A presents samples of our data formats on the input tape. Appendix B is a complete description of the input deck setup.

3.8 Output

The program prints on the standard printer (logical unit 61) the data format, chart parameters, and the actual number of points plotted for the track and profile. It writes the plotting instructions on a magnetic tape (logical unit 40). Appendix C presents sample profiles.

3.9 Formats

Appendix B describes the program deck structure.

3.10 External Routines and Symbols

SKIPFILE, PLOT, SQRTF, SIN, LOGF, COSF, TANF, ATANF, ACOSF, NUMBER, SYMBOL, XMODF.

3.11 Timing

The time required depends on the size of the grid and the number of data read and plotted.

3.12 Accuracy

The grid is reproduced exactly to scale.

3.13 Cautions to Users

None.

3.14 Program Deck Structure

Appendix B describes the program deck structure.

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3.15 References — Literature

N. Maddage and S.J. Kozloski, Program Spachart, Naval Research Laboratory, Washington, D.C. M.L. Blodgett and J.V. Massingill, "A Program for Storing Oceanographic Data on Magnetic Tape," NRL Report 7861, March 1975.

4.0 **METHOD OF ALGORITHM**

Not applicable.

5.0 **FLOW CHART AND/OR SOURCE LANGUAGE LISTING**

The flow chart and listing are given in Appendixes D and E.

6.0 **COMPARISON**

No other known programs are available for comparison.

7.0 **TEST METHOD AND RESULTS**

The program has been used and tested successfully on a Calcomp Plotter.

8.0 **REMARKS**

None.

APPENDIX A
Sample Input Data Record

NAVIGATION RECORD

Cruise Number	Time Zone	Year	Month	Day	Hour	Minute	Latitude	Longitude	Fix Description	Fix Number
731402		07	08	22	11	30	22.8833	10.2850		2004
000000	000000	00	00	00	00	00	00000000	00000000	00000000	00000000
1111	1111	11	11	11	11	11	11111111	11111111	11111111	11111111
222222	222222	22	22	22	22	22	22222222	22222222	22222222	22222222
333	3333	33	33	33	33	33	33333333	33333333	33333333	33333333
444444	444444	44	44	44	44	44	44444444	44444444	44444444	44444444
555555	555555	55	55	55	55	55	55555555	55555555	55555555	55555555
666666	666666	66	66	66	66	66	66666666	66666666	66666666	66666666
77	7777	77	77	77	77	77	77777777	77777777	77777777	77777777
888	8888	88	88	88	88	88	88888888	88888888	88888888	88888888
999999	999999	99	99	99	99	99	99999999	99999999	99999999	99999999

^aImplies a decimal point.

BATHYMETRY RECORD

Cruise Number	Time Zone	Year	Month	Day	Hour	Minute	Latitude	Longitude	Uncorrected Fathoms	Corrected Meters	Matthews Zone
000000	00	00	00	00	00	00	00	00	00	00	00
111111	11	11	11	11	11	11	11	11	11	11	11
222222	22	22	22	22	22	22	22	22	22	22	22
333333	33	33	33	33	33	33	33	33	33	33	33
444444	44	44	44	44	44	44	44	44	44	44	44
555555	55	55	55	55	55	55	55	55	55	55	55
666666	66	66	66	66	66	66	66	66	66	66	66
777777	77	77	77	77	77	77	77	77	77	77	77
888888	88	88	88	88	88	88	88	88	88	88	88
999999	99	99	99	99	99	99	99	99	99	99	99

^aImplies a decimal point.

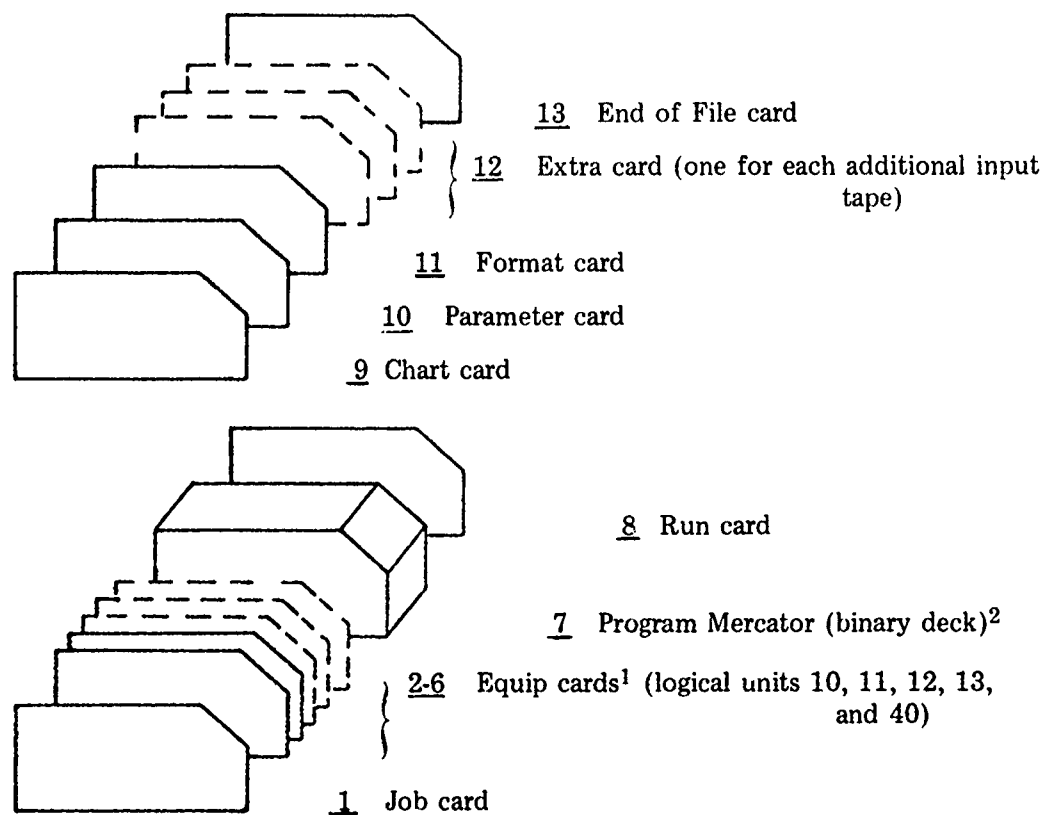
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MAGNETICS RECORD

Cruise Number	Time Zone	Year	Month	Day	Hour	Minute	Latitude	Longitude	Total Magnetic Field in Gammas	Residual Magnetic Intensity
106050	0600J	1960	00	00	00	00	22.2222	16.2467	52950	20
1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	1111
2222	22.22	2222	2222	2222	2222	2222	2222	2222	2222	2222
333	3333	3333	3333	3333	3333	3333	3333	3333	3333	3333
444	4444	4444	4444	4444	4444	4444	4444	4444	4444	4444
555	5555	5555	5555	5555	5555	5555	5555	5555	5555	5555
666	6666	6666	6666	6666	6666	6666	6666	6666	6666	6666
777	7777	7777	7777	7777	7777	7777	7777	7777	7777	7777
888	8888	8888	8888	8888	8888	8888	8888	8888	8888	8888
999	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999

^AImplies a decimal point.

APPENDIX B Deck Assembly for Program Mercator



¹The program uses a scratch tape on logical unit 05, but no Equip card is required, since the drum is used.

²If the Fortran source deck is used instead of the binary deck, a Fortran card is required after the Equip card. In addition, a Scope card and Load card must follow the source deck.

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<u>Number</u>	<u>Card Title</u>	<u>Column Number</u>	<u>Description</u>
1	Job	1-21	7/9 JOB, Charge No., ID No., time. See page 2-2 of the 3600/3800 Computer System Drum Scope Manual.
2-6	Equip	1-18	7/9 EQUIP, 40=**, WO, LO 7/9 EQUIP, 10=**, RO, HI 7/9 EQUIP, 11=**, RO, HI 7/9 EQUIP, 12=**, RO, HI 7/9 EQUIP, 13=**, RO, HI 10, 11, 12, 13, 40 = logical unit numbers. RO = read only. LO = low density. WO = write only. HI = high density. See page 2-3 of the 3600/3800 Computer System Drum Scope Manual.
7	Program	Deck of Mercator	This is the main program with asso- ciated subroutines. If the Fortran source deck is used instead of the binary deck, a Fortran card is re- quired after the Equip card. The Fortran card reads 7/9 FTN, L, R, X. In addition a Scope card with SCOPE starting in Column 10 and a Load card must follow the source deck.
8	Run	1-13	7/9 RUN, T, P, R, M, D T = time limit in minutes. P = maximum number of print or write operations R,M,D may be left blank. See page 2-15 of the 3600/3800 Computer System Drum Scope Manual.
9	Chart	1-5	28.0 Degree portion of southernmost latitude for the chart (28°30'N). (If the latitude were 28°30'S, a minus sign would precede 28.0.)
		6-10	30.0 Minute portion of southernmost latitude (28°30'N).

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<u>Number</u>	<u>Card Title</u>	<u>Column Number</u>	<u>Description</u>
		11-15	35.0 Degree portion of northernmost latitude. (A minus sign would in- dicate the latitude is south.)
		16-20	0.0 Minute portion of northernmost latitude. (Both degrees and minutes must be specified in decimal form even if a zero value is assigned.)
		21-26	-45.0 Degree portion of westernmost longitude for the chart (45° 10'W). (The minus sign indicates the lon- gitude is west.)
		27-30	10.0 Minute portion of westernmost longitude.
		31-36	-40.0 Degree portion of easternmost lon- gitude (40° 25'W).
		37-40	25.0 Minute portion of easternmost longitude.
10	Parameter	1-5	4000 (right justified). Units per inch for plotting values along the track. In this example a value of 4000 gammas would be plotted 1 inch above the track. The remainder of the profiling data would be scaled accordingly.
		7-8	60 Number of tick marks between the meridians.
		9-10	40 Number of tick marks between the parallels.

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<u>Number</u>	<u>Card Title</u>	<u>Column Number</u>	<u>Description</u>
		12	0, 1, or 2 0 = every fix will be plotted with a + symbol and annotated. 1 = the track will be plotted in a continuous line and every nth fix (columns 20-24) will be marked with a small square and annotated. 2 = plot value series as a profile perpendicular to the track.
		14	0 or 1 0 = use value as read from the input tape. 1 = read uncorrected fathoms from the input tape and convert to un- corrected meters.
		16	0 or 1 0 = do not multiply the profiling series by -1. 1 = multiply the profiling series by -1 to drop it below the track.
		19	0, 1, or 2 Number of files to be skipped over on the first input tape. There are a maximum of three files on our Geodata tapes.
		20-24	12 (right justified). This value designates the n of the nth fix to be annotated. This value is specified only if there is a 1 in column 12.
		26-30	5.0 Degree portion of the interval be- tween the meridians.
		31-35	0.0 Minute portion of the interval be- tween the meridians. (Both degrees and minutes must be specified in decimal form even if a zero value is assigned.) In this example the spac- ing will be at 5-degree intervals.

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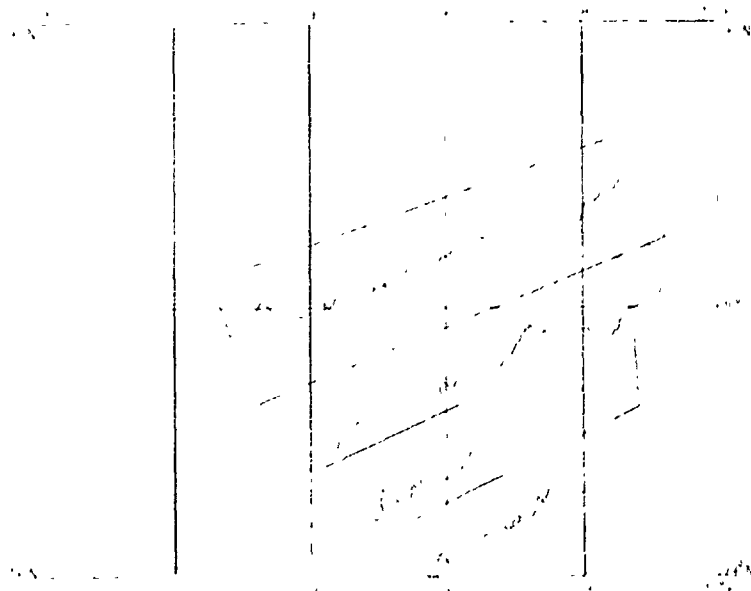
<u>Number</u>	<u>Card Title</u>	<u>Column Number</u>	<u>Description</u>
		36-40	10.0 Degree portion of the interval between the parallels.
		41-45	0.0 Minute portion of the interval between the parallels. In this example the spacing will be at 10-degree intervals.
		56-60	9.00 Physical height of the chart to be drawn.
		64	1, 2, 3, or 4 Number of input tapes, with the maximum being four.
		65-72	02250330 Date and time of the first data point to be read and plotted from the first input tape. Columns 65 and 66 are for the month, columns 67 and 68 are for the day, columns 69 and 70 are for the hour, and columns 71 and 72 are for the minutes.
		73-80	02280830 Date and time of the last data point to be read and plotted from the first input tape. All data between the date and time of the first data point and of the last data point will be read and plotted if it falls on the defined chart.
11	Format	1-?	(15XI4, 1XI4, 1XF8.4, F9.4, 10XF5.1) This format should be replaced by the desired input format. The format must be enclosed in parentheses and left-justified. Via this format the program reads the date (month and day), time (hour and whole minutes), latitude, longitude, and value to be annotated or profiled (fix number of navigation, uncorrected fathoms or corrected meters

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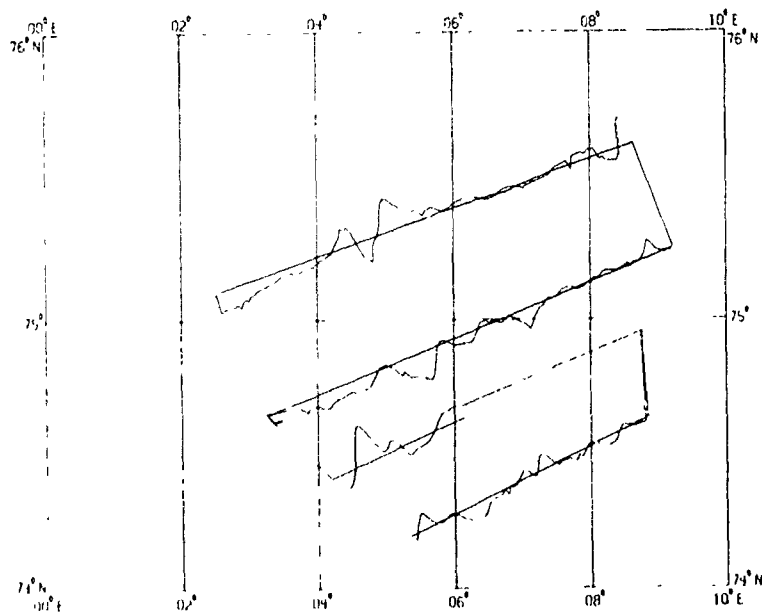
<u>Number</u>	<u>Card Title</u>	<u>Column Number</u>	<u>Description</u>
			for bathymetry, and residual magnetic intensity for magnetics). The formats for reading the three data types on our input tapes are:
			• Navigation (15XI4, 1XI4, 1XF8.4, F9.4, 9XF5) • Bathymetry - uncorrected fathoms (15XI4, 1XI4, 1XF8.4, F9.4, 10XF5.1) • Magnetics (15XI4, 1XI4, 1XF8.4, F9.4, 28XF5).
12	Extra	1-4	0, 1, or 2 Number of files to be skipped over on the second input tape. There must be an Extra card for each additional input tape. Since there is a maximum of four input tapes, the maximum number of Extra cards is three.
		5-12	02250330 Date and time of the first data point to be read and plotted from the second input tape. The dates for the first input tape are on the Map Parameter Card.
		13-20	02280830 Date and time of the last data point to be read and plotted from the second input tape.
13	End of File		Terminates the run.

APPENDIX C
Sample Profiles

BATHYMETRY PROFILE

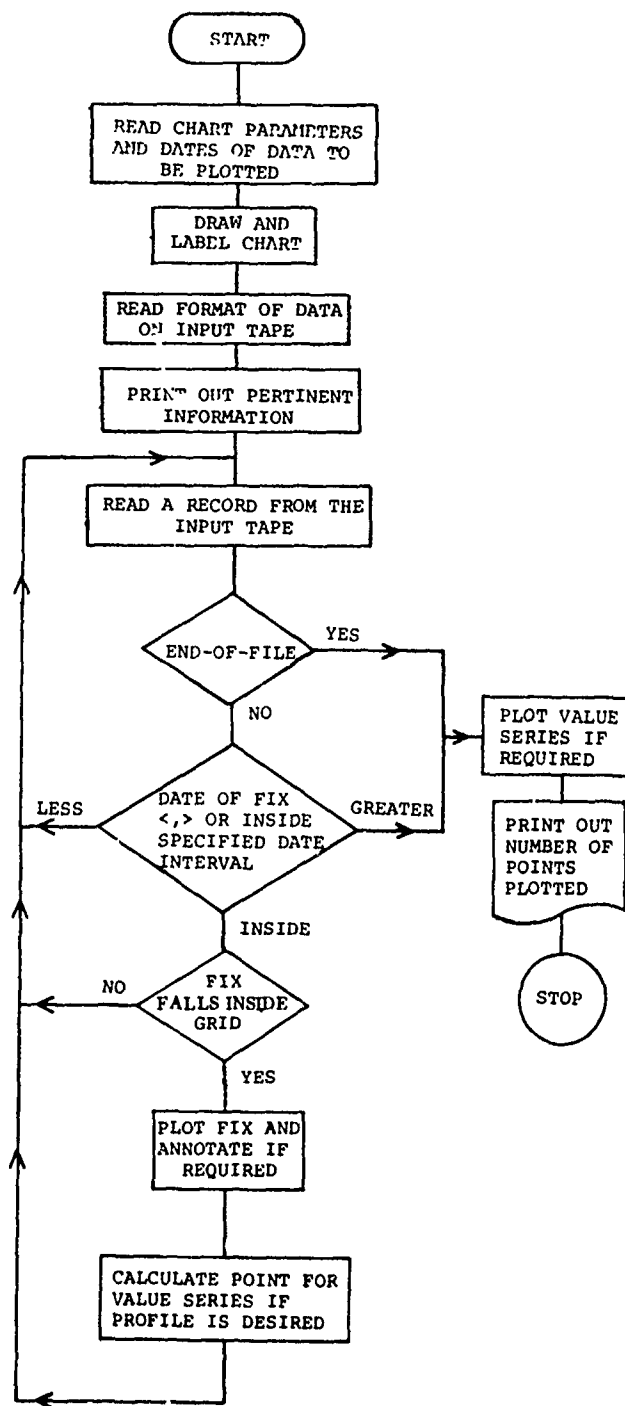


MAGNETIC PROFILE



APPENDIX D

Flow Chart



APPENDIX E Source Language Listing

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PROGRAM MERCATOR
REAL LAT
REAL LATMIN,LATMAX, LONGMIN, LONGMAX
DIMENSION IBLF(254), ANCH(2), HEAD(2), S(2)
DIMENSION IPR(10)
COMMON/MAPSYS/ CORR(4), RR, DEL, ACHT, 800
1 IPR, XMIN, YMIN, XMAX, 900
2 YMAX, MP, ICR, IA, 1000
3 RAH, RAH, 1100
C 1200
COMMON/INPT/ALATND, ALATNM, ALATNS, ALATXD, ALATXM, ALATXS, 1300
1 ALQND, ALQNM, ALQNS, ALQXD, ALQXM, ALQXS, 1400
2 MPC, KMP, WIDTH, WITE, DEGDVD, DEGDVM, 1500
3 DEGDVS, NTIC, TICLG, ALTHD(5), ALTHM(5), ALTHS(5), 1600
4 ALNMC(5), ALNMM(5), ALNMS(5), ALTSD(5), ALTSM(5), ALTSS(5), 1700
5 ALNSC(5), ALNSM(5), ALNSS(5), AR(5), VR(5) 1800
C 1900
COMMON/RATCOM/NAVSYS, NGRATE, RATID(5), CDLY(5), RATINC(5), 2000
1 ARAT(5), PHIM(5), ALAM(5), PHIS(5), ALAS(5), KNTMAX, 2100
2 KNT, EPS, NR, DELT, OSLN(5) 2200
C 2300
COMMON/CHTLBL/MINMER, MNMER(50), MAXMER, MINPAR, MNPAR(50), 2400
1 MAXPAR, NC, NNC(50), NT, NLY, 2500
2 NY(50), NRY, XL(50), YK(50), KXAXIS, 2600
3 KYAXIS, IYN, NI, XTIB, YTIB, 2700
4 LYN 2800
C COMMON/FIXGRAT/DCL,NTIX 2900
LP = 0 3000
IFIRST=0
KOUNT=1
IA = 1
IPR = 61
ICR = 60
EX=0
IT=10
IUP=3
ALATNS=0.0
ALATXS=0.0
ALQNS=0.0
ALQXS=0.0
DEGDDS=0.0
DEGDVS=0.0
PI=3.14159
KMP=1
NAVSYS=1
NGRATE=0
IYN=0
LYN=1
MPC=1
C READ IN RANGE OF CHART 83500
READ(60,101)ALATND,ALATNM,ALATXD,ALATXM,ALQND,ALQNM,ALQXD,
1ALQXM
101 FORMAT(4F5.1,F6.1,F4.1,F6.1,F4.1)
10 READ(ICR,601)GINCH,NTIC,NTIX,ILINE,IUSE,IHULT,ITAPE,IPT,DEGDVD,DEGDVM,DEGD
2DVM,

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1012 FORMAT(1H ,2(HESTM05Y LONGITUDE ,F10.2,10X20HESTM05Y LONGITUDE
1 ,F10.2)
MM=3
IOP=2
7400 READ(IT,IFM)IDAY,ITIME,RLAT,RLONG,ANOMAL
IF(IGCHECK,IT)7400,7051
7051 IF(EOP,IT)1002,1001
7401 IUP=3
GO TO 7400
1001 IF(IDAY,LT,JLDY1) GO TO 7401
IF(IDAY,GT,JLDY2) GO TO 1002
IF(IDAY,EQ,0) GO TO 1002
IF(IDAY,EQ,JLDY1,AND,ITIME,LT,ITM1) GO TO 7401
IF(IDAY,EQ,JLDY2,AND,ITIME,GT,ITM2)GO TO 1002
IF(RLAT,LT,LATMIN) GO TO 7401
IF(RLAT,GT,LATMAX) GO TO 7401
IF(RLONG,LT,LONGMIN) GO TO 7401
IF(RLONG,GT,LONGMAX) GO TO 7401
ITRAX=ITRAX + 1
CALL DTOR(RLAT ,AMIN,SEC,RRLAT)
CALL DTOR(RLONG ,AMIN,SEC,RRLONG)
CALL MERCUT(C,AQHT,RR,RRLAT,RRLONG,XDIM,YDIM)
IF(IUSE,EQ,1)609,610
609 ANOMAL=ANOMAL+1,8288
610 IF(IMULT,EQ,1)611,608
611 ANOMAL=-ANOMAL
608 IF(IFIRST)8001,8000,8001
8000 XLAST=XDIM
YLAST=YDIM
S(1)=XDIM
S(2)=YDIM
IFIRST=1
CALL PLOT(XDIM,YDIM,3)
8001 ANOM(1)=ANOM(2)
ANOM(2)=ANOMAL
IF(IFIRST,EQ,1) 503,504
503 XDIFF=XDIM-S(1)
YDIFF=YDIM-S(2)
IFIRST=2
GO TO 15
504 XDIFF=(XDIFF + (XDIM-S(1)))/2
YDIFF=(YDIFF + (YDIM + S(2)))/2
15 HEAD(2)=ATAN2(YDIFF,XDIFF)
IF(HEAD(2),LT,0)HEAD(2)=2*PI+HEAD(2)
IF(0,LE,HEAD(2))411,408
411 IF(HEAD(2),LE,PI/2)407,408
407 ISIGN=1
GO TO 23
408 IF(3,*PI/2,,LT,HEAD(2))412,410
412 IF(HEAD(2),LT,3,*PI)409,410
409 ISIGN=1
GO TO 23
410 ISIGN=-1
23 XONE=S(1)*ISIGN*ANOM(1)*SIN(HEAD(2))/GINCH
XTHO=S(2)*ISIGN*ANOM(1)*COS(HEAD(2))/GINCH
IF(ILINE,EQ,2) 605,606
605 WRITE(05,700) XONE,XTHO,IUP
700 FORMAT(2F10.4,I1)

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BLODGETT AND MASSINGILL

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606 S(1)=XDIM
    S(2)=YDIM
    HEAD(1)=HEAD(2)
    CALL ANGANO(YDIM,XLAST,YDIM,YLAST,ANG)
    CALL FIXANO(XDIM,YDIM,ANG,ANOMAL,KOUNT,ILINE,IPT,IUP)
    KOUNT=KOUNT + 1
    XLAST=XDIM
    YLAST=YDIM
    GO TO 7400
1002 IEX=IEX + 1
    REWIND IT
    IF(NOTP,EQ,IEX) GO TO 999
    IT=IT + 1
    READ(ICR,997)ITAPE,JUDY1,ITM1,JUDY2,ITM2
997  FORMAT(5I4)
    DO 998 IX=1,ITAPE
998  CALL SKIPFILE(IT)
    MM=3
    IOP=2
    IUP=3
    GO TO 7400
999  IF(IILINE,EQ,2)607,800
607  REWIND 05
1003 READ(05,700)XONE,XTWO,IUP
    IF(IOCHECK,05)1003,508
508  IF(EOF,05)800,801
801  IANOM=IANOM + 1
    IF(IFIRST,EQ,2) 505,506
505  CALL PLOT(XONE,XTWO,3)
    IFIRST=3
506  CALL PLOT(XONE,XTWO,IUP)
    GO TO 1003
800  CALL PLOTS(0,0)
    CALL STOPPLOT
    WRITE(61,1020)ITRAX
1020 FORMAT(1H0,15HPREGRAM PLOTTED, 18,5X19HPFIXES FOR THE TRACK)
    IF(IILINE,NE,2) GO TO 1015
    WRITE(61,1021)IANOM
1021 FORMAT(1H0,15HPREGRAM PLOTTED,18,5X22HPPOINTS FOR THE PROFILE)
1015 STOP
    END

```


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		IDENT	MERCATOR
PROGRAM LENGTH		01743	
ENTRY POINTS	MERCATOR	00565	
BLOCK NAMES			
	HAFSYS	00021	
	INFT	00133	
	RATCOM	00064	
	CHTLBL	00473	
	FIXCRAT	00002	
EXTERNAL SYMBOLS			
	QBCENTRY		
	THEND,		
	QJCO4100		
	QBCSTOPS		
	QBCDICT,		
	SKIPFILE		
	DTER		
	PUCYS		
	PUCY		
	MERCAT		
	GRATIE		
	TFCX		
	TFCY		
	CHLABEL		
	MERCTR		
	ANGANG		
	FIXANG		
	STEPPLCT		
	ATAN2		
	SINF		
	COSF		
	QBCIFECF		
	QBCIFEC		
	REN,		
	TSP,		
	SNF,		
	SUG,		
	SLI,		
	QNSINGL		
00450 SYMBOLS			

BLODGETT AND MASSINGILL

```

SUBROUTINE GRATIC
C
C .....
C *
C * THIS SUBROUTINE STORES VALUES IN AN ARRAY THAT ARE USED FOR PLOTTING
C * BORDER AND GRATICULE FOR A MERCATOR AND INVERSE MERCATOR PROJECTION
C * CHART, NOTE, SEE DOCUMENTATION FOR EXPLANATION OF INVERSE MERCATOR,
C *
C .....
C
COMMON/MAPSYS/ CORR(4), RR- DEL, ACHT,
1 IPR, XMIN, YMIN, XMAX,
2 YMAX, MP, ICR, LA,
3 RAH, RAWI
C
COMMON/INPT/ALATD, ALATNM, ALATNS, ALATXD, ALATXM, ALATXS,
1 ALGND, ALGNN, ALGNS, ALGXD, ALGXM, ALGXS,
2 MPC, KMP, WIDTH, HITE, DEGDVD, DEGDVM,
3 DEGDVS, NTIC, TICLGT, ALTMD(5), ALTMM(5), ALTMS(5),
4 ALNMD(5), ALNMM(5), ALNMS(5), ALTSD(5), ALTSM(5), ALTSS(5),
5 ALNSD(5), ALNSM(5), ALNSS(5), AR(5), VR(5)
COMMON/FIXGRAT/DEL,NTIX
C
C =====BORDER=====
C
ONEDEG = 3.1415926535/180.0
CALL PLOT(XMIN,YMIN,3)
CALL PLOT(XMAX,YMIN,2)
CALL PLOT(XMAX,YMAX,2)
CALL PLOT(XMIN,YMAX,2)
CALL PLOT(XMIN,YMIN,2)
IF(DEL)900,900,100
100 GO TO(110,110,910)MP
110 LK = 3
KL = 1
NTRY = 1
120 IF(DEL,LT,ONEDEG)NTRY = 1
TEMP = CORR(LK)/DEL
ITEMP = TEMP+0.0001
DIFF = ABS(TEMP-ITEMP)
AINCR = DEL
IF(DIFF,LT,DEL/20.0)GO TO 140
IF(CORR(LK),LT,0.0)GO TO 130
AINCR = DEL*(1.0-DIFF)
GO TO 140
130 AINCR = DEL*DIFF
140 ALCHK = CORR(LK+1)-AINCR/4.0
GO TO(150,160)KL
150 ALONG = CORR(3)+AINCR
ISB = 1
GO TO 170
160 ALAT = CORR(1)+AINCR
ISB = 3
170 NP = 3
ISW = 1
KSW = 1

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180	GO TO(180,190)K1 CALL MERCUR(C,ACHT,RR,CORR(ISB),ALONG,XX,YY) CALL PLOT(XX,YY,NP) JSW = NP-1 GO TO (185,200)JSW	65500 65800 65900
185	CALL CHFOLB(ALONG,XX,NTRY) ALONG = ALONG+DEL IF(ALONG,LT,ALCHK)GO TO 200 LK = 1 KL = 2 NTRY = 2 GO TO 220	66000 66100 66200 66300 66400 66500
190	CALL MERCUR(C,ACHT,RR,ALAT,CORR(ISB),XX,YY) CALL PLOT(XX,YY,NP) JSW = NP-1 GO TO(195,200)JSW	66900 67000
195	CALL CHFOLB(ALAT,YY,NTRY) ALAT = ALAT+DEL IF(ALAT,GT,ALCHK)GO TO 900	67100 67200 67300
200	IF(NP,NE,3)GO TO 210 ISB = ISB+KSW KSW = +1+KSW	67400 67500 67600
210	ISW = +1+ISW NP = NP+ISW GO TO(180,190)KL	67700 67800 67900
220	STDEL=DEL DEL=DDL IF(DEL)900,900,120	
900	CALL PLOT(XMIN,YMIN,3)	
910	DEL=STDEL RETURN END	71400

PROGRAM LENGTH	IDENT	GRATIE
ENTRY POINTS	00321	
BLOCK NAMES	00003	
	MNFSYS	00021
	INFT	00133
	FIXGRAT	00002
EXTERNAL SYMBOLS		
	00C10100	
	01C03100	
	00CDIGT,	
	PLOT	
	MERCUR	
	CHFOLB	
00163 SYMBOLS		

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	SUBROUTINE CHSYH(LABEL,XDIM,YDIM,NCHAR,JSUB)	31300
C		31400
	DATA(HH = 0.07), (H = 0.08), (H = 0.14), (S = 0.04),	31500
C		31600
	ANC = 3.0	31700
	IG0 = XABSF(NCHAR)-JSUB	31800
	GO TO(10,20,30,10,20)IG0	31900
10	ANC = ANC-1.0	32000
20	CALL SYMBOL(XDIM,YDIM,H,LABEL,0.0,8)	32100
	X2 = XDIM+H*ANC*(ANC-1.0)*0.103	32200
	YH = YDIM+H	32300
	IF(NCHAR,GT,0)GO TO 30	32400
	X3 = X2	32500
	GO TO 40	32600
30	CALL SYMBOL(X2,YH,HH,1H0,0.0,1)	32700
	IF(NCHAR,LT,5)GO TO 50	32800
	X3 = X2+3.0*(H+S)	32900
40	CALL SYMBOL(X3,YH,HH,1H/,0.0,1)	33000
50	RETURN	33100
	END	33200

		IDENT	CHSYH
PROGRAM LENGTH		00174	
ENTRY POINTS	CHSYH	00011	
EXTERNAL SYMBOLS	08CDICT, SYMBOL		
00063 SYMBOLS			

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SUBROUTINE BCDCON(FLPTD,FLPTH,BCD,NOCH,NE)	9800
DATA(1BLNK = 6060606060606060), (NOR = 45B), (ISOU = 62B),	9900
1 (IEAS = 25B), (IHES = 66B)	10000
DIMENSION LTR(10)	10100
C	10200
C,...	10300
NEWS = XARBF(NE)	10400
LPTD = ABSF(FLPTD)	10500
LPTH = FLPTH	10600
IF(NE.GT.0)GO TO 50	10700
IF(LPTH,NE.0)GO TO 50	10800
NOCH = 5	10900
ICAR = LPTD	11000
GO TO 60	11100
50 NOCH = 8	11200
ICAR = LPTD*1000+LPTH	11300
60 IF(LPTD,LT,100,NOCH = NOCH+1	11400
DO 5 LZ=1,NOCH	11500
5 LTR(LZ) = 0	11600
NCHAR = NOCH+2	11700
CALL BULAB(ICAR,NCHAR,LTR(1))	11800
KK = NOCH+1	11900
DO 10 JJ=KK,8	12000
10 LTR(JJ) = 1BLNK	12100
IF(NOCH.GT.6)LTR(NOCH+4)=1BLNK	12200
GO TO(20,30)NEWS	12300
20 KOMP = IEAS	12400
IF(FLPTD,LT,0,0)KOMP = IHES	12500
GO TO 40	12600
30 KOMP = NOR	12700
IF(FLPTD,LT,0,0)KOMP = ISOU	12800
40 LTR(NOCH) = KOMP	12900
CALL APACK(NOCH,LTR(1),BCD)	13000
RETURN	13100
END	13200

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PROGRAM LENGTH          00276  IDENT          BCDCON
ENTRY POINTS           BCDCON          00022
EXTERNAL SYMBOLS
                        01010100
                        0800101,
                        00LAB
                        00ACK

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00120	SYMBOLS	APACK				
	SUBROUTINE CENTR(MC,DLOC,DTLL)					
	COMMON/CHTGL/MXMER, MNMER(50),MAXMER, MI,PAR, MNPAR(50),					14400
1	MAXPAR, NC, NNC(50), NTC, NLY,					14500
2	NY(50), NRY, XL(50), YK(50), XXAXIS,					14600
3	KYAXIS, IYN, NI, XYIB, YIIB,					14700
4	LYN					14800
C						14900
	DATA(HID = 0.08), (SP = 0.04)					15000
C						15100
	DTLL = (HID*SP)*MC-SP					15200
	DLOC=DTLL*.5					15300
	RETURN					15400
	END					15500
						15600

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PROGRAM LENGTH IDENT CENTR
 ENTRY POINTS CENTR 00054 00005
 BLOCK NAMES CHTLBL 00473
 EXTERNAL SYMBOLS
 01C04100
 08CDICT,
 00052 SYMBOLS

SUBROUTINE CHLABEL		22600
COMMON/MAPSYS/ CORR(4), RR, DEL, ACHT,		22700
1 IPR, XMIN, YMIN, XMAX,		22800
2 YMAX, MP, ICR, IA,		22900
3 RAWI,		23000
COMMON/INPT/ALATD, ALATNM, ALATNS, ALATXD, ALATXM, ALATXS,		23100
1 ALOGD, ALOGNM, ALOGNS, ALOGXD, ALOGXM, ALOGXS,		23200
2 INOTUSE(79)		23300
COMMON/CHTLBL/MINMER, MNMER(50), MAXMER, MINPAR, MNP(50),		23400
1 MAXPAR, NC, NNC(50), NTC, NLY,		23500
2 NY(50), NRY, XL(50), YK(50), KXAXIS,		23600
3 KYAXIS, IYN, NI, XTIB, YTIB,		23700
4 LYN		23800
DATA(N9 = 8), (PH = 0.07)		23900
C,...		24000
ONEDEG = 3.1415926535/180.0		24100
NMIN = 1		24200
IF(DEL.LT.ONEDEG)NMIN = 1		24300
LNG = NMIN*1		24400
LTD = NMIN*2		24500
CALL BCDCGN(ALOGD,ALOGNM,MINMER,NC,LNG)		24600
CALL BCDCGN(ALOGXD,ALOGXM,MAXMER,NTC,LNG)		24700
CALL BCDCGN(ALATD,ALATNM,MINPAR,NLY,LTD)		24800
CALL BCDCGN(ALATXD,ALATXM,MAXPAR,NRY,LTD)		24900
C		25000
C,...		25100
SET UP MINIMUM MERIDIAN LABEL		25200
Y1 = YMIN*0.265		25300
KNT = 0		25400
100 CALL CENTR(NC,HTLL,TLL)		25500
X1 = XMIN*HTLL		25600
K1 = 0		25700
KNT = KNT+1		25800
CALL CHSYM(MINMER,X1,Y1,NC,3)		25900
C		26000
C,...		26100
SET UP INTERMEDIATE MERIDIAN LABELS		26200
120 K1 = K1+1		26300
KN = XABS(NNC(K1))		26400
CALL CENTR(KN,HTLL,TLL)		26500
X1 = XL(K1)*HTLL		26600
CALL CHSYM(MAMER(K1),X1,Y1,NNC(K1),1)		26700
140 IF(K1.LT.KXAXIS)GO TO 120		26800
C		26900
C,...		27000
SET UP MAXIMUM MERIDIAN LABEL		27100
150 CALL CENTR(NTC,HTLL,TLL)		27200
X1 = XMAX*HTLL		
CALL CHSYM(MAXMER,X1,Y1,NTC,3)		
GO TO(160,180)KNT		

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C		27300
C,...	SET UP FOR UPPER BORDER	27400
160	Y1 = YMAX+0,C55	27500
	GO TO 100	27600
C		27700
C,...	SET UP FOR MINIMUM PARALLEL LABEL	27800
C	FIND X1 PER LEFT BORDER	27900
180	CALL CENTR(NLY,HTLL,TLL)	28000
	KNT = 0	28100
	X1 = XMIN=(TLL+0,055)	28200
200	Y1 = YMIN	28300
	KY = 0	28400
	KNT = KNT+1	28500
	CALL CHSYM(MINPAR,X1,Y1,NLY,3)	28600
C		28700
C,...	SET UP INTERMEDIATE PARALLEL LABELS	28800
220	KY = KY+1	28900
	Y1 = YK(KY)+HH	29000
	GO TO(230,240)KNT	29100
C	FIND X1 PER LEFT BORDER	29200
230	KN = XABSF(NY(KY))	29300
	CALL CENTR(KN,HTLL,TLL)	29400
	X1 = XMIN=(TLL+0,125)	29500
240	CALL CHSYM(MNPAR(KY),X1,Y1,NY(KY),1)	29600
260	IF(KY,LY,KYAXIS)GO TO 220	29700
C		29800
C,...	SET UP MAXIMUM PARALLEL LABEL	29900
280	Y1 = YMAX+0,21	30000
	GO TO(290,300)KNT	30100
C	FIND X1 PER LEFT BORDER	30200
290	CALL CENTR(NRY,HTLL,TLL)	30300
	X1 = XMIN=(TLL+0,055)	30400
300	CALL CHSYM(MAXPAR,X1,Y1,NRY,3)	30500
	GO TO(320,350)KNT	30600
C		30700
C,...	SET UP FOR RIGHT BORDER	30800
320	X1 = XMAX+0,C55	30900
	GO TO 200	31000
350	RETURN	31100
	END	31200

PROGRAM LENGTH	IDENT	CHLABEL
ENTRY POINTS	00311	
BLOCK NAMES	00005	
	MAFSYS	00021
	INFT	00133
	CHTLQL	00473
EXTERNAL SYMBOLS		
	00CDICT,	
	00ICGN	
	00ATR	
	CHSYM	
00141 SYMBOLS		

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SUBROUTINE APACK(NCHS,STRING,OUTLAB)	8100
DIMENSION STRING(NCHS),OUTLAB(1)	8200
ENCODE(8,101,OUTLAB)(STRING(I),I=1,NCHS)	8300
RETURN	8400
101 FORMAT(8R1)	8500
END	8600

PROGRAM LENGTH	00075	IDENT	APACK
ENTRY POINTS	APACK	00006	
EXTERNAL SYMBOLS			

THEND,
GBCDICT,
ENC,
ONEINGL.

00035 SYMBOLS

SUBROUTINE CFFOLB(CORAD,ALOG,NTRY)	15700
COMMON/INPT/ALATND, DUMMY(5),	15800
COMMON/CHTLBL/HINMER, HNMER(50)	15900
1 MAXPAR, NC,	16000
2 NY(50), NRY,	16100
3 KYAXIS, IYN,	16200
4 LYN	16300
DIMENSION LTT(10)	16400
DATA(I8LNK = 6060606060606060B)	16500
C	16600
KGO = XABSF(NTRY)	16700
GO TO(10,20,30)KGO	16800
10 KOROLD = ABSF(ALATND)	16900
IF(CORAD,LT,C,0)KOROLD = KOROLD-1	17000
IK = 1	17100
KRT = NTRY	17200
NTRY = 3	17300
IAX = 1	17400
KXAXIS = 0	17500
GO TO 30	17600
20 KOROLD = ABSF(ALATND)	17700
IF(CORAD,LT,C,0)KOROLD = KOROLD-1	17800
IK = 1	17900
NTRY = 3	18000
IAX = 2	18100
KYAXIS = 0	18200
30 CALL RTODM(CORAD,KORDG,CORMN)	18300
KORMN = CORMN	18400
KORDG = XABSF(KORDG)	18500
IF(KORDG,EQ,KOROLD,AND,KORMN,NE,0)GO TO 40	18600
NK = 6	18700
IF(KORDG,LT,100)NK = NK-1	18800
KOROLD = KORCG	18900
IF(KRT,LT,0)GO TO 35	19000
ICAR = KORDG*1000-KORMN	19100
IF(CORAD,LT,C,0)KOROLD = KORDG-1	19200
GO TO 50	19300
35 ICAR = KORDG	19400
NK = NK-3	19500
GO TO 50	19600

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40	NK = 2	19700
	ICAR = KORMN	19800
50	JK = XABSF(NK)	19900
	DO 60 LZ=1,JK	20000
60	LTT(LZ) = 0	20100
	CALL BULAB(ICAR,JK,LTT(1))	20200
	GO TO(300,120,130,300,150,160)JK	20300
120	LTT(3) = LTT(4) = LTT(5) = LTT(6) = IBLNK	20400
	GO TO 200	20500
130	LTT(4) = LTT(5) = LTT(6) = IBLNK	20600
	GO TO 200	20700
150	LTT(3) = LTT(6) = IBLNK	20800
	GO TO 200	20900
160	LTT(4) = IBLNK	21000
200	CALL APACK(JK,LTT(1),ICAT)	21100
	GO TO(250,260)IAX	21200
250	MNMR(IK) = ICAT	21300
	ANC(IK) = NK	21400
	XL(IK) = ALBC	21500
	KXAXIS = KXAXIS#1	21600
	IK = IK#1	21700
	GO TO 300	21800
260	MNPAR(IK) = ICAT	21900
	NY(IK) = NK	22000
	YK(IK) = ALBC	22100
	KYAXIS = KYAXIS#1	22200
	IK = IK#1	22300
300	RETURN	22400
	END	22500

PROGRAM LENGTH	CHFOLE	IDENT	CHFOLE
ENTRY POINTS	CHFOLE	00340	
BLOCK NAMES		00016	
	INFT	00133	
	CH1LBL	00473	
EXTERNAL SYMBOLS			
	Q1C10100		
	Q8CDICT		
	RTEOM		
	BULAB		
	APACK		
00145 SYMBOLS			

C	SUBROUTINE DTOR(DEG,AMIN,SEC,RAD)	55800
	CONVERSION OF DEGREES, MINUTES, SECONDS INTO RADIANS	55900
	DG=ABSF(DEG)	56000
	P1=3.141592654	56100
	DEGD=SIGNF((DEG+AMIN/60.+SEC/3600.),DEG)	56200
	RAD=P1*DEGD/180.0	56300
	RETURN	56400
	END	56500

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		IDENT	DTOR	
PROGRAM LENGTH		00111		
ENTRY POINTS	DTOR	00003		
EXTERNAL SYMBOLS				
	08CDICT,			
	SUBROUTINE FINDA(RR,X,Y,ALTX,ALTN,ALGX,ALGN,A,ITR)			56600
C	THIS SUBROUTINE IS USED TO CALCULATE THE SEMI-MAJOR AXIS OF THE			56700
C	SPHEROID IN PLOTTER UNITS - NO FURTHER CONVERSIONS ARE NECESSA			56800
C	NECESSARY TO OUTPUT UNITS TO THE PLOTTER			56900
	IF(X)10,10,30			57000
10	IF(Y)20,50,20			57100
20	CALL MERCTR(1,1,0,RR,ALTX,ALGX,DUMMY,FLAMX)			57200
	CALL MERCTR(1,1,0,RR,ALTN,ALGN,DUMMY,FLAMN)			57300
	A=ABS(Y/(FLAMX-FLAMN))			57400
	ITR = 2			57500
	GO TO 40			57600
30	A=ABS(X/(ALGX-ALGN))			57700
	ITR = 1			57800
C	RESTORE BASE MERIDIAN AND PARALLEL IN MERCTR			57900
40	CALL MERCTR(1,A,RR,ALTN,ALGN,B0B0,D0D0)			58000
C	FIND ACTUAL HEIGHT AND WIDTH OF CHART			58100
	CALL MERCTR(C,A,RR,ALTX,ALGX,XMAX,YMAX)			58200
	CALL MERCTR(C,A,RR,ALTN,ALGN,XMIN,YMIN)			58300
	X = XMAX-XMIN			58400
	Y = YMAX-YMIN			58500
	RETURN			58600
50	ITR = -1			58700
	RETURN			58800
	END			58900

		IDENT	FINDA	
PROGRAM LENGTH		00246		
ENTRY POINTS	FINDA	00003		
EXTERNAL SYMBOLS				
	08CDICT,			
	MERCTR			
00105 SYMBOLS				
	SUBROUTINE MERCAT			87800
	COMMON/MARSYS/			87900
1	CORR(4),	RR,	DEL,	ACHT,
2	IPR,	XMIN,	YMIN,	XMAX,
3	YMAX,	MP,	ICR,	IA,
	RAH,	RAH,		
C	COMMON/INPT/ALATD,	ALATNM,	ALATNS,	ALATXD,
	ALATNM,	ALOGNM,	ALOGNS,	ALOGXD,
1	ALOGD,	ALOGNM,	ALOGNS,	ALOGXD,
2	IMPC,	KOMP,	WIDTH,	HITE,
3	DEGDVS,	NTIC,	TICLOT,	ALTHD(5),
4	ALNMC(5),	ALNMM(5),	ALNMS(5),	ALTS(5),
5	ALNSD(5),	ALNSM(5),	ALNSS(5),	AR(5),
				VR(5)
C	CALL FINDA(RR,WIDTH,HITE,CORR(2),CORR(1),CORR(4),CORR(3),ACHT,IRT)			88000
	IF(IRT)130,50,100			88100
				88200

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100	CONTINUE	
	RAH = (CORR(2)*CORR(1))/HITE	89400
	RAW = (CORR(4)*CORR(3))/WIDTH	89500
	CALL MERCTR(C,ACT,RR,CORR(1),CORR(3),XMIN,YMIN)	89600
	CALL MERCTR(C,ACT,RR,CORR(2),CORR(4),XMAX,YMAX)	89700
120	RETURN	89800
130	WRITE(IPR,101)	89900
	GO TO 120	90000
101	FORMAT(' INSUFFICIENT INFORMATION TO COMPLETE PLOT')	90100
	END	90300

		IDENT	MERCAT
PROGRAM LENGTH		00071	
ENTRY POINTS	MERCAT	00014	
BLOCK NAMES			
	MAPSYS	00021	
	INFT	00133	
EXTERNAL SYMBOLS			
	THEND,		
	QBDCICT,		
	FADA		
	MERCTR		
	STH,		

	00104 SYMBOLS	
	SUBROUTINE MERCTR(IT,A,RR,ALAT,ALON,X,Y)	90400
	IF(IT)10,20,10	90500
10	BM = ALON	90600
	BP = ALAT	90700
	XB = A*9M	90800
	E = SQRTF(1.0-RR*RR)	90900
	E2 = E/2.0	91000
	SINBP = SIN(BP)	91100
	ESINBP = E*SINBP	91200
	YB = A*LOGF((1.0+SINBP)/COSF(BP))*((1.0-ESINBP)/(1.0+ESINBP))*E2	91300
	X = XB	91400
	Y = YB	91500
	RETURN	91600
20	SINLA = SIN(ALAT)	91700
	ESINLA = E*SINLA	91800
	XA = A*ALON	91900
	X = XA-XB	92000
	YA = A*LOGF((1.0+SINLA)/COSF(ALAT))*((1.0-ESINLA)/(1.0+ESINLA))*E2	92100
	Y = YA-YB	92200
	RETURN	92300
	END	92400

BLODGETT AND MASSINGILL

PROGRAM LENGTH 00251 IDENT
ENTRY POINTS MERCTR 00003
EXTERNAL SYMBOLS

02C07111
08C01CT
SQRTP
SPNF
LOGF
COSF

00073 SYMBOLS

```

SUBROUTINE TICX
C
C.....
C *
C * THIS SUBROUTINE STORES VALUES IN AN ARRAY THAT ARE USED FOR PLOTTING
C * TICK MARKS ON A MERCATOR OR INVERSE MERCATOR PROJECTION CHART
C *
C.....
C
COMMON/MARSYS/ CORR(4), RR, DEL, ACHT,
1 IPR, XMIN, YMIN, XMAX,
2 YMAX, MP, ICR, IA,
3 RAH1, RAH1
C
COMMON/INPT/ALATD, ALATNM, ALATNS, ALATXD, ALATXM, ALATXS,
1 ALQND, ALQNM, ALQNS, ALQXD, ALQXM, ALQXS,
2 MPC, KOMP, WIDTH, HITE, DEGDVD, DEGDVM,
3 DEGDVS, NTIC, TICLGT, ALTHD(5), ALTHM(5), ALTHS(5),
4 ALNMC(5), ALNMH(5), ALNMS(5), ALTSD(5), ALTSM(5), ALTSS(5),
5 ALNSC(5), ALNSH(5), ALNSS(5), AR(5), VR(5)
COMMON/FIXGRAT/DCL,NTIX
C
DEGH=CORR(4)*CORR(3)
XINCR=XMAX-DCL/(DEGH*NTIX)
C
C***TICK MARKS ON LOWER BORDER OF CHART
C
IF(TICLGT,LE,0.0)TICLGT=0.06
166 TIC = TICLGT
Y0 = YMIN
M = 0
XX = XMIN
XX=XX*XINCR
IF(XX.GE.XMAX)30,15
15 M=M+1
IF(M=5)2,1,4
1 TIC1=2.0*TIC
GO TO 3
4 IF(M=10)2,6,6
6 TIC1=3.0*TIC
M = 0
GO TO 3
2 TIC1=TIC
3 CALL PLOT(XX,Y0,3)
YA = Y0+TIC1
CALL PLOT(XX,YA,2)
GO TO 10

```

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```

C
C*** TICK MARKS ON UPPER BORDER OF CHART
C
30 IF(Y0,GE,(YMAX=0.0005))55,35
35 Y0=YMAX
   TIC=TIC
   GO TO 60
55 CALL PLOT(XMIN,YMIN,3)
70 RETURN
END

```

144600
144700
144800
144900
145000
145100
145200
145400
145500

```

PROGRAM LENGTH      00135 IDENT TICX
ENTRY POINTS      TICX 00003
BLOCK NAMES

```

```

MAPSYS      00021
INFT        00133
FIXGRAT     00002

```

```

EXTERNAL SYMBOLS
02C04100
08C0101,
PUET

```

00124 SYMBOLS

SUBROUTINE TICX

```

C
C*****
C
C * THIS SUBROUTINE STORES VALUES IN AN ARRAY THAT ARE USED FOR PLOTTING
C * TICK MARKS ON A MERCATOR OR INVERSE MERCATOR PROJECTION CHART,
C *
C*****
C
COMMON/MAPSYS/ CORR(4), RR, DEL, ACHT,
1 IPR, XMIN, YMIN, XMAX,
2 YMAX, MR, ICR, IA,
3 RAWI, RAWI
C
COMMON/INPT/ALATND, ALATNM, ALATNS, ALATXD, ALATXM, ALATXS,
1 ALQND, ALQNM, ALQNS, ALQXD, ALQXM, ALQXS,
2 PC, KMP, WIDTH, HITE, DEQVD, DEQVM,
3 DEQVS, NTIC, TICLGT, ALTM(5), ALTM(5), ALTM(5),
4 ALNME(5), ALNMM(5), ALNMS(5), ALTSD(5), ALTSM(5), ALTSS(5),
5 ALNSE(5), ALNSH(5), ALNSS(5), AR(5), VR(5)
C
60 ALAT=CORR(1)
   YINCR=DEL/NTIC
   IF(TICLGT,LE,0.0)TICLGT=0.06
100 TIC = TICLGT
   XX = XMIN
   MI = 3
200 N = 0
   YY = YMIN
100 ALAT=ALAT+YINCR
   CALL MERCCTR(C,ACHT,RR,ALAT,CORR(MI),DUM,YY)
   IF(YY,GE,YMAX)99,20

```

145600
145700
145800
145900
146000
146100
146200
146300
146400
146500
146600
146700
146800
146900
147000
147100
147200
147300
147400
147500
147600
147800
147900
148000
148100
148200
148300
148400
148500
148600
148800

BLODGETT AND MASSINGILL

20	N=N+1	148900
	IF(N=5)5,4,15	149000
4	TIC1=2.0*TIC	149100
	GO TO 6	149200
15	IF(N=10)5,17,17	149300
17	TIC1=3.0*TIC	149400
	N = 0	149500
	GO TO 6	149600
5	TIC1=TIC	149700
6	CALL PLOT(XX,YY,3)	
	XA = XX+TIC1	149900
	CALL PLOT(XA,YY,2)	
35	GO TO 100	150100
99	IF(XX,GE, (XMAX=0.0005))105,48	150200
48	XX=XMAX	150300
	TIC=TIC	150400
	ALAT=CORR(1)	150500
	NI = 4	150600
	GO TO 200	150700
105	CALL PLOT(XMIN,YN,N,3)	
401	RETURN	154300
	END	154400

		IDENT	TICY
PROGRAM LENGTH		00147	
ENTRY POINTS	TICY	00003	
BLOCK NAMES			
	MAFSYS	00021	
	INFT	00133	
EXTERNAL SYMBOLS			
	Q1C05100		
	Q8C01CT,		
	MERCTR		
	PUCY		

00127 SYMBOLS		
SUBROUTINE BLLAB(INLAB,KJ,ITEMP)		13300
DIMENSION ITEMP(KJ)		13400
ILAB=INLAB		13500
DO 10 IK=1,M		13600
K=KJ-[K+1		13700
ITEMP(K)=MOD(ILAB,10)		13800
ILAB=ILAB/10		13900
IF(ILAB)10,11,10		14000
10 CONTINUE		14100
11 RETURN		14200
END		14300

128400
128500
128600
128700
128800
128900
129000
129100
129200

```

SUBROUTINE RTODH(RAD, IDEG, AMIN)
PI = 3.1415926535
RTOD = 180.0/PI
DELTA = 0.0000001
DEG = SIGNF((ABSF(RAD)*RTOD+DELTA), RAD)
IDEG = DEG
AMIN = ABSF(DEG+IDEG)*60.0
RETURN
END

```

Q	1
Q	2
Q	3
Q	4
Q	5
Q	6
Q	7
Q	8
Q	9
Q	10
Q	11
Q	12
Q	13
Q	14
Q	15
Q	16
Q	17
Q	18
Q	19
Q	20
Q	21
Q	22
Q	23
Q	24
Q	25
Q	26
Q	27
Q	28
Q	29
Q	30
Q	31

```

C SUBROUTINE ANGANG (XPT,XA,YPT,YA,ANG)
C COMPUTES ANGLE OF ROTATION FOR ANNOTATION

PI=3.141592653
XRAD=0.01745329
TEMP=ANG
IF (XPT=XA) 1,10,1
1 ARG=(YPT-YA)/(XPT-XA)
IF (ARG) 2,4,6
2 IF (YPT-YA) 3,4,9
3 ANG=(ATAN(ARG))/XRAD
GO TO 14
4 IF (XPT-XA) 5,10,10
5 ANG=PI/XRAD
GO TO 14
6 IF (YPT-YA) 7,4,8
7 ANG=(ATAN(ARG)+PI)/XRAD
GO TO 14
8 ANG=(ATAN(ARG))/XRAD
GO TO 14
9 ANG=(ATAN(ARG)+PI)/XRAD
GO TO 14
10 IF (YPT-YA) 11,13,12
11 ANG=270.0
GO TO 14
12 ANG=90.0
GO TO 14
13 ANG=TEMP
14 RETURN
END

```

BLODGETT AND MASSINGILL

PROGRAM LENGTH 00242 IDENT ANQAN0
ENTRY POINTS ANQAN0 00003
EXTERNAL SYMBOLS
00CDIGT,
ATANP
00076 SYMBOLS

C	SUBROUTINE FIXANG(XPT,YPT,ANG,CHAR,KOUNT,ILINE,IPT,IUP)	I	2
C	ANNOTATES FIX NUMBERS	I	4
	AHT=0.07		
	NFIG=5		
	XRAD=0.01745329	I	5
	CNG=ANG*90,	I	6
	IF (MOD(KOUNT,2),NE,0) GO TO 1	I	7
C	ANNOTATES FIGURES TO THE RIGHT HAND SIDE OF THE DATA POINT	I	8
	XP=XPT	I	9
	YP=YPT	I	10
	GO TO 4	I	11
C	ANNOTATES FIGURES TO THE LEFT HAND SIDE OF THE DATA POINT	I	12
1	ENG=(CNG-180,)*XRAD	I	13
	IF (NFIG,GT,4) GO TO 2	I	14
	HYP=AHT*(6./7,)*(NFIG+1)	I	15
	GO TO 3	I	16
2	HYP=AHT*(6./7,)*NFIG	I	17
3	YY=HYP*SINF(ENG)	I	18
	XX=HYP*COSE(ENG)	I	19
	YP=YPT+YY	I	20
	XP=XPT+XX	I	21
C	ILINE=0 EVERY POINT ILINE=1 EVERY N TH POINT ANNOTATED		
C	ILINE=2 PLOT VALUE SERIES NO ANNOTATION		
4	IF (ILINE-1)10,11,9		
11	IF (MOD(KOUNT,IPT),NE,1) GO TO 9		
	CALL PLOT(XPT,YPT,IUP)		
	CALL NUMBER(XP,YP,AHT,CHAR,CNG,2HF5)		
	CALL PLOT(XPT,YPT,3)		
	CALL SYMBOL(XPT,YPT,0.105,0.0,0.0,=1)		
	GO TO 7		
9	CALL PLOT(XPT,YPT,IUP)		
	GO TO 7		
10	CALL NUMBER (XP,YP,AHT,CHAR,CNG,2HF5)		
	CALL PLOT(XPT,YPT,3)		
20	CALL SYMBOL(XPT,YPT,0.020,3.0,0.0,=1)		
	GO TO 7		
7	CALL PLOT (XPT,YPT,3)	I	31
	IUP=2		
8	RETURN	I	43
	END	I	44

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PROGRAM LENGTH		00332	IDENT	
ENTRY POINTS	FIXANG	00005		FIXANG
EXTERNAL SYMBOLS				
	QNC04100			
	QBCDICT,			
	PUCY			
	NUMBER			
	SYMBOL			
	XMCDF			
	SNPF			
	COSF			

LOAD 00123 SYMBOLS

ABORT, UN UNIT

READ ATTEMPT ON UNASSIGNED UNIT, MUST HAVE EQUIP
DECLARATION, YOU HAVE TRIED TO READ FROM A UNIT THAT
HAS NOT BEEN WRITTEN ON, IF LUN=69, CHECK FORTRAN CARD
FOR X OPTION,

LUN:= 69

38

JB8,002171, 3600,009M,B
TERM, UN UNIT

[illegible]

THE TOTAL NUMBER OF LINES PRINTED FOR THIS JOB WAS