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USERS MANUAL FOR THE HYPOCENTER PLOTTING PROGRAM GPP3

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This report is preliminary and has not been edited or reviewed for conformity with Geological Survey standards and nomenclature

USERS MANUAL FOR THE
HYPOCENTER PLOTTING PROGRAM GPP3

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CONTENTS

INTRODUCTION

GPP3 is a computer program for plotting earthquake hypocenters in map or cross-section view. The projections available include Albers equal area conic, Lambert conformal conic, Mercator , polyconic and azimuthal equidistant. The first three can be specified as oblique projections using any desired projection reference pole.

Any map boundaries and scale may be chosen, and it is quite easy to make an overlay map of epicenters for any given base map. Any parameters associated with each event, such as magnitude, depth, or quality, may be used to control the plotting symbol and the symbol size. The variables chosen may also be used as a basis for selecting which events to plot.

A second set of point data, such as seismic station locations, may be added to each map. A four letter alphanumeric label may optionally be plotted next to each symbol.

Each earthquake summary card generated by the HYPOELLIPSE (Lahr and Ward, unpub. data). location program contain the length and orientation of the principal axes of the one standard deviation error ellipsoid. This information may be optionally included on epicenter maps or cross-sections. The outline of the shadow of the ellipsoid (formed by a light projected normally to the plotting surface) is plotted, centered on the earthquake symbol.

This is a preliminary manual describing the use of GPP3 as implemented on the Lawrence Berkeley Laboratory CDC 7600 computer. In order to be adapted to another computer center the subroutine PLOT will need to be modified to call the plot routine implemented on that computer.

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---------- PROGRAM CARD
 FOR PURPOSES OF FILE SUBSTITUTION, THE PROGRAM CARD IS
   PROGRAM GPPP (INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,FILM=201,
  1 TAPE10,TAPE15,TAPE21,TAPE22,TAPE23,TAPE24,TAPE25,TAPE70,TAPE99)
```

INPUT ITEMS FOR MGP3:

THE INPUT DATA IS DIVIDED INTO LOGICAL GROUPS OR 'ITEMS' AND DEFAULT VALUES FOR MOST ITEMS ARE STORED IN THE PROGRAM. THEREFORE ONLY THOSE ITEMS NEED BE INCLUDED FOR WHICH NON-DEFAULT VALUES ARE REQUIRED.
EACH ITEM OF INPUT STARTS WITH A CARD WITH A 'KEYWORD' PUNCHED STARTING IN COLUMN 1. OTHER PARAMETERS ARE USUALLY REQUIRED ON THIS CARD ALSO, AND SOME ITEMS REQUIRE ADDITIONAL CARDS.

THE TWO ITEMS THAT INITIATE THE MAKING OF A PLOT ARE MAP AND SECTION. THE RESULTING MAP OR CROSS-SECTION WILL BE DETERMINED BY THE PRECEEDING ITEMS IN THE DATA DECK.

SOME ITEMS SHOULD BE PLACED IN A CERTAIN ORDER. ITEMS IN GROUP 1 AND 2 BELOW SHOULD BE ORDERED AS SHOWN. FOR OTHER ITEMS IF THE ORDER IS IMPORTANT IT IS NOTED IN THE ITEM DESCRIPTION.

THIS IS A LISTINC OF THE KEYWORDS FOR EACH ITEM IN THE ORDER THEY ARE DESCRIBED IN THIS WRITEUP.

```
  GROUP #1                OUTPUT
   REQUIRED ORDER         FACTOR
                          R-CONTROL
                          QUAKES
                          BOUNDARY
                          TIC
                          PROJECT
                          SCALE
                          ADJUST

                          W-CONTROL
                          SYMBOLS
                          SIZE
                          TRUNCATE
                          ALPHA-OK
                          TITLE
                          GREAT-CIR
                          X-SPEC
                          ADD-QUAKES
                          STOP
                          RESET
                          NOLIST
                          LIST
                          NUMBER
                          STATIONS
                          ELLIPSE
                          FILTER
                          SCATTER
                          STEREO
                          YOUMIX
                          REWIND
                          SHIFT

      GROUP #2            MAP                  ONLY THESE ITEMS WILL
       REQUIRED ORDER     LINES                CAUSE A GRAPHIC OUTPUT
                                               TO BE CREATED.
                          SECTION

                          SYMKEY

   EACH ITEM IS SET UP AS FOLLOWS.

 KEYWORD    FORMAT FOR READING THIS KEYWORD CARD.
            READ LIST FOR KEYWORD CARD.
               EXPLANATION OF THE READ LIST PARAMETERS
            FORMAT FOR ADDITIONAL CARDS IF NEEDED.
            READ LIST FOR THESE CARDS.
               EXPLANATION OF THE READ LIST PARAMETERS.
            DEFAULT/ DEFAULT VALUES STORED IN PROGRAM FOR THIS ITEM.


 OUTPUT     (A10,4F10.0)
            KEYWORD,OUT1,OUT2,OUT3,OUT4.
               OUT1 TO OUT4 MAY BE FROM 1 TO 4 OF THE FOLLOWING CODES
               AND WILL CAUSE THE PLOT TO BE GENERATED ON THE
               CORRESPONDING DEVICE.  THIS MUST BE THE FIRST
               KEYWORD CARD.
                 CODE   OUTPUT DEVICE         JCL REQUIRED
                 1.0    10 INCH BKY PLOTTER   DISPOSE,TAPE99=PL.
                 2.0    BKY MICROFILM OR      DISPOSE,TAPE10=35,M=ME.  OR
                            MICROFICHE        DISPOSE,TAPE10=TF,M=ME.
                 3.0    TEKTRONIX AT USGS     LIBRITE,LIB,FILM/RB,SUB,
                                              50,OUTPUT,PSSFILE.
                                              NOTE THAT LIB IS YOUR PSS
                                              LIBRARY NAME AND SUB WILL
                                              BE THE SUBSET WITH THE
                                              TEKTRONIX PLOT.  USE
                                              COPYTX ON LIBRARY ALASKA
                                              TO MAKE USE OF SUB.
                 4.0    USGS PLOT             DISPOSE,TAPE15=PU,SC=GS.
                                              WARN THE USGS TERMINAL
                                              OPERATORS THAT YOU WILL
                                              HAVE A PLOT IN PU FILE.
                 5.0    GDS PLOT              FOR PRINTER PLOT OF LEFT
                                              MOST 11 INCHES OF PLOT
                                              USE GDSPR JCL NOTED ABOVE

                                              FOR BKY CAMPUS PLOTTER USE
                                              GDSCC JCL NOTED ABOVE.
                                              THE RETURNING CARD DECK
                                              MUST BE SENT TO CAMPUS
                                              VIA COURIER.  FOR 30 OR
                                              11 INCH PLOTS.
            DEFAULT/ 10 INCH BKY PLOTTER.

 FACTOR     (A10,3F10.0)
            KEYWORD,XFACT,YFACT,DEVICE-CODE.
               XFACT AND YFACT ARE SCALE FACTORS NORMALLY SET TO 1.0.
               FOR EXAMPLE SET XFACT=YFACT=0.5 TO SHRINK PLOT TO HALF
               SIZE.  THE CODE IS  1.0, 2.0, 3.0, OR 4.0 AS DEFINED
               ABOVE.  IF ZERO, THIS SCALE FACTOR IS USED FOR ALL FOUR
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                 DEVICES.  OTHERWISE ONLY THE FACTOR FOR THE DEVICE
                 SPECIFIED WILL BE CHANGED.
              DEFAULT/ ALL SCALE FACTORS EQUAL 1.0.

R-CONTROL     (A10,3I10)
              KEYWORD,IWRT,IDECI,INFILE.
                 IWRT IS 0 OR 1.  IF 1 PRINT OUT HYPOCENTER DATA AS
                 IT IS READ IN.  IDECI IS 0 OR 1.  IF COORDINATES ARE
                 GIVEN IN DECIMAL DEGREES ON YOUR DATA CARDS(IE 60.42N)
                 THEN SET IDECI=1 AND ALATMIN AND ALONMIN WILL BE
                 DROPPED FROM THE FOLLOWING READ LIST.
                 INFILE IS TAPE UNIT NUMBER FOR HYPOCENTER DATA CARDS.
                 5 IS FOR CARDS AND 21 IS FOR TAPE.
              DEFAULT/ IWRT=1, IDECI=0, AND INFILE=5.
              (8A10)
              FORMAT1.
                 EACH HYPOCENTER CARD IS READ 3 TIMES.  THEREFORE THREE
                 FORMAT CARDS ARE REQUIRED, EACH STARTING WITH ( AND
                 ENDING WITH ).  DO NOT USE T FORMATS.  THIS FORMAT
                 CONTROLS THE FOLLOWING READ LIST/
                 IYEAR,IMONTH,IDAY,IHOUR,IMINUTE,ALATDEG,ISNLAT,ALATMIN,
                 ALONDEG,ISNLON,ALONMIN,Z,(IAZ(I),IDP(I),SE(I),I=1,3)
                 WHERE ISNLAT AND ISNLON ARE A1 TO INDICATE N, S, E,
                 OR W.  IF NOT S OR E, N AND W ARE ASSUMED RESPECTIVELY.
                 IAZ,IDP AND SE ARE THE ERROR ELLIPSE DATA FROM THE
                 PROGRAM HYPOELLIPSE.  THE FORMAT MUST INCLUDE SOME
                 SPECIFICATION FOR ALL OF THE VARIABLES EVEN IF THE VARIABLES
                 ARE NOT INCLUDED ON THE HYPOCENTER CARDS  (FAKE IT).
              DEFAULT/ HYPOELLIPSE SUMMARY CARD FORMAT.
              (8A10)
              FORMAT2.
                 THIS FORMAT CONTROLS THE READING OF/
                 DATA(I),I=1,4.  THESE ARE ANY FOUR QUANTITIES TO BE
                 USED IN ASSIGNING SYMBOLS AND SIZES, AND FOR TRUNCATING
                 THE DATA SET.  TO READ AN INTEGER, SUCH AS 55, USE F2.0.
              DEFAULT/ FOR HYPOELLIPSE SUMMARY CARDS, Z,MAG,GAP,RMS.
              (8A10)
              FORMAT3.
                 FORMAT FOR READING IQTRUNCATE.  THIS IS AN A1 VARIABLE
                 USED TO TRUNCATE THE DATA SET AND, OR AS A PLOTTING
                 SYMBOL.
              DEFAULT/ FOR HYPOELLIPSE SUMMARY CARDS, IQTRUNCATE = NSWT.

QUAKES        (A9,A1,I10)
              KEYWORD,RCONT,IFILE.
                 THIS STARTS THE READING OF SUMMARY CARDS
                 FROM THE FILE TAPEXX, WHERE XX = IFILE.  SET RCINT = R
                 TO REWIND TAPEXX BEFORE READING FROM IT.  DEFAULT FILE
                 IS 5 (READ FROM CARDS), BUT IFILE MAY BE 5, 21, 22, 23,
                 24, OR 25.
              (USER FORMATS)
                 HYPOCENTER SUMMARY CARDS.  MAXIMUM OF 1000.  EXCESS
                 OVER 1000 WILL BE SCANNED AND SKIPPED.  USE 'ADD-EQS'
                 TO PLOT MORE THAN 1000 EVENTS.
              (USER FORMATS)
                 TO TERMINATE HYPOCENTER DECK USE CARD WITH ALATDEG=90
                 THIS CARD IS NOT REQUIRED WHEN READING ON TAPE21.
              DEFAULT/ NO EARTHQUAKES ARE PLOTTED.

BOUNDARY      (A10,4F10.0)  THIS CARD MUST PRECEDE 'PROJECT' CARD.
              KEYWORD,BOTTOM,TOP,LEFT,RIGHT.
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            MAP LIMITS.  NORTH AND EAST ARE POSITIVE, SOUTH AND
               WEST NEGATIVE.
            DEFAULT/ LIMITS OF 60.  64.  -158.  -150.

TIC         (A10,4F10.0)
            KEYWORD,ATINC,ONINC,ATEDG,ONEDG
               ATINC AND ONINC GIVE SPACING OF TIC MARKS WITHIN MAP,
               WHILE ATEDG AND ONEDG GIVE SPACING ON EDGES.  BOTH
               START AT LOWER LEFT CORNER OF MAP.
               IF ATEDG AND ONEDG ARE BLANK THEY ARE SET EQUAL TO
               ATINC AND ONINC RESPECTIVELY.
            DEFAULT/ ATINC=ONINC=ATEDG=ONEDG=1.0

PROJECT     (A10,2I10,2F10.0)
            KEYWORD,IPROJ-CODE,IROT,MXLFT,MXRT.
               IPROJ-CODE IS PROJECTION CODE AS FOLLOWS/
                     1   CENTRAL PROJECTION CONIC
                     2   ALBERS EQUAL AREA CONIC
                     3   LAMBERT CONFORMAL CONIC
                     4   MERCATOR'S
                     5   POLYCONIC
                     6   AZIMUTHAL EQUIDISTANT
               IROT IS 0 FOR EW DIRECTION PARALLEL TO EDGE OF PAPER
               WITH HOLES,  1 FOR EW PERPENDICULAR TO EDGE.  MXLFT
               AND MXRT ARE THE MAXIMUM EXCURSIONS OF PEN ALONG PAPER
               WITH RESPECT TO LOWER LEFT CORNER OF PLOT IN INCHES.




            FOR PROJECTIONS 1,2, OR 3 USE THE FOLLOWING SCALE CARD.

SCALE       (A10,6F10.0,F9.0)
            KEYWORD,STD1,STD2,BTW,PSKALE,FLAT,OBLIQ-LAT,OBLIQ-LON.
               STD1 AND STD2 ARE THE LOWER AND UPPER STANDARD
               PARALLELS.  BTW IS THE NUMBER OF INCHES BETWEEN THE
               STANDARD PARALLELS.  OBLIQ-LAT AND OBLIQ-LON ARE THE
               OPTIONAL OBLIQUE POLE COORDINATES.  FLAT IS THE EARTH
               FLATTENING CONSTANT.  IF ZERO, SPHERICAL EARTH IS USED.
               PSKALE GIVES VARIOUS OPTIONS AS LISTED BELOW.
                 PSKALE = 0.0   NORMAL PLOT.
                                A) MAP BOUNDARIES ARE IN TERMS OF
                                   NORTH POLE.
                                B) STANDARD PARALLELS SHOULD ENCLOSE
                                   TWO-THIRDS OF THE MAP.
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                              C) INCHES BETWEEN STANDARD PARALLELS
                                 IS USED TO DETERMINE MAP SCALE.
                              D) PSKALE IS NOT USED TO CALCULATE
                                 MAP SCALE.
            PSKALE GT 0.0     NORMAL WINDOW BUT OBLIQUE POLE
                              A) MAP BOUNDARIES ARE IN TERMS OF
                                 NORTH POLE.
                              B) STANDARD PARALLELS ARE WITH RESPECT
                                 TO OBLIQUE POLE.
                              C) INCHES BETWEEN STANDARD PARALLELS
                                 IS NOT USES.
                              D) PSKALE IS MAP SCALE.  FOR EXAMPLE
                                 A 1 TO 5000000 MAP HAS PSKALE =
                                 5000000.0
            PSKALE = -10.     OBLIQUE WINDOW AND OBLIQUE POLE
                              A) MAP BOUNDARIES ARE IN TERMS OF
                                 OBLIQUE POLE.
                              B) STANDARD PARALLELS ARE WITH
                                 RESPECT TO OBLIQUE POLE.
                              C) INCHES BETWEEN STANDARD PARALLELS
                                 IS USED TO DETERMINE MAP SCALE.
                              D) PSKALE IS NOT USED TO CALCULATE
                                 MAP SCALE

SCALE       FOR PROJECTION 4 (MERCATOR'S) USE THE FOLLOWING SCALE CARD.
            (A10,5F10.0)
            KEYWORD,PDLON,WINDOW,FLAT,OBLIQ-LAT,OBLIQ-LON.
               PDLON IS INCHES PER DEGREE LONGITUDE.
               OBLIQ-LAT AND OBLIQ-LON ARE THE OPTIONAL OBLIQUE POLE
               COORDINATES.  FLAT IS THE EARTH FLATTENING CONSTANT.
               IF FLAT IS ZERO, SPHERICAL EARTH IS USED.
               WINDOW GIVES VARIOUS OPTIONS AS LISTED BELOW.
                 WINDOW = 0.0    NORMAL PLOT
                              A) MAP BOUNDARIES ARE IN TERMS OF
                                 NORTH POLE.
                              B) OBLIQUE POLE IS NOT USED.
                              C) INCHES PER DEGREE LONGITUDE ARE
                                 WITH RESPECT TO NORTH POLE.
                 WINDOW = 1.0    NORMAL WINDOW BUT OBLIQUE POLE.
                              A) MAP BOUNDARIES ARE IN TERMS OF
                                 NORTH POLE.
                              B) OBLIQUE POLE USED FOR PROJECTION.
                              C) INCHES PER DEGREE LONGITUDE ARE
                                 WITH RESPECT TO OBLIQUE POLE.
                 WINDOW = -1.0   OBLIQUE WINDOW AND OBLIQUE POLE.
                              A) MAP BOUNDARIES ARE IN TERMS OF
                                 OBLIQUE POLE.
                              B) OBLIQUE POLE USED FOR PROJECTION.
                              C) INCHES PER DEGREE LONGITUDE ARE
                                 WITH RESPECT TO OBLIQUE POLE.

SCALE       FOR PROJECTION 5 (POLYCONIC) USE THE FOLLOWING SCALE CARD.
            (A10,3F10.2)
            KEYWORD,CMER,PSKALE,FLAT.
               CMER IS LONGITUDE OF CENTRAL MERIDIAN.
               WEST IS NEGATIVE.  PSKALE IS MAP SCALE.  FOR EXAMPLE,
               A 1 TO 250000 MAP HAS PSKALE = 250000.0.
               FLAT IS THE EARTH FLATTENING CONSTANT.  IF FLAT IS
               ZERO A SPHERICAL EARTH IS USED.

            FOR PROJECTION 6 (AZIMUTHAL EQUIDISTANT) USE THE FOLLOWING
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             SCALE CARD.
SCALE        (A10,4F10.0)
                KEYWORD,PSKALE,FLAT,OBLIG-LAT,OBLIG-LON.
                PSKALE IS THE MAP SCALE.  FOR EXAMPLE, A 1 TO 250000
                MAP HAS PSKALE = 250000.0
                FLAT IS THE EARTH FLATTENING CONSTANT.  IF FLAT IS
                ZERO A SPHERICAL EARTH IS USED.
                OBLIG-LAT AND OBLIQ-LON ARE THE OPTIONAL OBLIQUE
                POLE COORDINATES, AND ARE REQUIRED.

ADJUST       (A10,5F10.2)
             KEYWORD,ALAT1,ALON1,ALAT2,ALON2,DIST.
                THE MAP SCALE SPECIFIED WILL BE ADJUSTED SO THAT
                THE DISTANCE BETWEEN THESE TWO POINTS IS EQUAL TO
                DIST INCHES.  NORTH ANE EAST ARE POSITIVE, SOUTH AND
                WEST ARE NEGATIVE.
             DEFAULT/ NO ADJUSTMENT.

W-CONTROL    (A10,I10)
             KEYWORD,IPRN
                IPRN = 0   -  DO NOT WRITE OUT DATA.
                       1   -  WRITE ONLY DATA NOT PLOTTED.
                       2   -  WRITE ONLY DATA PLOTTED.
                       3   -  WRITE OUT ALL DATA, PLOTTED OR NOT

SYMBOLS      (A10,I10,I10,I10,39X,A1)
             KEYWORD,NUMBER-OF-SYMBOLS,SYM-TYPE,PAGE-SYM,ALPHA-SYM.
                IF NUMBER-OF-SYMBOLS IS NEGATIVE, USE IQTRUNCATE FOR
                PLOT SYMBOL.  THEN DO NOT READ THE NEXT TWO CARDS.

                SYM-TYPE IS 0 FOR PAGE SYMBOLS OR 1 FOR ALPHANUMERIC
                SYMBOLS.  PAGE-SYM CODE IS AS FOLLOWS
                                   0   +
                                   1   X
                                   2   TRIANGLE (UP)
                                   3      ,     (RIGHT)
                                   4      ,     (DOWN)
                                   5      ,     (LEFT)
                                   6   DIAMOND
                                   7   SQUALE
                                   8   CIRCLE
                                   9   STAR

                IF NUMBER-OF-SYMBOLS IS ZERO, PAGE-SYM OR ALPHA-SYM
                IS USED DEPENDING ON THE VALUE OF SYM-TYPE, AND THE
                NEXT THREE CARDS MUST NOT BE INCLUDED IN YOUR DECK.
                IF NUMBER-OF-SYMBOLS IS GREATER THAN ZERO PAGE-SYM
                AND ALPHA-SYM ARE NOT USED BUT THE NEXT TWO CARDS
                ARE READ.
             DEFAULT/ USE X SYMBOL.

                IF NUMBER-OF-SYMBOLS IS 1 OR MORE READ THE APPROPRIATE
                SET OF THREE CARDS THAT FOLLOW.

   FOR PAGE SYMBOLS USE THE NEXT THREE CARDS.
             (6X,A4,I10)
             DATA-NAME, DATA-NUMBER(1,2,3, OR 4)
                DATA-NAME IS ANY A4 NAME FOR YOUR REFERENCE.
                DATA-NUMBER(1,2,3, OR4) CORRESPONDS TO THE SUBSCRIPT
                OF DATA(I) USE IN THE HYPOCENTER READ LIST.
             (9F5.0.
            DATA INTERVALS.  INCLUSIVE OF LOWER LIMITS, EXCLUSIVE
            OF UPPER ONES.  NUMBER-OF-SYMBOLS + 1 INTERVALS.
            (8I5)
            SYMBOL CODE FOR EACH INTERVAL.

     FOR ALPHANUMERIC SYMBOLS USE THE NEXT THREE CARDS.
            (6X,A4,I10)
            DATA-NAME, DATA-NUMBER(1,2,3, OR 4)
               DATA-NAME IS ANY A4 NAME FOR YOUR REFERENCE.
               DATA-NUMBER(1,2,3, OR4) CORRESPONDS TO THE SUBSCRIPT
               OF DATA(I) USE IN THE HYPOCENTER READ LIST.
            (16F5.0)
            DATA INTERVALS.  INCLUSIVE OF LOWER LIMITS, EXCLUSIVE
            OF UPPER ONES.  NUMBER-OF-SYMBOLS + 1 INTERVALS
            (15(4X,A1))
            KEYPUNCH SYMBOL FOR EACH INTERVAL.

SIZE        (A10,I10,F10.0)
            KEYWORD,NUMBER-OF-SIZES,DSIZE.
               IF NUMBER-OF-SIZES IS ZERO, DSIZE IS USED AND THE
               NEXT THREE CARDS MUST NOT BE INCLUDED IN YOUR DECK.
            DEFAULT/ SIZE OF ALL SYMBOLS = 0.18.

               IF NUMBER-OF-SIZES IS 1 OR MORE, READ THE NEXT THREE
               CARDS.
            (6X,A4,I10)
            DATA-NAME, DATA-NUMBER(1,2,3, OR 4)
               DATA-NAME IS ANY A4 NAME YOU DESIRE.  DATA-NUMBER
               CORRESPONDS TO THE SUBSCRIPT OF DATA(I) USED
               IN THE HYPOCENTER READ LIST.
            (16F5.0)
            DATA INTERVALS.  INCLUSIVE OF LOWER LIMIT, EXCLUSIVE OF
            UPPER ONE.  NUMBER-OF-SIZES + 1 INTERVALS.
            (15F5.0)
            SIZE FOR EACH INTERVAL.

TRUNCATE    (A10)
            KEYWORD.
               FOLLOWING THIS CARD PLACE FROM 1 TO 4 CARDS AS FOLLOWS/
            (4X,A4,2X,I10,2F10.0)
            DATA-NAME,DATA-NUMBER,LIM1,LIM2.
               LIM1 AND LIM2 ARE LIMITS FOR DATA(I), I= DATA-NUMBER,
               BEYOND WHICH EARTHQUAKE IS NOT PLOTTED.  ONE TRUNCATE
               CARD MAY BE SPECIFIED FOR EACH OF THE FOUR DATA
               VARIABLES READ ON THE HYPOCENTER CARDS.
            DEFAULT/ NO NUMERIC TRUNCATION.

ALPHA-OK    (A10,I10)
            KEYWORD,NALPH
               NALPH IS NUMBER OF ACCEPTABLE POSSIBILITIES.
            (15(4X.A1))
            ALPHA
               ALPHA ARE THE ACCEPTABLE POSSIBILITIES FOR THE
               IQTRUNCATE VARIABLE READ ON THE HYPOCENTER CARDS
               EARTHQUAKES WITH OTHER VALUES ARE NOT PLOTTED.
            DEFAULT/ NO ALPHANUMERIC TRUNCATION.

TITLE       (A10,F10.0,2I10)
            KEYWORD,HEIGHT,NUMBER-OF-LINES,NUMBER-OF-LETTERS.
               NUMBER-OR-LETTERS IS THE LENGTH OF THE LONGEST LINE.
               FIVE LINES IS THE MAXIMUM ALLOWED.  HEIGHT IS ALSO USED FOR
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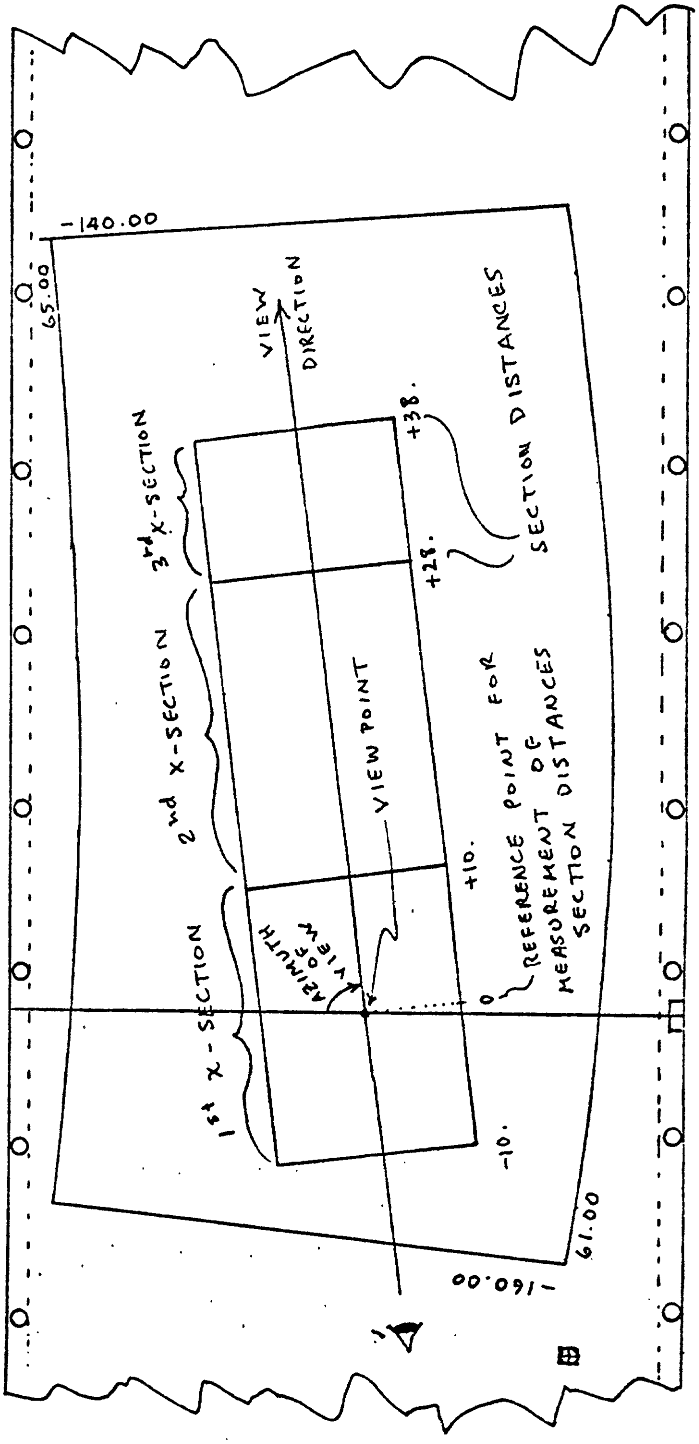
                 SIZE OF LAT AND LON ANNOTATION ON MARGIN OF MAP
              (8A10)
              TITLE
                 AS MANY TITLE CARDS AS SPECIFIED ON THE PRECEEDING
                 CARD.  START IN COLUMN ONE.
              DEFAULT/ NO TITLE, AND HEIGHT = 0.16 INCHES.

GREAT CIR     (A10,6F10.0)
              KEYWORD,ALAT,ALON,AZ,DEGMIN,DEGMAX,DEGINC.
                 WITH RESPECT TO A POLE AT ALAT,ALON POINTS WILL BE
                 PLOTTED AND LABELED AT AN AZIMUTH AZ BETWEEN LATITUDES
                 DEGMIN AND DEGMAX, ONE POINT EACH DEGINC INCREMENT
                 AS MANY GREAT CIRCLE CARDS AS REQUIRED MAY BE INCLUDED
                 THESE MUST FOLLOW THE MAP OR LINES ITEMS AND ARE NOT
                 SAVED FOR THE NEXT RUN.
              DEFAULT/ NO GREAT CIRCLES.

X-SPEC        (A10,4F10.0,2I10)
              KEYWORD,ALAT,ALON,WIDTH,W-INC,NUM-AZ,NUM-SEC.
                 ALAT,ALON SPECIFY CENTER POINT THROUGH WHICH THE
                 VERTICAL PROJECTION PLANE PASSES (CALLED VIEW POINT).
                 WIDTH IS THE WIDTH OF THE X-SECTION(KM)
                 W-INC IS THE TIC MARK INTERVAL ALONG THE WIDTH IN (KM).
                 NUM-AZ IS THE NUMBER OF AZIMUTHS OF VIEW.  MAX OF 16.
                 NUM-SEC IS THE NUMBER OF X-SECTIONS PER AXIMUTH.
                 MAXIMUM OF 16.
              (16F5.3)
              AZIMUTHS-OF-VIEW.
                 MEASURED COLCKWISE FROM LINE DRAWN PERPENDICULAR
                 TO EDGE OF PLOTTER PAPER THROUGH VIEW POINT.
              (16F5.2)
              SECTION-DISTANCES.
                 DISTANCES TO BEGINNING AND END OF EACH SECTION(KM)
                 (SECTIONS MUST BE ADJACENT TO EACH OTHER)
                 MEASURED FROM VIEW POINT ALONG AZIMUTH OF VIEW.
                 NUMBER OF DISTANCES IS ONE MORE THAN NUM-SEC.
              (2F10.0)
              MAX-Z,Z-INC.
                 MAX-Z IS MAXIMUM DEPTH ON X-SECTION.
                 Z-INC IS TIC MARK SPACING ALONG Z AXIS.
              DEFAULT/ NONE.
```


-140.00
65.00
VIEW DIRECTION
SECTION DISTANCES
+38.
+28.
3rd X-SECTION
2nd X-SECTION
VIEW POINT
+10.
REFERENCE POINT FOR MEASUREMENT OF SECTION DISTANCES
AZIMUTH OF VIEW
0
1st X-SECTION
-10.
61.00
-160.00

```
ADD-EQS      (A9,A1,I10)
             KEYWORD,RCONT,IFILE.
                THE FOLLOWING EARTHQUAKES WILL BE ADDED TO THE PREVIOUS
                MAP OR X-SECTION.  THIS MUST FOLLOW A MAP OR SECTION CARD.
                READ FORM THE FILE TAPEXX, WHERE XX = IFILE.
                IF RCONT = R THEN TAPEXX IS REWOUND BEFORE IT IS READ.
                THE DEFAULT FILE IS 5 (READ FROM CARDS) BUT IFILE MAY BE
                5,21,22,23,24, OR 25.
             (USER FORMAT)
             HYPOCENTER CARDS.
             (USER FORMAT)
             USE A CARD WITH ALATDEG = 90.  TO TERMINATE
             HYPOCENTER DECK.
             DEFAULT/ NONE.

STOP         (A10)
             KEYWORD.
                TERMINATE THIS JOB.
             DEFAULT/ NONE.

RESET        (A10)
             KEYWORD.
                RESET ALL ITEMS TO DEFAULT VALUES.
             DEFAULT/ NONE.

LIST         (A10)
             KEYWORD
                LIST ALL PARAMETERS AS PREVIOUSLY SET AND REVERSE
                EFFECT OF ANY NOLIST CARD FOR FUTURE DATA INPUT.
             DEFAULT/ NONE.

NUMBER       (A10,I10)
             KEYWORD,PLOT-NUMBER.
                USEFUL ONLY FOR USGS PLOTTING, THIS CARD WRITES THE
                PLOT NUMBER ON THE PLOT TAPE.  THIS CAN BE USED WHEN
                SEARCHING FOR ONE PARTICULAR PLOT ON THE TAPE.
                ONLY NUMBERS 71 TO 98 MAY BE USED.  OTHERS ARE IGNORED.
             DEFAULT/ NO PLOT-NUMBER.

STATIONS     (A10,F10.0,2I10,39X,A1)
             KEYWORD,SYM-SIZE,SYM-TYPE,PAGE-SYM-CODE,ALPHA-SYM.
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            SYM-SIZE IS SIZE OF SYMBOLS IN INCHES.
            SYM-TYPE IS 0 FOR PAGE SYMBOLS OR 1 FOR ALPHANUMERIC
            SYMBOLS   PAGE-SYM CODE IS AS FOLLOWS
                                0    +
                                1    X
                                2    TRIANGLE (UP)
                                3             (RIGHT)
                                4             (DOWN)
                                5             (LEFT)
                                6    DIAMOND
                                7    SQUALE
                                8    CIRCLE
                                9    STAR
            ALPHA-SYM IS ANY KEYPUNCH CHARACTER.
            THE SYMBOL SELECTED IS PLOTTED AT EACH STATION.
         DEFAULT/ NO STATIONS PLOTTED.  GO ON TO NEXT KEYWORD CARD.

         (8A10)
         FORMAT.
            THIS CARD GIVES THE FORMAT FOR READING YOUR STATION
            CARDS.  ENCLOSE FORMAT IN ( ).
         (USER FORMAT)
         NAME,ALATDEG,ISNLAT,ALATMIN,ALONDEG,ISNLON,ALONMIN.
            THESE ARE THE STATION CARDS.  NAME IS A4 FORMAT,
            AND IS PLOTTED NEXT TO STATION SYMBOL.
            ISNLAT AND ISNLON MUST BE A1/ N, S, E, OR W.  IF BLANK
            NW IS ASSUMED.
         (USER FORMAT)
         TERMINATE STATION DECK WITH ALATDEG=90. CARD
            A MAXIMUM OF 350 STATIONS IS ALLOWED.

ELLIPSE  (A10,2F10.0)
         KEYWORD,ELIP-FACT,ELIP-MAX.
            ELIP-FACT IS A SCALE FACTOR BY WHICH ELLIPSE
            DIMENSIONS ARE MULTIPLIED.  IF 0.0, NO ELLIPSES ARE
            DRAWN.  ELIP-MAX IS THE MAXIMUM PRINCIPAL AXIS LENGTH
            ALLOWED.  LARGER VALUES WILL BE TRUNCATED.  IF THE AXIS
            LENGTH IS BLANK ON THE HYPOCENTER CARD, THE MAXIMUM
            WILL BE USED
         DEFAULT/ NO ELLIPSES PLOTTED, AND ELIP-MAX = 50.

FILTER   (A10,F10.0)
         KEYWORD,FILT.
            DO NOT PLOT TWO EARTHQUAKE SYMBOLS WITHIN FILT INCHES
            OF EACH OTHER.
         DEFAULT/ NO FILTERING.

SCATTER  (A10,F10.0)
         KEYWORD,SCAT.
            ADD RANDOM VARIABLE TO THE X AND TO THE Y COORDINATES
            OF THE SECOND AND SUBSEQUENT SYMBOLS TO BE PLOTTED AT
            THE SAME POINT.  THE DISTRIBUTION IS A BOXCAR
            WITH 2*SCAT WIDTH.  DATA IS SCATTERED AND
            THEN FILTERED.
         DEFAULT/ NO SCATTERING.

STEREO   (A10,5F10.0)
         KEYWORD,EYE-HEIGHT,EYE-SEP,PAPER-Z,ALAT,ALON.
            EYE-HEIGHT IS APPROXIMATE VIEWING DISTANCE IN INCHES.
            EYE-SEP IS DISTANCE BETWEEN EYES IN INCHES.
            PAPER-Z IS DEPTH OF PAPER SURFACE.  IF THIS IS SET TO
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                DEPTH BELOW EARTHQUAKES, THEY WILL 'FLOAT'.
                ALAT AND ALON IS LOCATION OF VIEW POINT FOR 'TRUE'
                STEREO.  IF ZERO, USE VIEW FROM ABOVE EACH HYPOCENTER.
             DEFAULT/ NO STEREO.
                IN ORDER TO USE THE STEREO OPTION, TWO INK COLORS MUST
                BE SELECTED TO MATCH THE TWO COLOR STEREO GLASSES
                AVAILABLE.  THE PLOT WILL FIRST BE MADE OF THE LEFT EYE
                VIEW, THEN THE PEN COLOR MUST BE CHANGED BEFORE THE
                RIGHT EYE VIEW IS PLOTTED.

YOUMIX       (A10,I10)
             KEYWORD,MIX.
                IF AND ONLY IF MIX = 1.0 SUBROUTINE YOUMIX WILL BE
                CALLED AFTER EACH HYPOCENTER DATA CARD IS READ.  THIS
                SUBROUTINE IS USER SUPPLIED AND WILL ALLOW COMPLEX
                MANIPULATION OF THE DATA BEFORE PLOTTING.  THIS CARD
                MUST BE PLACED BEFORE THE QUAKES CARD.

SHIFT        (A10,4F10.0)
             KEYWORD,DTXX,DTXY,DMFX,DMFY.
                USED TO SHIFT FIELD OF VIEW ON TEKTRONIX OR MICROFILM
                PLOTS.  FOR EXAMPLE SET DTXX = +1.0 AND DTXY = +1.0
                IN ORDER TO INCLUDE LABELING OF LOWER LEFT CORNER
                OF MAP (IE SHIFT PLOT UP AND TO THE RIGHT) ON TEKTRONIX

MAP          (A10)
             KEYWORD.
                PLOT MAP BASED UPON BOUNDARY, TIC, PROJECTION ETC.
                AS SPECIFIED ON THE CARDS PRECEEDING THIS MAP CARD IN
                YOUR DATA DECK.
             DEFAULT/ NONE.

LINES        (A9,A1,2I10)
             KEYWORD,RCONT,NUMBER-PER-CARD,IFILE.
                IF DESIRED, THIS MUST FOLLOW THE MAP CARD.  THE
                LINE DATA IS NOT SAVED TO BE USED ON MORE THAN ONE MAP.
                LINES MAY BE DRAWN FOR SHORELINES, FAULTS ETC.
                NUMBER-PER-CARD IS THE NUMBER OF POINTS PER CARD.
                READ FROM THE FILE TAPEXX, WHERE XX = IFILE.  IF
                RCONT = R THEN REWIND TAPEXX BEFORE READING FROM IT.
                THE DEFAULT FILE IS 5 (READ FROM CARDS) BUT IFILE MAY BE
                5,21,22,23,24, OR 25.
             (20A4)
             FORMAT.
                THIS FORMAT IS USED FOR THE FOLLOWING CARDS.
             (USER FORMAT)
             (ALAT(I),ALON(I),I=1,NUMBER-PER-CARD)
                THESE POINTS DEFINE THE LINES TO BE DRAWN.  THEY ARE
                READ AND PLOTTED BUT NOT SAVED.  TO LIFT PEN BETWEEN
                POINTS, INSERT ONE WITH ALAT=0.03 AND ALON=0.0.

                TO SPECIFY REFERENCE POLE FOR POINTS, INSERT A POINT
                WITH ALAT=0.10, ALON=0.0 FOR NORTH POLE OR
                ALAT=0.20 AND ALON=0.0 FOR OBLIQUE POLE DEFINED ON
                SCALE CARD.  THIS MAY BE CHANGED AT ANY TIME.  DEFAULT
                IS NORTH POLE.  ANY POINT WITH ALAT=0.0 AND ALON=0.0
                IS IGNORED.

                THE LINE DATA MAY OPTIONALLY BE STORED ON TAPE22.  TO DO THIS
                SET THE FIRST ALAT(1) = -922.  TO START READING ON TAPE22.
                BEFORE REPLOTTING THE SAME LINES ON A SUBSEQUENT PLOT USE
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          A  -  REWIND     22.   - CONTROL CARD.
         (USER FORMAT)
            THE LAST CARD HAS ALAT=99.
         DEFAULT/ NO LINES.

SECTION  (A10)
         KEYWORD.
            PLOT X-SECTION ACCORDING TO PRECEEDING X-SPEC CARDS.
         DEFAULT/ NONE.

SYMKEY   (A10,I10)
         KEYWORD,IKEYS.
            PLOT A SYMBOL KEY.

A SAMPLE SET OF INPUT DATA FOLLOWS:

7 8/9
OUTPUT      3.        1.                                  : PICK OUTPUT DEVICES
FACTOR       .5        .5                                 : SET ALL SCALE FACTORS TO 0.5
FACTOR      1.0       1.0      4.0                        : RESET USGS FACTORS TO 1.0
R-CONTROL           1       1
 6X,5I2,3X,F5.3,A1,F6.3,A1,F3.0,2I1,F1.0,5X,2(7X,2I1,F1.0))
(52X,F3.0,F3.2,12X,F3.0,7X,F3.2)                          : 3 SUMMARY CARD READ FORMATS
(77X,A1)
QUAKES
 PR    1 1 2 520  055000N165000W025                        009       780PAS A
 PR    2 6 31317  057000N156000W100                        012       830PAS
QUTE  27 8 42156 6064000N151000W025                        001       830PAS A
QUTE  22 8 72224  057000N161000W120                        011       650PAS  CCB
QUTE  15 5 8 83136059000N141000W                           019       700PAS
QUTE  13 510 758 6057000N160000W100                        011       675PAS  CCC
QUTE  22 911 50124060500N149000W060                  B     014     DF690PAS
QUTE  31 112201148061000N147500W080                        002       725PAS
QUTE   7 612 9555405900ON153000W                           002       640PAS
QUTE  10 6121606 6059000N153000W                           002       700PAS
QUTE   7 712 75742064000N147000W                           001       740PAS
QUTE   71112 74024057500N155000W090                        012       750PAS
QUTE   51212122736057500N154000W090                        013       700PAS
QUTE   7 72018412906100ON140000W                           018       600PAS
QUTE  10 42113401605400ON134000W                           022       650PAS
QUTE  25 42319315305900ON138000W                           019       575PAS
QUTE   4 52316263905550ON156500W                           017       710PAS
QUTE  17 723 10211063000N147000W                           001       560PAS
                  9                                       : TERMINATES SUMMARY CARD DECK
BOUNDARY     54.        72.       -174.      -129.
TIC          4.0        8.0        2.0        4.0
PROJECT            5         0    -5.        55.
SCALE       -150.       5000000.
W-CONTROL          3
SCATTER      .15
SYMBOLS            1         0
     ZSYM          1
[illegible]  50.
      1
SIZE               5
     MAGZ          4
   4.5  5.5  6.5  7.5  9.0
[illegible] 111 .167 .250 .375
MAP                                                       : PLOT MAP
SYMBOLS            3         0                            : CHANGE SYMBOLS AND
     ZSYM          1
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5W   100. 150. 500.
   8     2    7
REPLOT                                                          : REPLOT ON SAME MAP
X-SPEC    D
SYMBOLS                0           0          1
SECTION                                                         : PLOT X-SECTION
RESET                                                           : RESET PARAMETERS TO DEFAULT
OUTPUT      3.          1.
BOUNDARY     80.         90.         -180.       180.
TIC        10.          10.
PROJECT                 2            -10.        30.
SCALE      82.          82.        1.0
MAP                                                             : PLOT MAP - ONLY OUTLINE SINCE
                                                                : NO DATA WAS READ IN.
STOP
THIS IS A GOOD PLACE TO PUT MISCELANEOUS JCL CARDS NOT NEEDED FOR THIS RUN

C       PROGRAM MGP3(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,FILM=201,          MGP.1
F      1 TAPE10,TAPE15,TAPE21,TAPE22,TAPE23,TAPE24,TAPE25,TAPE70,TAPE99)      MGP.2
C ---  MULTICS VERSION OF GPPP, MAR 1978 --- C. STEPHENS-----                 MGP.3
        EXTERNAL CLOSE_FILE(DESCRIPTORS)
        EXTERNAL IO_CALL(DESCRIPTORS)
        EXTERNAL DELETE(DESCRIPTORS)
        EXTERNAL EC(DESCRIPTORS)
        CHARACTER*70 COMMAND_LINE
        CHARACTER*32 FILE_NAME,BLANK_NAME
        CHARACTER*4 JSTAT,ANSWER,VIP
        CHARACTER*80 FMT,FMTT,FMT1,FMT2,FMT3,DFT1,DFT2,DFT3,CHARR
        CHARACTER*80 CARD
        LOGICAL LISTIN,RED,VIA
        INTEGER OUTPUT,FACTOR,STATIO,ELLIPS,RCONT,QUAKES,BOUNDA,PROJEC,        MGP.9
       1  SCALE,ADJUST,WCONT,FILTER,SCATTE,SYMBO,SIZEE,TRUNCA,ALPHA,PEN,      MGP.10
       2 TITLE,STEREO,TIC,GREATC,SECTIO,XSPEC,ADDQUA,STOP,RESET,D,QSYM        MGP.11
        INTEGER SYMKEY,REWIND,YOUMIX                                          MGP.12
        INTEGER SLIDE,COMM                                                    MGP.13
        INTEGER REPLOT,XBOUND
        DIMENSION DDD(7),AISYM(15)
        DIMENSION AZVW(16),DSVW(16)                                           MGP.16
        DIMENSION XFACT(5),YFACT(5)                                           MGP.17
        COMMON ACHAR(9001),ALLA(9001),ALLO(9001),ALLSE(3,9001),ALLZ(9001),
       2DATA(4,9001),IAZ(3,9001),IDATE(9001),IDP(3,9001),IHRMN(9001),IKEY    MGP.19
       3(9001),IQTRN(9001),JSYM(9001),NUMSC(9001),PHI(9001),XXSV(9001),      MGP.20
       4XXX(9001),YYSV(9001),YYY(9001),ZZZ(9001)                             MGP.21
        COMMON /ALL/ PI,RPD,DPR                                               MGP.22
        COMMON /MB/ IPRN,NMSYM,NDSYM,NCSYM,SMINT(16),ISYM(15),IALLSM          MGP.23
        COMMON /MB1/ NMSIZ,NDSIZ,NCSIZ,SZINT(16),SIZE(15),ALLSZ               MGP.24
        COMMON /MB2/ NMTRD(5),NDTRD(5),TRUN1(5),TRUN2(5),NCTRD                MGP.25
        COMMON /MB3/ NMALP,NCALP,IQOK(15),NPLOT                               MGP.26
        COMMON /MBCLOT/ ALAT1,ALAT2,ALON1,ALON2                               MGP.27
        COMMON /MBCLT/ PSKALE,OBLAT,OBLON,FLAT,CMER                           MGP.28
        COMMON /MBDX/ NOFILE                                                  MGP.29
        COMMON /MC/ ALFA1,ALFA2,MAPRO,NC,SKALE,SINTH,COSTH,SHFTH,QSKALE       MGP.30
        COMMON /MC1/ XMULT,YMULT
        COMMON /MCO/ SINRA,COSRA,SHIFT                                        MGP.31
        COMMON /MCOT/ ROTA                                                    MGP.32
        COMMON /MD/ DEFLT,MIX,IFILE                                           MGP.33
        COMMON /ME/ PPAZ                                                      MGP.34
        COMMON /MEOT/ MORSE                                                   MGP.35
        COMMON /MET/ ELFAC                                                    MGP.36
        COMMON /ML/ NPPC,LFILE,IREAD                                          MGP.37
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      COMMON /MM/  IROT,NEWVS,XMNPL,SHIF,SHIFX,SHIFY
      COMMON /MO/  ATINC,HCHAR,NCHAR,NLINE,ONINC,TTH,XMN,ATEDG,ONEDG       MGP.38
      COMMON /MO1/  DINC,ZMAX,ZINC,PTRSZ,YOFF,SINPD,YMAX,CHARR(5),TICSZ    MGP.39
      COMMON /MOT/  IMORS                                                  MGP.40
      COMMON /MOTX/  SINPK                                                 MGP.41
      COMMON /MP/  FILT,SCAT                                               MGP.42
      COMMON /MPPP/  BL,BK,V   ,TX,GDS                                     MGP.43
      COMMON /MT/  STASZ,ISTYP,ISTSM,NSTA,STALA(351),STALO(351),ISTAT      MGP.44
      COMMON /MT1/  MIT,MSTER,EYHT,EYX,EYY,ITRUE,EYSOT,JSEC,PAPD           MGP.45
      COMMON /MT2/  JSTAT(351),LSPEC,AZPL,DPPL                             MGP.46
      COMMON /MX/  X1,Y1,NOSEC,DSVIN(16),CTH,STH                           MGP.47
      COMMON /DBMPTX/  MAXDA                                               MGP.48
      COMMON /OMPX/  XINT,XMAX                                             MGP.49
      DATA DFT1/80H(5I2,4X,F2.0,A1,F4.2,F3.0,A1,F4.2,F5.2,15X,3(I3,I2,F4MGP.50
     1.2))                 /                                               MGP.51
      DATA DFT2/80H(29X,F5.2,F2.1,3X,F3.0,3X,F4.2)                         MGP.52
     1                     /                                               MGP.53
      DATA DFT3/80H(76X,A1)                                                MGP.54
     1                     /                                               MGP.55
      DATA OUTPUT/4HOUTP/,NUMBER/4HNUMB/,FACTOR/4HFACT/,                   MGP.56
     1     STATIO/4HSTAT/,ELLIPS/4HELLI/,RCONT /4HR-CO/,                   MGP.57
     2     QUAKES/4HQUAK/,FILTER/4HFILT/,SCATTE/4HSCAT/,                   MGP.58
     3     SYMBO /4HSYMB/,QSYM  /4HQSYM/,SIZEE /4HSIZE/,                   MGP.59
     4     TRUNCA/4HTRUN/,ALPHA /4HALPH/,STEREO/4HSTER/                    MGP.60
      DATA BOUNDA/4HBOUN/,TITLE /4HTITL/,PROJEC/4HPROJ/,                   MGP.61
     6     SCALE /4HSCAL/,ADJUST/4HADJU/,TIC   /4HTIC /,                   MGP.62
     7     MAP   /4HMAP /,LINES /4HLINE/,GREATC/4HGREA/,                   MGP.63
     8     XSPEC /4HX-SP/,SECTIO/4HSECT/,RESET /4HRESE/,                   MGP.64
     9     ADDQUA/4HADD-/,STOP  /4HSTOP/,IBLANK/4H    /,D/1HD/             MGP.65
      DATA REWIND/4HREWI/,SLIDE/4HSHIF/,XBOUND/4HX-BO/
      DATA SYMKEY/4HSYMK/,NEWVP/4HNEWV/,PEN/4HPEN /,YOUMIX/4HYOUM/         MGP.67
      DATA WCONT/4HW-CO/,REPLOT/4HREPL/,COMM/4HC-FI/,MULT/4HMULT/
      DATA LIST/4HLIST/,ICAT/4HCATE/,NOLIST/4HNOLI/                        MGP.69
      DATA JS,JE,JR/1HS,1HE,1HR/                                           MGP.70
      WRITE(6,1)                                                           MGP.71
    1 FORMAT(" **** MGP3 VERSION  2, OCT 1978 ****")                       MGP.72
      PI = 3.1415926536                                                    MGP.73
      RPD = 1.745329251994E-2                                              MGP.74
      DPR = 57.2957795131                                                  MGP.75
      IREAD  = 5
      IFILE = 5
      NOFILE = 8
      IHEX = 0                                                             MGP.76
      IOUT = 0                                                             MGP.77
      TTH = 0.0                                                            MGP.78
      ISTART = 1                                                           MGP.79
      IVFLAG = 0                                                           MGP.80
      ZMAX = 0.0                                                           MGP.81
      YOFF = 0.0                                                           MGP.82
      VIA =  FALSE.
                                                                           MGP.83
       DEFAULT PARAMETERS                                                  MGP.84
  100 CONTINUE                                                             MGP.85
  100 IF(ISTART .EQ. 2) CALL PLTT(XMAX,0.0,5)                              MGP.86
      XMAX = 0.0                                                           MGP.87
      BK = 0.                                                              MGP.88
      V   = 0                                                              MGP.89
      TX = 0                                                               MGP.90
      BL = 0                                                               MGP.91
      GDS = 0.                                                             MGP.92
      DO 120 I = 1,5                                                       MGP.93
      XFACT(I) = 1.0                                                    MGP.94
  120 YFACT(I) = 1.0                                                    MGP.95
      NSTA = 0                                                          MGP.97
      ELFAC = 0.0                                                       MGP.98
      DEFLT = 50.                                                       MGP.99
      IWRT = 0                                                          MGP.100
      IDECI = 0                                                         MGP.101
C      DEFINE HYPOELLIPSE FMT1-3 AS DEFAULT THRU DATA STATEMENT         MGP.102
      FMT1=DFT1
      FMT2=DFT2
      FMT3=DFT3
      MAXDA = 0                                                         MGP.106
      FIL = 0.0                                                         MGP.107
      FILT = 0.0                                                        MGP.108
      SCAT = 0.0                                                        MGP.109
      LSPEC = 0                                                         MGP.110
      NCSYM = 0                                                         MGP.111
      IALLSM = 1                                                        MGP.112
      NCSIZ = 0                                                         MGP.113
      ALLSZ = 0.18                                                      MGP.114
      NCTRD = 0                                                         MGP.115
      NCALP = 0                                                         MGP.116
      MSTER = 0                                                         MGP.117
      ELAT = 0.0                                                        MGP.118
      ELON = 0.0                                                        MGP.119
      ALAT1 = 58.                                                       MGP.120
      ALAT2 = 64.                                                       MGP.121
      ALON1 = -156.                                                     MGP.122
      ALON2 = -144.                                                     MGP.123
      NLINE = 0                                                         MGP.124
      HCHAR = 0.16                                                      MGP.125
      MAPRO = 3                                                         MGP.126
      IROT = 0                                                          MGP.127
      XMN = -5.                                                         MGP.128
      XMX = 12.                                                         MGP.129
      XMULT = 1.0
      YMULT = 1.0
      ATINC = 1.0                                                       MGP.132
      ONINC = 1.0                                                       MGP.133
      ATEDG = 1.0                                                       MGP.134
      ONEDG = 1.0                                                       MGP.135
      TICSZ = .16
      IPRN = 3                                                          MGP.136
      VLA = 60.5                                                        MGP.137
      VLO = -152.                                                       MGP.138
      WIDVW = 300.                                                      MGP.139
      DINC = 50.                                                        MGP.140
      NOAZM = 1                                                         MGP.141
      NOSEC = 1                                                         MGP.142
      NOP1 = NOSEC + 1                                                  MGP.143
      AZVW(1) = 20.                                                     MGP.144
      DSVW(1) = -150.                                                   MGP.145
      DSVW(2) = 150                                                     MGP.146
      ZMAX = 200.                                                       MGP.147
      ZINC = 100.                                                       MGP.148
      MIX = 0                                                           MGP.149
      MOREG = 0                                                         MGP.151
      NPEN = 1                                                          MGP.152
      NEWVS = 0                                                         MGP.154
  124 WRITE(6,220)
      READ(IREAD,205) CARD
      RED = .TRUE.
      DECODE(CARD,125) KEY,DDD(1)
  125 FORMAT(A4,6X,F10.0)
      IF(KEY .EQ. "OUTP") GO TO 140
      IF(KEY .EQ. STOP) GO TO 9900
      IF(KEY .NE. COMM) GO TO 130
      IREAD = DDD(1) + 0.2
      WRITE(6,3940) IREAD
      GO TO 124
  130 BL = 1.
      CALL PLTT(XFACT(1),YFACT(1),20)                                   MGP.96
      CALL PLTT(XMN,0.,-60)                                             MGP.130
      CALL PLTT(XMX,29.5,+60)                                           MGP.131
      CALL PLTT(0.,0.,30)                                               MGP.155
  140 KEY = "SCAL"                                                      MGP.156
      IDEFT = "D"                                                       MGP.157
      LISTIN = .FALSE.                                                  MGP.158
      GO TO 2000                                                        MGP.159
  150 ISTART = 2                                                        MGP.160
      LISTIN = .TRUE.                                                   MGP.161
C                                                                       MGP.162
C      READ KEYWORD CARD                                                MGP.163
  200 IF (.NOT. RED) GO TO 210
      RED = .FALSE.
      GO TO 250
  205 FORMAT(A80)
  210 WRITE(6,220)
  220 FORMAT(1X,"COMMAND ?"/)                                           MGP.165
      READ(IREAD,205) CARD
  225 FORMAT(A4,5X,A1,6F10.0,F9.0,A1)                                   MGP.167
  250 DECODE(CARD,225) KEY,IDEFT,DDD,IQ
C                                                                       MGP.168
C********************************************************* LIST       **MGP.169
  275 IF(KEY .NE. LIST) GO TO 290                                       MGP.170
      WRITE(6,280)                                                      MGP.171
  280 FORMAT(1H1, "  LIST CURRENT PLOT PARAMETERS"/)                    MGP.172
      LISTIN = .TRUE.                                                   MGP.173
      GO TO 360                                                         MGP.174
C********************************************************* NOLIST     **MGP.175
  290 IF(KEY .NE. NOLIST) GO TO 300                                     MGP.176
      LISTIN = .FALSE.                                                  MGP.177
      GO TO 200                                                         MGP.178
C      PICK OUTPUT DEVICES                                              MGP.179
C********************************************************* OUTPUT     **MGP.180
  300 IF(KEY .NE. OUTPUT) GO TO 400                                     MGP.181
      BK = 0                                                            MGP.182
      V   = 0.                                                          MGP.183
      TX = 0.                                                           MGP.184
      BL = 0.                                                           MGP.185
      GDS = 0.                                                          MGP.186
      IF(IDEFT .NE. D) GO TO 320                                        MGP.187
      BL = 1.                                                           MGP.188
      GO TO 360                                                         MGP.189
  320 DO 340 I = 1,5                                                    MGP.190
      IF(DDD(I) .EQ. 1) BL = 1.                                         MGP.191
      IF(DDD(I) .EQ. 2) V   = 1.                                        MGP.192
      IF(DDD(I) .EQ. 3) TX = 1.                                         MGP.193
      IF(DDD(I) .EQ. 4) BK = 1.                                         MGP.194
      IF(DDD(I) .EQ. 5) GDS = 1.                                        MGP.195
  340 CONTINUE                                                          MGP.196
      IF ((V .NE. 1.) .OR. (IVFLAG .NE. 0)) GO TO 350                   MGP.203
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 341  WRITE(6,220)
      READ(IREAD,205) CARD
      RED = .TRUE.
      DECODE(CARD,343) VIP
 343  FORMAT(A4)
      IF(    (VIP.NE."XMIN") AND.(VIP NE."XMAX")
     1   AND.(VIP.NE."YMIN").AND.(VIP.NE."YMAX"))
     2 GO TO 345
      WRITE(66,205) CARD
      VIA = .TRUE.
      GO TO 341
 345  CONTINUE
      IF (.NOT. VIA) GO TO 349
      CALL IO_CALL("CLOSE","FILE66")
      CALL IO_CALL("DETACH","FILE66")
      CALL IO_CALL("ATTACH","INIT_VALS","VFILE_","FILE66")
 349  CALL PLTT(0.,0.,200)
      IVFLAG = 1                                                        MGP.207
 350  IF(.NOT. LISTIN) GO TO 200                                        MGP.197
 360  WRITE(6,380) BL,V  ,TX,BK,GDS                                     MGP.198
 380  FORMAT("     OUTPUT DEVICES = 1 IF USED ",/,                      MGP.199
     1 "     b-1 PLOT    versatec PLOT     ........OTHER DEVICES NOT YET",MGP.200
     2 " AVAILABLE...  ",                                               MGP 201
     3 /6X,F3.0,12X,F3.0,15X,F3.0,13X,F3.0,12X,F3.0/)                   MGP.202
      IF (RED) GO TO 200
 390  IF(KEY .EQ. LIST) GO TO 540                                       MGP.208
      GO TO 200                                                         MGP.209
C                                                                       MGP.210
C       PLOT NUMBER                                                     MGP.211
C********************************************************** NUMBER     **MGP.212
 400  IF(KEY .NE. NUMBER) GO TO 500                                     MGP.213
      IF(IDEFT .EQ. 0) GO TO 200                                        MGP.214
      N = DDD(1) + 0.5                                                  MGP.215
      IF(( N .LT.  71) .OR.  (N .GT  98)) GO TO 200                     MGP.216
      CALL PLTT(0.,0.,N)                                                MGP.217
      WRITE(6,425) N                                                    MGP.218
 425  FORMAT(1H1,"    MULTICS GENERAL PURPOSE PLOTTING PROGRAM",/,      MGP.219
     1 "      VERSION 1, MAR  1978",/,"     PLOT NUMBER",I3/)           MGP.220
      GO TO 200                                                         MGP.221
C                                                                       MGP.222
C       FACTOR                                                          MGP.223
C********************************************************** FACTOR     **MGP.224
 500  IF(KEY .NE. FACTOR) GO TO 600                                     MGP.225
      CALL PLTT(XMAX,0.0,5)                                             MGP.226
      XMAX = 0.0                                                        MGP.227
      IF(IDEFT .NE. 0) GO TO 520                                        MGP.228
      DO 510 I = 1,5                                                    MGP 229
      XFACT(I) = 1.0                                                    MGP.230
 510  YFACT(I) = 1.0                                                    MGP.231
      CALL PLTT(1.,1.,20)                                               MGP.232
      GO TO 540                                                         MGP.233
 520  IF(DDD(3) .NE. 0.0) GO TO 528                                     MGP.234
      DO 524 I = 1,5                                                    MGP.235
      XFACT(I) = DDD(1)                                                 MGP.236
 524  YFACT(I) = DDD(2)                                                 MGP.237
      CALL PLTT(DDD(1),DDD(2),20)                                       MGP.238
      GO TO 540                                                         MGP.239
 528  I = DDD(3) + 0.5                                                  MGP.240
      XFACT(I) = DDD(1)                                                 MGP.241
      YFACT(I) = DDD(2)                                                 MGP.242
 530  CONTINUE                                                          MGP.243
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      IF(BL .NE. 0.) CALL PLTT(XFACT(1),YFACT(1),120)
      IF(V .NE. 0.) CALL PLTT(XFACT(2),YFACT(2),220)
      IF (TX .NE. 0.) CALL PLOT_TX$PLOT(XFACT(3),YFACT(3),20)          MGP. 246
      IF (BK .NE. 0.) CALL PLOT_BK$PLOT(XFACT(4),YFACT(4),20)          MGP. 247
      IF (GDS .NE. 0.) CALL PLOT_GDS$PLOT(XFACT(5),YFACT(5),20)        MGP. 248
  540 IF(.NOT. LISTIN) GO TO 200                                       MGP. 249
      WRITE(6,560) (XFACT(I),YFACT(I),I=1,5)                           MGP. 250
  560 FORMAT("     SCALE FACTORS"/                                     MGP. 251
     1       "        b-1 PLOTTER",2F10.2/                             MGP. 252
     2       " versatec PLOTTER",2F10.2/                               MGP. 253
     3       "      NOT AVAILABLE",2F10.2/                             MGP. 254
     4       "      NOT AVAILABLE",2F10.2/                             MGP. 255
     5       "      NOT AVAILABLE",2F10.2/)                            MGP. 256
      IF(KEY .NE. LIST) GO TO 200                                      MGP. 257
      IF(NSTA .EQ. 0) GO TO 720                                        MGP. 258
      I = ISTYP + 1                                                    MGP. 259
      IF(KEY .EQ. LIST) GO TO (620,640),I                              MGP. 260
      GO TO 200                                                        MGP. 261
C                                                                      MGP. 262
C      READ STATIONS TO BE PLOTTED                                     MGP. 263
C*************************************************** STATIONS     **MGP. 264
  600 IF(KEY .NE. STATIO) GO TO 700                                    MGP. 265
      IF(IDEFT .NE. 0) GO TO 610                                       MGP. 266
      NSTA = 0                                                         MGP. 267
      IF(.NOT. LISTIN) GO TO 200                                       MGP. 268
      WRITE(6,605)                                                     MGP. 269
  605 FORMAT("     DEFAULT - NO STATIONS WILL BE PLOTTED"/)            MGP. 270
      GO TO 200                                                        MGP. 271
  610 STASZ = DDD(1)                                                   MGP. 272
      ISTYP = DDD(2) + 0.5                                             MGP. 273
      ISTSM = DDD(3) + 0.5                                             MGP. 274
      IF(ISTYP .EQ. 1) ISTSM = IQ                                      MGP. 275
      I = ISTYP + 1                                                    MGP. 276
      IF(.NOT. LISTIN) GO TO 660                                       MGP. 277
      GO TO (620,640) ,I                                               MGP. 278
  620 WRITE(6,630) STASZ,ISTSM                                         MGP. 279
  630 FORMAT("     STATION SYMBOL SIZE =",F5.2,                        MGP. 280
     1 "     PAGE SYMBOL CODE =",I5,/)                                 MGP. 281
      GO TO 660                                                        MGP. 282
  640 WRITE(6,650) STASZ,ISTSM                                         MGP. 283
  650 FORMAT("     STATION SYMBOL SIZE =",F5.2,                        MGP. 284
     1 "     SYMBOL IS",A1,/)                                          MGP. 285
  660 IF(KEY .EQ. LIST) GO TO 675                                      MGP. 286
      READ(IREAD ,205) FMT
  675 IF(.NOT. LISTIN) GO TO 682                                       MGP. 289
      WRITE(6,680) FMT                                                 MGP. 290
  680 FORMAT("     THE FORMAT FOR READING STATION CARDS IS",/1X,A80 /) MGP. 291
  682 IF(KEY .EQ. LIST) GO TO 720                                      MGP. 292
      DO 690 I=1,351                                                   MGP. 293
      READ(IREAD ,FMT) JSTAT(I),DLA,ISNLA,ALA,DLO,ISNLO,ALO            MGP. 294
      IF(.NOT. LISTIN) GO TO 687                                       MGP. 295
      WRITE(6,685 ) DLA,ISNLA,ALA,DLO,ISNLO,ALO,JSTAT(I)               MGP. 296
  685 FORMAT(2(2X,F10.2,A1,F10.2),5X,A4)                               MGP. 297
  687 IF(DLA .EQ. 90.) GO TO 697                                       MGP. 298
      STALA(I) = DLA + ALA/60.                                         MGP. 299
      STALO(I) = -DLO-ALO/60.                                          MGP. 300
      IF(ISNLA .EQ. JS) STALA(I) = -STALA(I)                           MGP. 301
      IF(ISNLO .EQ. JE) STALO(I) = -STALO(I)                           MGP. 302
  690 CONTINUE                                                         MGP. 303
      WRITE(6,695)                                                     MGP. 304
  695 FORMAT(" STATION CARD WITH LAT = 90. NOT FOUND.  TERMINATE JOB") MGP. 305
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      GO TO 9900
  697 NSTA = I - 1                                                      MGP.307
      GO TO 200                                                         MGP.308
C                                                                       MGP.309
       ERROR ELLIPSES                                                   MGP.310
C********************************************************* ELLIPSE    **MGP.311
  700 IF(KEY .NE. ELLIPS) GO TO 800                                     MGP.312
      IF(IDEFT .NE. D) GO TO 710                                        MGP.313
      ELFAC = 0.0                                                       MGP.314
      DEFLT = 50.                                                       MGP.315
      GO TO 720                                                         MGP.316
  710 ELFAC = DDD(1)                                                    MGP.317
      DEFLT = DDD(2)                                                    MGP.318
  720 IF(.NOT. LISTIN) GO TO 200                                        MGP.319
      WRITE(6,730) ELFAC,DEFLT                                          MGP.320
  730 FORMAT("     PLOT ELLIPSES MULTIPLIED BY",F10.2,/                 MGP.321
     1  "      THE DEFAULT VALUE FOR BLANK STD. ERRORS"                 MGP.322
     2  /,"         AND THE LIMIT BEYOND WHICH THEY ARE TRUNCATED IS",  MGP.323
     3  F10.2/)                                                         MGP.324
      IF(KEY .EQ. LIST) GO TO 820                                       MGP.325
      GO TO 200                                                         MGP.326
C                                                                       MGP.327
       READ CONTROL                                                     MGP.328
C********************************************************* R-CONTROL  **MGP.329
  800 IF(KEY .NE. RCONT) GO TO 900                                      MGP.330
      IF(IDEFT .NE. D) GO TO 810                                        MGP.331
      IWRT = 0                                                          MGP.332
      IDECI = 0                                                         MGP.333
      FMT1=DFT1
      FMT2=DFT2
      FMT3=DFT3
      GO TO 820                                                         MGP.337
  810 IWRT = DDD(1) + 0.5                                               MGP.338
      IDECI = DDD(2) + 0.5                                              MGP.339
  820 IF(.NOT. LISTIN) GO TO 831                                        MGP.340
      WRITE (6,830) IWRT,IDECI                                          MGP.341
  830 FORMAT("     IWRT =",I2,".  IF 1 WRITE OUT DATA AS IT IS READ IN",/MGP.342
     1  ,"     IDECI =",I2,".  IF 1 CO-ORDINATES GIVEN IN "             MGP.343
     2  ,16H DECIMAL DEGREES /18X, 23HRATHER THAN DEG AND MIN )         MGP.344
  831 IF(KEY .EQ. LIST) GO TO 845                                       MGP.345
      IF(IDEFT .NE. D) GO TO 833
      WRITE(6,832)
  832 FORMAT("     DEFAULT FORMATS FOR HYPOELLIPSE USED")
      GO TO 845
  833 WRITE(6,834)
  834 FORMAT(1X/"  ENTER FORMAT NUMBER(S) AND FORMAT(S) (INCLUDING P",
     1 "ARENTHESIS) FOR READING DATA"/"  START IN COLUMN 1, ONE FORM",
     2 "AT PER LINE"/"  END WITH NEW KEYWORD CARD:")
      RED = .TRUE.
  835 READ(IREAD,205) CARD
      DECODE(CARD,837) NOFMTT,FMTT
  837 FORMAT(A1,A79)
      IF(NOFMTT .NE. "1") GO TO 840
      FMT1 = FMTT
      GO TO 835
  840 IF(NOFMTT .NE  "2") GO TO 841
      FMT2 = FMTT
      GO TO 835
  841 IF(NOFMTT .NE. "3") GO TO 842
      FMT3 = FMTT
      GO TO 835
  842 CONTINUE
      IF(NOFMTT .EQ. ".") GO TO 835
  845 IF(.NOT. LISTIN) GO TO 200                                        MGP.351
      WRITE(6,850) FMT1,FMT2,FMT3
  850 FORMAT("    READ IN DATA CARDS WITH THE FOLLOWING FORMATS",/,     MGP.353
     1  3(1X,A80 /))                                                    MGP.354
      IF (RED) GO TO 200
      IF(KEY .EQ. LIST) GO TO 1020                                      MGP.355
      GO TO 200                                                         MGP.356
C                                                                       MGP.357
C      READ HYPOCENTER CARDS                                            MGP.358
C*********************************************************** QUAKES   **MGP.359
  900 IF(KEY .NE. QUAKES) GO TO 1000                                    MGP.360
      IFILE=DDD(1)+.5                                                   MGP.361
      IF (IFILE.EQ.0) IFILE=5                                           MGP.362
      IF (IDEFT .NE. JR) GO TO 905                                      MGP.363
      REWIND IFILE                                                      MGP.364
      WRITE (6,2940) IFILE                                              MGP.365
  905 WRITE (6,2950) IFILE                                              MGP.366
  910 CALL DATAIN(IWRT,IDECI,FMT1,FMT2,FMT3,MOREQ)
      DO 912 I = 1,3                                                    MGP.368
  912 IKEY(I) = I                                                       MGP.369
      IF(KEY .EQ. QUAKES) GO TO 200                                     MGP.370
      IF(MORXK .EQ. MAP) GO TO 2324                                     MGP.371
      IF(MORXK .EQ. SECTIO) GO TO 2715                                  MGP.372
      GO TO 200                                                         MGP.373
C                                                                       MGP.374
C      FILTER DATA                                                      MGP.375
C*********************************************************** FILTER   **MGP.376
 1000 IF(KEY .NE. FILTER) GO TO 1100                                    MGP.377
      IF(IDEFT .NE. D) GO TO 1010                                       MGP.378
      FIL = 0.0                                                         MGP.379
      FILT = 0.0                                                        MGP.380
      IF(.NOT. LISTIN) GO TO 200                                        MGP.381
      WRITE(6,1005)                                                     MGP.382
 1005 FORMAT("    DO NOT FILTER DATA"/)                                 MGP.383
      GO TO 200                                                         MGP.384
 1010 FIL = DDD(1)                                                      MGP.385
 1020 IF(.NOT. LISTIN) GO TO 200                                        MGP.386
      IF(FIL .EQ. 0) GO TO 1040                                         MGP.387
      WRITE(6,1030) FIL                                                 MGP.388
 1030 FORMAT("    DO NOT PLOT POINTS WITHIN",F10.2,                     MGP.389
     1  " INCHES OF EACH OTHER"/)                                       MGP.390
 1040 IF(KEY .EQ. LIST) GO TO 1115                                      MGP.391
      FILT = FIL**2                                                     MGP.392
      GO TO 200                                                         MGP.393
C                                                                       MGP.394
C      SCATTER DATA                                                     MGP.395
C*********************************************************** SCATTER  **MGP.396
 1100 IF(KEY .NE. SCATTE) GO TO 1200                                    MGP.397
      IF(IDEFT .NE. D) GO TO 1110                                       MGP.398
      SCAT = 0.0                                                        MGP.399
      IF(.NOT. LISTIN) GO TO 200                                        MGP.400
      WRITE(6,1105)                                                     MGP.401
 1105 FORMAT("    DO NOT SCATTER DATA"/)                                MGP.402
      GO TO 200                                                         MGP.403
 1110 SCAT = DDD(1)                                                     MGP.404
 1115 IF(.NOT. LISTIN) GO TO 200                                        MGP.405
      IF(SCAT .EQ. 0.0) GO TO 1125                                      MGP.406
      WRITE(6,1120) SCAT                                                MGP.407
 1120 FORMAT("    SCAT =",F10.2,                                        MGP.408
     1 " INCHES.  ADD RANDOM VARIABLE TO EPICENTERAL LOCATIONS."/)          MGP.409
 1125 IF(KEY .NE. LIST) GO TO 200                                            MGP.410
      IF(NCSYM .EQ. ICAT) GO TO 1224                                         MGP.411
      IF(NCSYM .EQ. 0) GO TO 1130                                            MGP.412
      IF(LSPEC .EQ. 1) GO TO 1293                                            MGP.413
      GO TO 1278                                                             MGP.414
 1130 IF(LSPEC .EQ. 1) GO TO 1245                                            MGP.415
      GO TO 1229                                                             MGP.416
C                                                                            MGP.417
C      PICK SYMBOL                                                           MGP.418
C******************************************************** SYMBOLS    **MGP.419
 1200 IF(KEY .NE. SYMBO ) GO TO 1300                                         MGP.420
      IF(IDEFT .NE. D) GO TO 1220                                            MGP.421
      LSPEC = 0                                                              MGP.422
      NCSYM = 0                                                              MGP.423
      IALLSM = 1                                                             MGP.424
      IF(.NOT. LISTIN) GO TO 200                                             MGP.425
      WRITE(6,1210)                                                          MGP.426
 1210 FORMAT("     USE DEFAULT SYMBOL X"/)                                   MGP.427
      GO TO 200                                                              MGP.428
 1220 NCSYM = DDD(1) + SIGN(0.5,DDD(1))                                      MGP.429
      LSPEC = DDD(2) + 0.5                                                   MGP.430
      IF(NCSYM .GT. 0) GO TO 1260                                            MGP.431
      IF(NCSYM .EQ. 0) GO TO 1228                                            MGP.432
      NMSYM = ICAT                                                           MGP.433
      LSPEC = 1                                                              MGP.434
 1224 IF(.NOT. LISTIN) GO TO 1298                                            MGP.435
      WRITE(6,1226)                                                          MGP.436
 1226 FORMAT("     USE IQTRUNCATE FOR SYMBOL"/)                              MGP.437
      GO TO 1298                                                             MGP.438
 1228 IF(LSPEC .EQ. 1) GO TO 1240                                            MGP.439
      IALLSM = DDD(3) + 0.5                                                  MGP.440
 1229 IF(.NOT. LISTIN) GO TO 1298                                            MGP.441
      WRITE(6,1230) IALLSM                                                   MGP.442
 1230 FORMAT("     USE PAGE SYMBOL WITH CODE = ",I2/)                        MGP.443
      GO TO 1298                                                             MGP.444
 1240 IALLSM = IQ                                                            MGP.445
 1245 IF(.NOT. LISTIN) GO TO 1298                                            MGP.446
      WRITE(6,1250) IALLSM                                                   MGP.447
 1250 FORMAT("     USE THE SYMBOL "A1/)                                      MGP.448
      GO TO 1298                                                             MGP.449
 1260 READ(IREAD ,1265) NMSYM,ANDSYM
 1265 FORMAT(6X,A4,F10.0)                                                    MGP.451
      NDSYM=ANDSYM+0.1
      J = NCSYM + 1                                                          MGP.452
      IF(LSPEC .EQ. 1) GO TO 1285                                            MGP.453
C      PAGE SYMBOLS                                                          MGP.454
      READ(IREAD ,1270) (SMINT(I) ,I=1,J)
 1270 FORMAT(16F5.0)                                                         MGP.456
      READ(IREAD ,1275) (AISYM(I),I=1,NCSYM)                                 MGP.457
 1275 FORMAT(15F5.0)                                                         MGP.458
      DO 1276 I=1,NCSYM
 1276 ISYM(I)=AISYM(I) + 0.1
 1278 IF(.NOT. LISTIN) GO TO 1298                                            MGP.459
      WRITE(6,1280) NCSYM,NMSYM,NDSYM,(SMINT(I),I=1,J)                       MGP.460
 1280 FORMAT(,,4X,I5,1X,A4," INTERVALS PLOTTED BY SYMBOL    DATA > ",I5/MGP.461
     1  4X, "CLASS",9F12.2)                                                  MGP.462
      WRITE(6,1282) (ISYM(I),I=1,NCSYM)                                      MGP.463
 1282 FORMAT(4X,"SYMBOL",13X,8(I1,11X)/)                                     MGP.464
      GO TO 1298                                                             MGP.465
C      ALPHA SYMBOLS                                                         MGP.466
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 1285 READ(IREAD ,127C) (SMINT(I), I=1,J)                            MGP.467
      READ(IREAD ,1290) (ISYM(I),I=1,NCSYM)                          MGP.468
 1290 FORMAT(15(4X,A1))                                              MGP.469
 1293 IF(.NOT. LISTIN) GO TO 1298                                    MGP.470
      WRITE(6,1295) NCSYM,NMSYM.NDSYM,(SMINT(I),I=1,J)               MGP.471
 1295 FORMAT(/,4X,I5,1X,A4," INTERVALS PLOTTED BY SYMBOL.   DATA > ",I5/ MGP.472
     1 4X,"CLASS",16F7.2/)                                           MGP.473
      WRITE(6,1296) (ISYM(I),I=1,NCSYM)                              MGP.474
 1296 FORMAT(4X,"SYMBOL",8X,15(A1,6X)/)                              MGP.475
 1298 IF(KEY .NE. LIST) GO TO 200                                    MGP.476
      IF(NCSIZ .GT. 0) GO TO 1375                                    MGP.477
      GO TO 1325                                                     MGP.478
C                                                                    MGP.479
C       PICK SIZE                                                    MGP.480
C*************************************************** SIZE         **MGP.481
 1300 IF(KEY .NE. SIZEE)GO TO 1400                                   MGP.482
      IF(IDEFT .NE. D) GO TO 1320                                    MGP.483
      NCSIZ = 0                                                      MGP.484
      ALLSZ = 0.18                                                   MGP.485
      IF(.NOT. LISTIN) GO TO 200                                     MGP.486
      WRITE(6,1310)                                                  MGP.487
 1310 FORMAT("     USE DEFAULT SIZE OF 0.18 INCHES"/)                MGP.488
      GO TO 200                                                      MGP.489
 1320 NCSIZ = DDD(1) + 0.5                                           MGP.490
      IF(NCSIZ .GT. 0) GO TO 1340                                    MGP.491
      ALLSZ = DDD(2)                                                 MGP.492
 1325 IF(.NOT. LISTIN) GO TO 1390                                    MGP.493
      WRITE(6,1330) ALLSZ                                            MGP.494
 1330 FORMAT("     USE SIZE =",F10.2," INCHES"/)                     MGP.495
      GO TO 1390                                                     MGP.496
 1340 READ(IREAD ,1350) NMSIZ,ANDSIZ                                 MGP.497
 1350 FORMAT(6X,A4,F1C.0)                                            MGP.498
      NDSIZ = ANDSIZ÷0.1
      J = NCSIZ + 1                                                  MGP.499
      READ(IREAD ,136C) (SZINT(I) ,I=1,J)                            MGP.500
 1360 FORMAT(16F5.0)                                                 MGP.501
      READ(IREAD ,1370) (SIZE(I),I=1,NCSIZ)                          MGP.502
 1370 FORMAT(15F5.0)                                                 MGP.503
 1375 IF(.NOT. LISTIN) GO TO 1390                                    MGP.504
      WRITE(6,1380) NCSIZ,NMSIZ,NDSIZ,(SZINT(I),I=1,J)               MGP.505
 1380 FORMAT(/,4X,I5,1X,A4," INTERVALS PLOTTED BY SIZE.    DATA > ",I5/  MGP.506
     1  4X,"CLASS",16F7.2)                                           MGP.507
      WRITE(6,1385) (SIZE(I),I=1,NCSIZ)                              MGP.508
 1385 FORMAT(4X,"SIZE",6X,15(F5.2,2X)/)                              MGP.509
 1390 IF(KEY .NE. LIST) GO TO 200                                    MGP.510
      IF(NCTRD .EQ. 0) GO TO 1397                                    MGP.511
      DO 1395 J = 1,NCTRD                                            MGP.512
      WRITE(6,1450) NDTRD(J),NMTRD(J),TRUN1(J),TRUN2(J)              MGP.513
 1395 CONTINUE                                                       MGP.514
 1397 IF(NCALP.EQ. 0) GO TO 1560                                     MGP.515
      GO TO 1535                                                     MGP.516
C                                                                    MGP.517
C       NUMERIC TRUNCATION                                           MGP.518
C*************************************************** TRUNCATE     **MGP.519
 1400 IF(KEY .NE. TRUNCA) GO TO 1500                                 MGP.520
      IF(IDEFT .NE. D) GO TO 1420                                    MGP.521
      NCTRD = 0                                                      MGP.522
      IF(.NOT. LISTIN) GO TO 200                                     MGP.523
      WRITE(6,1410)                                                  MGP.524
 1410 FORMAT("     NO NUMERIC TRUNCATION OF DATA"/)                  MGP.525
      GO TO 200                                                      MGP.526
 1420 NCTRD = 0                                                          MGP.527
 1430 J = NCTRD + 1                                                      MGP.528
      READ(IREAD ,1440) KEY,NMTRD(J),IDEFT,DDD,IQ                        MGP.529
 1440 FORMAT(A4,A4,1X,A1,6F10.0,F9.0,A1)                                 MGP.530
      IF(KEY .NE. IBLANK) GO TO 275                                      MGP.531
      NCTRD = J                                                          MGP.532
      NDTRD(J) = DDD(1) + 0.5                                            MGP.533
      TRUN1(J) = DDD(2)                                                  MGP.534
      TRUN2(J) = DDD(3)                                                  MGP.535
      IF(.NOT. LISTIN) GO TO 1430                                        MGP.536
      WRITE(6,1450) NDTRD(J),NMTRD(J),TRUN1(J),TRUN2(J)                  MGP.537
 1450 FORMAT(/,4X,"INCLUDE ONLY DATA FOR WHICH",I5,"-",A4," IS WITHIN THMGP.538
     1E RANGE",F10.2," TO ",F10.2," INCLUSIVE"/)                         MGP.539
      GO TO 1430                                                         MGP.540
C                                                                        MGP.541
C      ALPHA TRUNCATION                                                  MGP.542
C********************************************************* ALPHA-OK   **MGP.543
 1500 IF(KEY .NE. ALPHA) GO TO 1600                                      MGP.544
      IF(IDEFT .NE. 0) GO TO 1520                                        MGP.545
      NCALP = 0                                                          MGP.546
      IF(.NOT. LISTIN) GO TO 200                                         MGP.547
      WRITE(6,1510)                                                      MGP.548
 1510 FORMAT("     NO ALPHANUMERIC TRUNCATION"/)                         MGP.549
      GO TO 200                                                          MGP.550
 1520 NCALP = DDD(1) + 0.5                                               MGP.551
      READ(IREAD ,1530) (IQOK(I),I=1,NCALP)                              MGP.552
 1530 FORMAT(15(4X,A1))                                                  MGP.553
      NMALP = 4H IQ                                                      MGP.554
 1535 IF(.NOT. LISTIN) GO TO 1550                                        MGP.555
      WRITE(6,1540) NMALP,NCALP,(IQOK(I),I=1,NCALP)                      MGP.556
 1540 FORMAT(4X,A4," CAN HAVE",I5," VALUES",/10X,15(4X,A1))              MGP.557
 1550 IF(KEY .NE. LIST) GO TO 200                                        MGP.558
 1560 IF(MSTER .EQ. 0) GO TO 1730                                        MGP.559
      GO TO 1625                                                         MGP.560
C                                                                        MGP.561
C      STEREO                                                            MGP.562
C********************************************************* STEREO     **MGP.563
 1600 IF(KEY .NE. STEREO) GO TO 1700                                     MGP.564
      IF(IDEFT .NE. 0) GO TO 1620                                        MGP.565
      MSTER = 0                                                          MGP.566
      ELAT = 0.0                                                         MGP.567
      ELON = 0.0                                                         MGP.568
      IF(.NOT. LISTIN) GO TO 200                                         MGP.569
      WRITE(6,1610)                                                      MGP.570
 1610 FORMAT("     NO STEREO"/)                                          MGP.571
      GO TO 200                                                          MGP.572
 1620 MSTER = 1                                                          MGP.573
      EYHT = DDD(1)                                                      MGP.574
      EYSEP = DDD(2)                                                     MGP.575
      EYSOP = EYSEP/2.0                                                  MGP.576
      ELAT = DDD(3)                                                      MGP.577
      ELON = DDD(4)                                                      MGP.578
      PAPD = DDD(5)                                                      MGP.579
 1625 IF(.NOT. LISTIN) GO TO 200                                         MGP.580
      WRITE(6,1630) EYHT,EYSEP,ELAT,ELON,PAPD                            MGP.581
 1630 FORMAT("   STEREO PLOT"/                                           MGP.582
     1 "        EYE HEIGHT =",F10.2/,                                    MGP.583
     2 "        EYE SEPARATION =",F10.2,/,                               MGP.584
     3 "        LAT AND LON OF VIEW POINT =",2F10.2,/,                   MGP.585
     4 "        PAPER DEPTH =",F10.2/)                                   MGP.586
      IF(KEY .EQ. LIST) GO TO 1730                                       MGP.587
      GO TO 200                                                         MGP.588
C                                                                       MGP.589
C      BOUNDARY OF MAP                                                  MGP.590
C********************************************************** BOUNDARY **MGP.591
 1700 IF(KEY .NE. BOUNDA) GO TO 1800                                    MGP.592
      IF(IDEFT .NE. D) GO TO 1720                                       MGP.593
      ALAT1 = 58.                                                       MGP.594
      ALAT2 = 64.                                                       MGP.595
      ALON1 = -156.                                                     MGP.596
      ALON2 = -144.                                                     MGP.597
      IF(.NOT. LISTIN) GO TO 1730                                       MGP.598
      WRITE(6,1710)                                                     MGP.599
 1710 FORMAT("    DEFAULT")                                             MGP.600
      GO TO 1730                                                        MGP.601
 1720 ALAT1 = DDD(1)                                                    MGP.602
      ALAT2 = DDD(2)                                                    MGP.603
      ALON1 = DDD(3)                                                    MGP.604
      ALON2 = DDD(4)                                                    MGP.605
 1730 IF(.NOT. LISTIN) GO TO 1750                                       MGP.606
      WRITE(6,1740) ALAT1,ALAT2,ALON1,ALON2                             MGP.607
 1740 FORMAT("    MAP BOUNDARIES   LATITUDE    LONGITUDE"/              MGP.608
     1  19X,2F6.2,4X,2F7.2/)                                            MGP.609
 1750 IF(KEY .NE. LIST) GO TO 200                                       MGP.610
      IF(NLINE .EQ. 0) GO TO 1930                                       MGP.611
      GO TO 1835                                                        MGP.612
C                                                                       MGP.613
C      TITLE                                                            MGP.614
C********************************************************** TITLE    **MGP.615
 1800 IF(KEY .NE. TITLE) GO TO 1900                                     MGP.616
      IF(IDEFT .NE. D) GO TO 1620                                       MGP.617
      NLINE = 0                                                         MGP.618
      HCHAR = 0.16                                                      MGP.619
      IF(.NOT. LISTIN) GO TO 200                                        MGP.620
      WRITE(6,1810)                                                     MGP.621
 1810 FORMAT("    NO TITLE"/)                                           MGP.622
      GO TO 200                                                         MGP.623
 1820 HCHAR = DDD(1)                                                    MGP.624
      NLINE = DDD(2) + 0.5                                              MGP.625
      NCHAR = DDD(3) + 0.5                                              MGP.626
      IF((NLINE .LE. 0) .OR. (NLINE .GE. 6)) GO TO 200                  MGP.627
      READ(IREAD ,205) (CHARR(J),J=1,NLINE)                             MGP.628
 1835 IF(.NOT. LISTIN) GO TO 1850                                       MGP.630
      WRITE(6,1840) HCHAR,NLINE,NCHAR                                   MGP.631
 1840 FORMAT("    TITLE"/                                               MGP.632
     1  "         CHARACTER HEIGHT =",F10.2/,                           MGP.633
     2  "         NUMBER OF LINES =",I5/                                MGP.634
     3  "         LONGEST LINE =",I5/)                                  MGP.635
 1850 IF(KEY .EQ. LIST) GO TO 1930                                      MGP.636
      GO TO 200                                                         MGP.637
C                                                                       MGP.638
C      MAP PROJECTION                                                   MGP.639
C********************************************************** PROJECT  **MGP.640
 1900 IF(KEY .NE. PROJEC) GO TO 2000                                    MGP.641
      IF(IDEFT .NE. D) GO TO 1920                                       MGP.642
      MAPRO = 3                                                         MGP.643
      IROT = 0                                                          MGP.644
      XMN = -5.                                                         MGP.645
      XMULT = 1.0
      YMULT = 1.0
      XMX = 12.                                                         MGP.646
      IF(.NOT. LISTIN) GO TO 1930                                       MGP.647
      WRITE(6,1910)                                                     MGP.648
 1910 FORMAT("     DEFAULT")                                            MGP.649
      GO TO 1930                                                        MGP.650
 1920 MAPRO = DDD(1) + 0.5                                              MGP.651
      IROT = DDD(2) + 0.5                                               MGP.652
      XMN = DDD(3)                                                      MGP.653
      XMX = DDD(4)                                                      MGP.654
      XMULT = DDD(5)
      IF(XMULT .EQ. 0) XMULT = 1.0
      YMULT = DDD(6)
      IF(YMULT .EQ.  0 ) YMULT = 1.0
 1930 IF(.NOT. LISTIN) GO TO 1950                                       MGP.655
      WRITE(6,1940) MAPRO,IROT,XMN,XMX,XMULT,YMULT                      MGP.656
 1940 FORMAT("     MAP PROJECTION CODE   IROT"/                         MGP.657
     1  10X,I2,15X,I1/                                                  MGP.658
     2  "      WITH RESPECT TO LOWER LEFT CORNER OF MAP, MINIMUM AND" , MGP.659
     3  " MAXIMUM X VALUES ARE"/,                                       MGP.660
     3  15X,2F10.2/,"     X AND Y MULTIPLIERS ARE"/,15X,2F10.3/)
 1950 IF(KEY .EQ. LIST) GO TO 2062                                      MGP.662
      CALL PLTT(XMN,0.,-60)                                             MGP.663
      CALL PLTT(XMX,29.5,+60)                                           MGP.664
      GO TO 200                                                         MGP.665
C                                                                       MGP.666
C      MAP SCALE                                                        MGP.667
C*********************************************************** SCALE    **MGP.668
 2000 IF(KEY .NE. SCALE) GO TO 2100                                     MGP.669
      IF(IDEFT .NE. D) GO TO 2020                                       MGP.670
      ALFA1 = 60.6666                                                   MGP.671
      ALFA2 = 63.3333                                                   MGP.672
      SKALE = 11.71                                                     MGP.673
      OBLAT = 0.0                                                       MGP.674
      OBLON = 0.0                                                       MGP.675
      PSKALE = .0                                                       MGP.676
      FLAT = 0.0                                                        MGP.677
      IF(.NOT. LISTIN) GO TO 2060                                       MGP.678
      WRITE(6,2010)                                                     MGP.679
 2010 FORMAT("     DEFAULT")                                            MGP.680
      GO TO 2060                                                        MGP.681
 2020 GO TO (2025,2025,2025,2030,2035,2040),MAPRO                       MGP.682
 2025 ALFA1 = DDD(1)                                                    MGP.683
      ALFA2 = DDD(2)                                                    MGP.684
      SKALE = DDD(3)                                                    MGP.685
      PSKALE = DDD(4)                                                   MGP.686
      FLAT = DDD(5)                                                     MGP.687
      OBLAT = DDD(6)                                                    MGP.688
      OBLON = DDD(7)                                                    MGP.689
      GO TO 2060                                                        MGP.690
 2030 QSKALE = DDD(1)                                                   MGP.691
      PSKALE = DDD(2)                                                   MGP.692
      FLAT = DDD(3)                                                     MGP.693
      OBLAT = DDD(4)                                                    MGP.694
      OBLON = DDD(5)                                                    MGP.695
      GO TO 2060                                                        MGP.696
 2035 CMER = DDD(1)                                                     MGP.697
      QSKALE = DDD(2)                                                   MGP.698
      FLAT = DDD(3)                                                     MGP.699
      PSKALE = 0.0                                                      MGP.700
      GO TO 2060                                                        MGP.701
 2040 QSKALE = DDD(1)                                                   MGP.702
      FLAT = DDD(2)                                                     MGP.703
      OBLAT = DDD(3)                                                    MGP.704
      OBLON = DDD(4)
      PSKALE = 0.
 2060 IREV=1
      ROTA = 0.0
      SHIFT = 0.0
      NC = 0
      SINTH = 10.0
 2062 IF(.NOT. LISTIN) GO TO 2090
      GO TO (2065,2070,2075,2080,2085,2088),MAPRO
 2065 WRITE(6,2067) ALFA1,ALFA2,SKALE
 2067 FORMAT(/" CENTRAL PROJECTION CONIC "/
     1        /" STANDARD PARALLELS   INCHES BETWEEN THEM"/2F10.5,9X,
     2  F5.2/)
      GO TO 2083
 2070 WRITE(6,2072) ALFA1,ALFA2,SKALE
 2072 FORMAT(/" ALBERS EQUAL AREA CONIC PROJECTION "/
     1        /" STANDARD PARALLELS   INCHES BETWEEN THEM"/2F10.5,T30,
     2  F5.2/)
      GO TO 2083
 2075 WRITE(6,2077) ALFA1,ALFA2,SKALE
 2077 FORMAT(/" LAMBERT CONFORMAL CONIC PROJECTION "/
     1        /" STANDARD PARALLELS   INCHES BETWEEN THEM"/2F10.5,T30,
     2  F5.2/)
      GO TO 2083
 2080 WRITE(6,2082) QSKALE,OBLAT,OBLON,PSKALE
 2082 FORMAT(/" MERCATORS  PROJECTION "//1X,F10.5," INCHES PER DEGREE",
     1 " LONGITUDE"/" PROJECTION POLE  LAT                LON          ",
     3 "WINDOW",/,6X,3F15.2/)
      GO TO 2090
 2083 WRITE(6,2084) OBLAT,OBLON,PSKALE
 2084 FORMAT(" PROJECTION POLE  LAT               LON           SKALE",
     1  /,6X,3F15.2/)
      GO TO 2090
 2085 WRITE(6,2087) CMER,QSKALE,FLAT
 2087 FORMAT(/21H POLYCONIC PROJECTION ,//,1X,F10.3,20H CENTRAL MERIDIAN
     1    ,F10.0,13H MAP SCALE    ,F10.6,17H EARTH FLATTENING )
      GO TO 2090
 2088 WRITE(6,2089) QSKALE,FLAT,OBLAT,OBLON
 2089 FORMAT(34H AZIMUTHAL EQUIDISTANT PROJECTION ,//,
     1  62H       SCALE   EARTH FLATTENING   PROJECTION POLE LAT       LO
     2N,/,1X,F10.2,9X,F10.6,12X,2F10.3)
 2090 CONTINUE
      IF(KEY .EQ. LIST) GO TO 2098
      CALL CONVRT(ALAT1,ALON1,A1,B1)
      CALL CONVRT(ALAT1,ALON2,A2,B2)
      R = SQRT((A2-A1)**2+(B2-B1)**2)
      SINTH = (B2-B1)/R
      COSTH = (A2-A1)/R
      SHFTH = 0.0
C        DIF IS LONGITUDE FROM 1 TO 2 CLOCKWISE.
      DIF = ALON2 - ALON1
      IF(DIF .LT. 0.0) DIF = 360  + DIF
      A     = ALON1 + DIF*0.5
      CALL CONVRT(ALAT1,A,A1,B1)
      SHFTH = -B1
      ROTC = ATAN2(B2-B1,A2-A1)
C------- X PRIME = X*COSTH + Y*SINTH
C------- Y PRIME =-X*SINTH + Y*COSTH + SHFTH
      IF(IROT .EQ. 0) GO TO 2092
      CALL CONVRT(ALAT1,ALON1,A1,B1)
      CALL CONVRT(ALAT1,ALON2,A2,B2)
      SHIFT = SQRT((A2-A1)**2+(B2-B1)**2)                               MGP.766
      ROTA = PI*0.5                                                     MGP.767
      SINRA = SIN(ROTA)                                                 MGP.768
      COSRA = COS(ROTA)                                                 MGP.769
C------- CALCULATE INCHES PER DEGREE, SINPD. ------------               MGP.770
C------- CALCULATE INCHES PER KILOMETER, SINPK                          MGP.771
 2092 IF(MAPRO .EQ. 4) GO TO 2093                                       MGP.772
      IF(MAPRO .GE. 5) GO TO 2097                                       MGP.773
      IF(PSKALE .LE. 0.0) GO TO 2096                                    MGP.774
      SINPD = 4.4*(10.**6)/PSKALE                                       MGP.775
      SINPK = SINPD/111.                                                MGP.776
      A = (ALAT1 + ALAT2)*0.5                                           MGP.777
      B = (ALON1 + ALON2)*0.5                                           MGP.778
      A = FLATC(A,FLAT)                                                 MGP.779
      CALL NEWPOL(A,B,X,Y,OBLAT,OBLON)                                  MGP.780
      IF(.NOT. LISTIN) GO TO 2098                                       MGP.781
      WRITE(6,2094) X,Y                                                 MGP.782
      GO TO 2098                                                        MGP.783
 2093 A = (ALAT1 + ALAT2)*RPD*0.5                                       MGP.784
      IF(PSKALE .NE. 1.0) GO TO 2095                                    MGP.785
      A = A/RPD                                                         MGP.786
      B = (ALON1 + ALON2)*0.5                                           MGP.787
      A = FLATC(A,FLAT)                                                 MGP.788
      CALL NEWPOL(A,B,X,Y,OBLAT,OBLON)                                  MGP.789
C------- X IS NOW THE LAT OF MAP CENTER WRT OBLIQUE POLE.               MGP.790
      IF(.NOT. LISTIN) GO TO 20941                                      MGP.791
      WRITE(6,2094) X,Y                                                 MGP.792
 2094 FORMAT(/" WITH RESPECT TO THE OBLIQUE POLE THE MAP CENTER IS AT ",MGP.793
     1  2F10.2)                                                         MGP.794
20941 A = X*RPD                                                         MGP.795
 2095 SINPD = QSKALE/COS(A)                                             MGP.796
      SINPK = SINPD/111.                                                MGP.797
      GO TO 2098                                                        MGP.798
 2096 SINPD = SKALE/(ALFA2-ALFA1)                                       MGP.799
      SINPK = SKALE/((ALFA2-ALFA1)*111.)                                MGP.800
      GO TO 2098                                                        MGP.801
 2097 SINPD = 4.4*(10.**6)/QSKALE                                       MGP.802
      SINPK = SINPD/111                                                 MGP.803
 2098 IF(.NOT. LISTIN) GO TO (150,200),ISTART                           MGP.804
      WRITE(6,2099) SINPD,SINPK,FLAT                                    MGP.805
 2099 FORMAT (/1X,F10.5," INCHES PER DEGREE LAT."/                      MGP.806
     1  1X,F10.5," INCHES PER KILOMETER "/,                             MGP.807
     1 1X,F10.5," EARTH FLATTENING CONSTANT"/)                          MGP.808
      IF(KEY .EQ. LIST) GO TO 2122                                      MGP.809
      GO TO 200                                                         MGP.810
C                                                                       MGP.811
C      SCALE ADJUSTMENT                                                 MGP.812
C********************************************************* ADJUST     **MGP.813
 2100 IF(KEY .NE. ADJUST) GO TO 2200                                    MGP.814
      IF(IDEFT .NE. 0) GO TO 2120                                       MGP.815
      WRITE(6,2110)                                                     MGP.816
 2110 FORMAT("    NO DEFAULT POSSIBLE FOR ADJUSTMENT"/)                 MGP.817
      GO TO 200                                                         MGP.818
 2120 AAL1 = DDD(1)                                                     MGP.819
      OOL1 = DDD(2)                                                     MGP.820
      AAL2 = DDD(3)                                                     MGP.821
      OOL2 = DDD(4)                                                     MGP.822
      XDIST = DDD(5)                                                    MGP.823
 2122 IF(.NOT. LISTIN) GO TO 2127                                       MGP.824
      IF(XDIST .EQ. 0.0) GO TO 2127                                     MGP.825
      WRITE(6,2125) AAL1,OOL1,AAL2,OOL2,XDIST                           MGP.826
 2125 FORMAT(/"  SET SCALE SO THAT THE DISTANCE BETWEEN ",2F10.2," AND",MGP.827
     1  2F10.2," =",F10.2," INCHES"/)                                 MGP.828
 2127 IF(KEY .EQ. LIST) GO TO 2225                                     MGP.829
      IF(XDIST .EQ. 0.0) GO TO 200                                     MGP.830
      IF(PSKALE .GE. 0.0) GO TO 2130                                   MGP.831
C-------- CONVERT TO OBLIQUE COORDINATES.                              MGP.832
      AAL1 = FLATC(AAL1,FLAT)                                          MGP.833
      CALL NEWPOL(AAL1,OOL1,X,Y,OBLAT,OBLON)                           MGP.834
      AAL1 = X                                                         MGP.835
      OOL1 = Y                                                         MGP.836
      AAL2 = FLATC(AAL2,FLAT)                                          MGP.837
      CALL NEWPOL(AAL2,OOL2,X,Y,OBLAT,OBLON)                           MGP.838
      AAL2 = X                                                         MGP.839
      OOL2 = Y                                                         MGP.840
 2130 CALL CONVRT(AAL1,OOL1,X1,Y1)                                     MGP.841
      CALL CONVRT(AAL2,OOL2,X2,Y2)                                     MGP.842
      DIS = SQRT((X2-X1)**2+(Y2-Y1)**2)                                MGP.843
      IF(MAPRO .EQ. 4) GO TO 2135                                      MGP.844
      IF(MAPRO .GE. 5) GO TO 2140                                      MGP.845
      IF(PSKALE .LE. 0.0) SKALE = SKALE*XDIST/DIS                      MGP.846
      IF(PSKALE .GT. 0.0) PSKALE = PSKALE*DIS/XDIST                    MGP.847
      GO TO 2145                                                       MGP.848
 2135 QSKALE = QSKALE*XDIST/DIS                                        MGP.849
      GO TO 2145                                                       MGP.850
 2140 QSKALE = QSKALE*DIS/XDIST                                        MGP.851
 2145 IREV = 2                                                         MGP.852
      GO TO 2060                                                       MGP.853
C                                                                      MGP.854
C      TIC MARKS                                                       MGP.855
C******************************************************** TIC       **MGP.856
 2200 IF(KEY .NE. TIC) GO TO 2300                                      MGP.857
      IF(IDEFT .NE. 0) GO TO 2220                                      MGP.858
      ATINC = 1.0                                                      MGP.859
      ONINC = 1.0                                                      MGP.860
      ATEDG = 1.0                                                      MGP.861
      ONEDG = 1.0                                                      MGP.862
      TICSZ = .16
      IF(.NOT. LISTIN) GO TO 2225                                      MGP.863
      WRITE(6,2210)                                                    MGP.864
 2210 FORMAT("     DEFAULT")                                           MGP.865
      GO TO 2225                                                       MGP.866
 2220 ATINC = DDD(1)                                                   MGP.867
      ONINC = DDD(2)                                                   MGP.868
      ATEDG = DDD(3)                                                   MGP.869
      ONEDG = DDD(4)                                                   MGP.870
      TICSZ = DDD(5)
      IF(ATINC .LE. 0.0) ATINC = 4.0                                   MGP.871
      IF(ONINC .LE. 0.0) ONINC = 8.0                                   MGP.872
      IF(ATEDG .LE. 0) ATEDG = ATINC                                   MGP.873
      IF(ONEDG .LE. 0) ONEDG = ONINC                                   MGP.874
 2225 IF(.NOT. LISTIN) GO TO 2240                                      MGP.875
      WRITE(6,2230) ATEDG,ONEDG,ATINC,ONINC                            MGP.876
 2230 FORMAT("      TIC MARK SPACING    LAT    LON"/,                  MGP.877
     1  "      ON MAP EDGE",5X,2F6.2,/,                                MGP.878
     2  "      WITHIN MAP",6X,2F6.2/)                                  MGP.879
 2240 IF(KEY .EQ. LIST) GO TO 2635                                     MGP.880
      GO TO 200                                                        MGP.881
C                                                                      MGP.882
C      DRAW MAP                                                        MGP.883
C******************************************************** MAP       **MGP.884
 2300 IF(KEY .NE. MAP) GO TO 2400                                      MGP.885
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      MORSE = 0                                                         MGP. 886
      AZPL = DDD(1)                                                     MGP. 887
      DPPL = DDD(2)                                                     MGP. 888
      IF(IDEFT .NE. 0) GO TO 2320                                       MGP. 889
      GO TO 200                                                         MGP. 890
 2320 CONTINUE                                                          MGP. 891
      MORXK = KEY                                                       MGP. 892
 2324 CONTINUE                                                          MGP. 895
      WRITE(6,2325)                                                     MGP. 896
 2325 FORMAT("   EPICENTER MAP"/)                                       MGP. 897
      IF(DPPL .NE. 0.0) WRITE(6,2327) AZPL,DPPL                         MGP. 898
 2327 FORMAT(55H PROJECT MAPPED POINTS FROM A PLANE WHOSE PLUNGE VECTOR,MGP. 899
     1  8H STRIKES,F10.2,9H AND DIPS,F10.2/)                            MGP. 900
      CALL BEFPLT                                                       MGP. 901
      IF((KEY .EQ. ADDQUA) .OR. (KEY .EQ. REPLOT)) GO TO 2350           MGP. 902
      CALL MAPOUT
 2350 CALL FORMS(1,.4,XMNPL,0.)                                         MGP. 925
      ITRUE = 0                                                         MGP. 926
      IF((ELAT .EQ. 0.0) .AND. (ELON .EQ. 0.0)) GO TO 2355              MGP. 927
      ITRUE = 1                                                         MGP. 928
      CALL CONVRT(ELAT,ELON,EYX,EYY)                                    MGP. 929
      IF(MAXDA .EQ. 0) GO TO 200                                        MGP. 930
      IF(NPLOT .EQ. 0) GO TO 200                                        MGP. 931
C------- SORT DATA. -----                                               MGP. 932
 2355 XINT = (XMAX + 1.)/10.                                            MGP. 933
      IF(MAXDA .GT. 3) CALL PLSORT                                      MGP. 934
C------- PLOT MAP. -------                                              MGP. 935
      MST = 1                                                           MGP. 936
      IF(MSTER .NE. 0) MST = 2                                          MGP. 937
      DO 2360 MIT = 1,MST                                               MGP. 938
      WRITE(6,2357)                                                     MGP. 939
 2357 FORMAT("    PLOT POINTS ON MAP"/)
 2360 CALL TOLPDA                                                       MGP. 941
      CALL FORMS(6,.4,XMNPL,0.)                                         MGP. 942
      IF(MOREQ .EQ. 0) GO TO 200                                        MGP. 943
      KEY = ADDQUA                                                      MGP. 944
      GO TO 910                                                         MGP. 945
C                                                                       MGP. 946
C      DRAW LINES                                                       MGP. 947
C********************************************************* LINES      **MGP. 948
 2400 IF(KEY .NE. LINES) GO TO 2500                                     MGP. 949
      LFILE=DDD(2)+.5                                                   MGP. 950
      IF (LFILE.EQ.0) LFILE=5                                           MGP. 951
      IF (IDEFT.NE.JR) GO TO 2405                                       MGP. 952
      REWIND LFILE                                                      MGP. 953
      WRITE (6,2940) LFILE                                              MGP. 954
 2405 WRITE (6,2410) LFILE                                              MGP. 955
 2410 FORMAT (/ 39H  LINES...   READ LINE DATA ON FILE TAPE ,I2)        MGP. 956
 2420 NFPC = DDD(1) + 0.5                                               MGP. 957
      IF(NPPC .GT. 0) CALL LINPLT                                       MGP. 958
      CALL FORMS(8,.4,XMNPL,0.)                                         MGP. 959
      GO TO 200                                                         MGP. 960
C                                                                       MGP. 961
C      DRAW GREAT CIRCLE GRID POINTS                                    MGP. 962
C********************************************************* GREAT-CIR  **MGP. 963
 2500 IF(KEY .NE. GREATC) GO TO 2600                                    MGP. 964
      IF(IDEFT .EQ. 0) GO TO 200                                        MGP. 965
      CALL GRIDPT(DDD)                                                  MGP. 966
      CALL SYMBOL(XMN,0.,0.4,1H+,0.,1)                                  MGP. 967
      GO TO 200                                                         MGP. 968
                                                                        MGP. 969
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C     X-SECTION SPECIFICATIONS                                          MGP. 970
C******************************************************** X-SPEC     **MGP. 971
 2600 IF(KEY .NE. XSPEC) GO TO 2700                                     MGP. 972
      IF(IDEFT .NE. D) GO TO 2620                                       MGP. 973
      VLA = 60.5                                                        MGP. 974
      VLO = -152.                                                       MGP. 975
      WIDVW = 300.                                                      MGP. 976
      DINC = 50.                                                        MGP. 977
      NOAZM = 1                                                         MGP. 978
      NOSEC = 1                                                         MGP. 979
      NOP1 = NOSEC + 1                                                  MGP. 980
      AZVW(1) = 20.                                                     MGP. 981
      DSVW(1) = -150.                                                   MGP. 982
      DSVW(2) = 150.                                                    MGP. 983
      ZMAX = 200.                                                       MGP. 984
      ZINC = 100.                                                       MGP. 985
      IF(.NOT. LISTIN) GO TO 2635                                       MGP. 986
      WRITE(6,2610)                                                     MGP. 987
 2610 FORMAT("     DEFAULT")                                            MGP. 988
      GO TO 2635                                                        MGP. 989
 2620 VLA = DDD(1)                                                      MGP. 990
      VLO = DDD(2)                                                      MGP. 991
      WIDVW = DDD(3)                                                    MGP. 992
      DINC = DDD(4)                                                     MGP. 993
      NOAZM = DDD(5) + 0.5                                              MGP. 994
      NOSEC = DDD(6) + 0.5                                              MGP. 995
      NOP1 = NOSEC + 1                                                  MGP. 996
C ------- READ IN LAT AND LON OF VIEW POINT, WIDTH OF VIEW IN KM,       MGP. 997
C          INCREMENTS ALONG WIDTH, NO. OF AZMUTHS, NO. OF SECTIONS PER AZM.MGP. 998
      READ(IREAD ,2625) (AZVW(I),I=1,NOAZM)                             MGP. 999
 2625 FORMAT(16F5.2)                                                    MGP. 1000
      READ(IREAD ,2625) (DSVW(I),I=1,NOP1)                              MGP. 1001
      READ(IREAD ,2630) ZMAX,ZINC                                       MGP. 1002
 2630 FORMAT(2F10.2)                                                    MGP. 1003
 2635 IF(.NOT. LISTIN) GO TO 2660                                       MGP. 1004
      WRITE(6,2640) VLA,VLO,WIDVW,DINC,NOAZM,NOSEC,ZMAX,ZINC            MGP. 1005
 2640 FORMAT(/"    VERTICAL SECTION PLOT CENTERED AT ",2F10.2/,         MGP. 1006
     1 ' WIDTH OF VIEW  WIDTH INCREMENTS  NO. OF AZMUTHS  NO. OF SECTIONMGP. 1007
     2S PER AZMUTH  MAX. DEPTH  DEPTH INCREMENTS",/                     MGP. 1008
     3 4X,F10.2,8X,F10.2,6X,I10,18X,I10,2X,F10.2,8X,F10.2)              MGP. 1009
      WRITE(6,2645) (AZVW(I),I=1,NOAZM)                                 MGP. 1010
 2645 FORMAT(/" VIEW AZMUTHS ",/16F8.2)                                 MGP. 1011
      NOP1  = NOSEC + 1                                                 MGP. 1012
      WRITE(6,2650) (DSVW(I),I=1,NOP1)                                  MGP. 1013
 2650 FORMAT(/"    LIMITS OF SECTIONS",/3X,16F8.2/)                     MGP. 1014
 2660 IF(KEY .EQ. LIST) GO TO 3125                                      MGP. 1015
      GO TO 200                                                         MGP. 1016
C                                                                       MGP. 1017
C       DRAW X-SECTION                                                  MGP. 1018
C******************************************************** SECTION    **MGP. 1019
 2700 IF(KEY .NE. SECTIO)  GO TO 2800                                   MGP. 1020
      MORSE = 1                                                         MGP. 1021
      IF(IDEFT .NE. D) GO TO 2710                                       MGP. 1022
      GO TO 200                                                         MGP. 1023
 2710 CONTINUE                                                          MGP. 1024
      MORXK = KEY                                                       MGP. 1025
      ANEWX = XMAX + 10.                                                MGP. 1026
      XMAX = WIDVW*SINPK                                                MGP. 1027
      OLDOFF = YOFF                                                     MGP. 1028
      IOUT = 0                                                          MGP. 1029
      YMAX = SINPK*ZMAX                                                 MGP. 1030
      YOFF = 3.*HCHAR*(1+NLINE) + YMAX                                  MGP.1031
      SORD = 3.*HCHAR*(2+NLINE)                                         MGP.1032
C------- ENTER WITH MORE QUAKES                                         MGP.1033
 2715 CONTINUE                                                          MGP.1034
      WRITE(6,2716)                                                     MGP.1035
 2716 FORMAT("     X-SECTION PLOT"/)                                    MGP.1036
      CALL BEFPLT                                                       MGP.1037
      ITRUE = 0                                                         MGP.1038
      MST = 1                                                           MGP.1039
      IF(MSTER .EQ. 1) MST = 2                                          MGP.1040
      IF(NPLOT .EQ. 0) GO TO 2770                                       MGP.1041
      DO 2720 N = 1,MAXDA                                               MGP.1042
      XXSV(N) = XXX(N)                                                  MGP.1043
      YYSV(N) = YYY(N)                                                  MGP.1044
 2720 CONTINUE                                                          MGP.1045
      DO 2730 I = 1,NOP1                                                MGP.1046
      DSVIN(I) = DSVW(I)*SINPK                                          MGP.1047
 2730 CONTINUE                                                          MGP.1048
      IF((KEY .NE. ADDQUA) .AND. (KEY .NE. REPLOT)) GO TO 2718          MGP.1049
C------- MOVE ORIGIN BACK TO START OF X-SECTIONS                        MGP.1050
      CALL PLTT(-XSHFT,0.0,-3)                                          MGP.1051
      GO TO 2735                                                        MGP.1052
 2718 CONTINUE                                                          MGP.1053
C------- MOVE ORIGIN TO RIGHT OF LAST PLOT                              MGP.1054
C          AND ON PAPER EDGE WITH X = 0.                                MGP.1055
      RELY = YOFF -OLDOFF                                               MGP.1056
      CALL PLTT(ANEWX,RELY,-103)
      VSNEWX = ANEWX                                                    MGP.1058
      IF (NEWVS .EQ. 1) VSNEWX = -XMN                                   MGP.1059
      NEWVS = 0                                                         MGP.1060
      CALL PLTT(VSNEWX,RELY,-203)
 2735 XSHFT = 0.0                                                       MGP.1062
      IF(SHIF .EQ. 0) GO TO 2737
      CALL PLTT(SHIFX,SHIFY,230)
      SHIF = 0
 2737 DO 2750 IIAZM = 1,NOAZM                                           MGP.1063
      AZMU = AZVW(IIAZM)*RPD                                            MGP.1064
      PPAZ = AZMU + PI/2.0                                              MGP.1065
      CTH = COS(AZMU)                                                   MGP.1066
      STH = SIN(AZMU)                                                   MGP.1067
      CALL CONVRT(VLA,VLO,X1,Y1)                                        MGP.1068
      CALL XOSECT                                                       MGP.1069
      XINT = (XMAX + 1.0)/10.0                                          MGP.1070
      CALL PLSORT                                                       MGP.1071
      DO 2750 JSEC = 1,NOSEC                                            MGP.1072
C------- SET PLOT LIMITS                                                MGP.1076
      CALL FORMS(0,.4,XMNPL,0.)
      IF(IOUT .EQ. 0) CALL OUTLIN                                       MGP.1077
      XMNPL = XMN + .2                                                  MGP.1078
      CALL FORMS(1,.4,XMNPL,0.)                                         MGP.1079
      DO 2740 MIT = 1,MST                                               MGP.1080
 2740 CALL TOLPDA                                                       MGP.1081
      CALL FORMS(6,.4,XMNPL,0.)                                         MGP.1082
      WRITE(6,2742) AZVW(IIAZM)                                         MGP.1083
 2742 FORMAT("     PLOTTED X-SECTION WITH AZ OF VIEW = ", F6.2/)        MGP.1084
      IF((IIAZM .EQ. NOAZM) .AND. (JSEC .EQ. NOSEC)) GO TO 2755         MGP.1085
      Y = -9.*HCHAR                                                     MGP.1086
      X = XMAX + 5.0                                                    MGP.1087
      XSHFT = XSHFT + X                                                 MGP.1088
C------- MOVE ORIGIN OVER                                               MGP.1089
      CALL PLTT(X,0.0,-3)                                               MGP.1090
 2750 CONTINUE                                                              MGP.1091
 2755 IF (IOUT .EQ. 1) GO TO 2760
      RIGHT = XSHIFT + XMAX + 10.
      TOP = YOFF
      WRITE(6,2349) RIGHT, TOP
 2349 FORMAT("     PLOT DIMENSIONS:"/
     1 "          LENGTH ALONG EDGE OF PAPER = ",F6.2,"IN"/
     2 "          WIDTH OF PLOT =              ",F6.2,"IN"/)
 2760 IOUT = 1                                                              MGP.1092
      IF(MOREQ .EQ. 0) GO TO 200                                            MGP.1093
      KEY = ADDQUA                                                          MGP.1094
      GO TO 910                                                             MGP.1095
 2770 WRITE(6,2775)                                                         MGP.1096
 2775 FORMAT(/"  **** SKIP THIS PLOT ****  NO POINTS"/)                     MGP.1097
      ISKP = 1                                                              MGP.1098
      IF(MOREQ .EQ. 0) GO TO 200                                            MGP.1099
      KEY = ADDQUA                                                          MGP.1100
      GO TO 910                                                             MGP.1101
C                                                                           MGP.1102
C       RESET TO DEFAULT VALUES                                             MGP.1103
C******************************************************** RESET      **MGP.1104
 2800 IF(KEY .NE. RESET) GO TO 2900                                         MGP.1105
      GO TO 100                                                             MGP.1106
C                                                                           MGP.1107
C       ADD QUAKES                                                          MGP.1108
C******************************************************** ADD-QUAKES **MGP.1109
 2900 IF(KEY .NE. ADDQUA) GO TO 3000                                        MGP.1110
      IFILE =DDD(1)+.5                                                      MGP.1111
      IF (IFILE.EQ.0) IFILE=5                                               MGP.1112
      IF (IDEFT.NE.JR) GO TO 2945                                           MGP.1113
      REWIND IFILE                                                          MGP.1114
      WRITE (6,2940)  IFILE                                                 MGP.1115
 2940 FORMAT(/ 14H   REWIND TAPE ,I2)                                       MGP.1116
 2945 WRITE (6,2950) IFILE                                                  MGP.1117
 2950 FORMAT (/ 35H   QUAKES... READ DATA ON FILE TAPE ,I2)                 MGP.1118
      GO TO 910                                                             MGP.1119
C                                                                           MGP.1120
C       STOP                                                                MGP.1121
C******************************************************** STOP       **MGP.1122
 3000 IF(KEY .NE. STOP) GO TO 3100                                          MGP.1123
      WRITE(6,3010)                                                         MGP.1124
 3010 FORMAT("     ...STOP...  ")                                           MGP.1125
      IF (V .NE. 0.) WRITE(6,3020)                                          MGP.1126
 3020 FORMAT(1X,"   WAIT TO WRITE VERSATEC PLOT FILE..."/)                  MGP.1127
      CALL PLTT(0.,0.,99)                                                   MGP.1129
      GO TO 9900
C******************************************************** W-CONTROL  **MGP.1131
 3100 IF(KEY .NE. WCONT) GO TO 3200                                         MGP.1132
      IF(IDEFT .NE. D) GO TO 3120                                           MGP.1133
      NOFILE = 8                                                            MGP.1134
      IPRN = 3                                                              MGP.1135
      WRITE(6,3110) IPRN,NOFILE                                             MGP.1136
 3110 FORMAT("     DEFAULT WRITE CONTROL =",I2,"    OUTPUT LISTINGS ON ",MGP.1137
     1 "FILE",I2/)                                                          MGP.1138
      GO TO 3130                                                            MGP.1139
 3120 IF (DDD(1) .NE. 0.) IPRN = DDD(1)+0.2                                 MGP.1140
      IF (DDD(2) .NE. 0.) NOFILE = DDD(2)+0.2                               MGP.1141
 3125 IF(.NOT. LISTIN) GO TO 3150                                           MGP.1142
 3130 WRITE(6,3140) IPRN,NOFILE                                             MGP.1143
 3140 FORMAT("     WRITE CONTROL =",I2,"   OUTPUT LISTINGS ON FILE",I2/) MGP.1144
 3150 CONTINUE                                                              MGP.1145
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      IF(KEY .EQ. LIST) GO TO 3320                                      MGP. 1146
      GO TO 200                                                         MGP. 1147
C********************************************************** REPLOT     **MGP. 1148
 3200 IF(KEY .NE. REPLOT) GO TO 3300                                    MGP. 1149
 3220 WRITE(6,3230)                                                     MGP. 1150
 3230 FORMAT("     REPLOT"/)                                            MGP. 1151
      IF(MORXK .EQ. MAP) GO TO 2324                                     MGP. 1152
      IF(MORXK .EQ. SECTIO) GO TO 2715                                  MGP. 1153
      GO TO 200                                                         MGP. 1154
C********************************************************** YOUMIX     **MGP. 1155
 3300 IF (KEY .NE. YOUMIX) GO TO 3500                                   MGP. 1156
      MIX = DDD(1) + 0 5                                                MGP. 1157
      IF(.NOT. LISTIN) GO TO 3340                                       MGP. 1158
 3320 WRITE(6,3330) MIX                                                 MGP. 1159
 3330 FORMAT("     YOUMIX =",I2,".   IF EQUAL 1 CALL YOUMIX "/)         MGP. 1160
 3340 CONTINUE                                                          MGP. 1161
      IF(KEY .EQ. LIST) GO TO 3505                                      MGP. 1162
      GO TO 200                                                         MGP. 1163
C********************************************************** SHIFT      **MGP. 1164
 3500 IF(KEY.NE.SLIDE) GO TO 3600                                       MGP. 1165
      SHIF = 1
      SHIFX = DDD(1)
      SHIFY = DDD(2)
      IF (.NOT. LISTIN) GO TO 3520                                      MGP. 1167
 3505 WRITE(6,3510) (DDD(I),I=1,4)                                      MGP. 1168
 3510 FORMAT("     SHIFT VERSATEC        NOT AVAILABLE"/,               MGP. 1169
     1      "            DX      DY        DX      DY"/,                 MGP. 1170
     2   5X,2F7 1,2X,2F7.1/)                                            MGP. 1171
 3520 CONTINUE                                                          MGP. 1172
      IF (KEY .EQ. LIST) GO TO 3835                                     MGP. 1173
      GO TO 200                                                         MGP. 1174
C********************************************************** SYMKEY     **MGP. 1175
 3600 IF(KEY NE.SYMKEY) GO TO 3700                                      MGP. 1176
      WRITE(6,3620)                                                     MGP. 1177
 3620 FORMAT(/10X,16H DRAW SYMBOL KEY)                                  MGP. 1178
      ANEWX = XMAX + 5.                                                 MGP. 1179
      OLDOFF = YOFF                                                     MGP. 1180
      CALL PLTT(ANEWX,-OLDOFF,-103)
      VSNEWX = ANEWX                                                    MGP. 1182
      IF (NEWVS .EQ. 1) VSNEWX = -XMN                                   MGP. 1183
      NEWVS = 0                                                         MGP. 1184
      CALL PLTT(VSNEWX,-OLDOFF,-203)
      CALL SYMTAB(1.0,1.0)                                              MGP. 1186
      GO TO 200                                                         MGP. 1187
C**********************************************************  NEWVP     **MGP. 1188
 3700 IF (KEY .NE. NEWVP) GO TO 3800                                    MGP. 1189
      CALL PLTT(0.,0.,279)
      NEWVS = 1                                                         MGP. 1191
      WRITE(6,3740)                                                     MGP. 1192
 3740 FORMAT("     START NEW vERSATEC FRAME"/)                          MGP. 1193
      GO TO 200                                                         MGP. 1194
C**********************************************************  PEN       **MGP. 1195
 3800 IF (KEY .NE. PEN) GO TO 3900                                      MGP. 1196
      IF (V  EQ. 0.) GO TO 200                                          MGP. 1197
      IF (IDEFT .NE. "D") GO TO 3820                                    MGP. 1198
      XPEN = 1.                                                         MGP. 1199
      GO TO 3830                                                        MGP. 1200
 3820 XPEN = DDD(1)
 3830 CALL PLTT(XPEN,0.,215)
      IF (.NOT. LISTIN) GO TO 3850                                      MGP. 1203
 3835 WRITE(6,3840) XPEN                                                MGP. 1204
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3840 FORMAT("     VERSATEC PEN SIZE RESET TO",F4.0/)                              MGP.1205
3890 CONTINUE                                                                    MGP.1206
     IF (KEY .EQ. LIST) GO TO 3935                                               MGP.1207
     GO TO 200                                                                   MGP.1208
*********************************************************  C-FILE     **
3900 IF (KEY .NE. COMM) GO TO 4000
     IF (IDEFT .NE. "D") GO TO 3920
     IREAD = 5
     GO TO 3930
3920 IREAD = DDD(1) +0.2
3930 IF (.NOT. LISTIN) GO TO 3950
     IF(IDEFT .EQ. JR) REWIND IREAD
3935 WRITE(6,3940) IREAD
3940 FORMAT("     COMMANDS READ FROM FILE",I2/)
3950 CONTINUE
     IF (KEY .EQ. LIST) GO TO 200
     GO TO 200

C*** DRAW CROSS-SECTION BOUNDARIES ON MAP ************* X-BOUND
4000 IF(KEY .NE. XBOUND) GO TO 5100
     WRITE(6,4005)
4005 FORMAT(/10X,42HX-BOUND:   DRAW SECTION BOUNDARIES ON MAP   )
     SVMOR = MORSE
     MORSE = 0
     CALL MAPOUT
     DO 4020 IIAZM = 1,NOAZM
     AZMU = AZVW(IIAZM)*RPD
     CTH = COS(AZMU)
     STH = SIN(AZMU)
     CALL CONVRT(VLA,VLO,X1,Y1)
     CALL FORMS(0.,4,X1,Y1)
     NOSP1 = NOSEC + 1
     DO 4010 JSEC = 1,NOSP1
     EY1 = Y1 + (DSVW(JSEC)*CTH - WIDVW*STH/2.)*SINPK
     EX1 = X1 + (DSVW(JSEC)*STH + WIDVW*CTH/2.)*SINPK
     EY2 = Y1 + (DSVW(JSEC)*CTH + WIDVW*STH/2.)*SINPK
     EX2 = X1 + (DSVW(JSEC)*STH - WIDVW*CTH/2.)*SINPK
     CALL PLTT(EX1,E\1,3)
     CALL PLTT(EX2,E\2,2)
4010 CONTINUE
4020 CONTINUE
     MORSE = SVMOR
     GO TO 200
C*** MULTICS COMMAND PROCESSOR *************************  MULT      **
5100 IF(KEY .NE. MULT) GO TO 6100
     WRITE(6,5110)
5110 FORMAT(1X,"@NTER MULTICS COMMAND:  ")
     READ(IREAD,205) CARD
     CALL EC(">UDD>aKSS>LIBRARY>MULTICS_COMMAND.EC",CARD)
     GO TO 200
6100 WRITE(6,6110) KEY,IDEFT,DDD,IQ                                              MGP.1209
6110 FORMAT(1X,A4,5X,A1,7F10.2,5X,A1,//,                                        MGP.1210
    1 " ***warning***  THIS CARD HAS INCORRECT KEYWORD."/
    2 "       PROGRAM NOW READING COMMANDS FROM FILE05 AND PROCEEDING"/)
     IREAD = 5
     GO TO 200                                                                   MGP.1212
 900 CONTINUE
     CALL CLOSE_FILE("-ALL")
     IF(.NOT VIA) GO TO 9998
     CALL IO_CALL("DETACH","INIT_VALS")
     CALL DECETE("FILE66")
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9998 WRITE(6,9999)
9999 FORMAT(" eND OF RUN")
      END
      SUBROUTINE MAPOUT
      CHARACTER*80 CHARR
      COMMON /MM/ IROT,NEWVS,XMNPL,SHIF,SHIFX,SHIFY
      COMMON /OMPX/ XINT,XMAX                                         MGP. 49
      COMMON /MO/ ATINC,HCHAR,NCHAR,NLINE,ONINC,TTH,XMN,ATEDG,ONEDG   MGP. 38
      COMMON /MO1/ DINC,ZMAX,ZINC,PTRSZ,YOFF,SINPD,YMAX,CHARR(5),TICSZ MGP. 39
      COMMON /MBCLOT/ ALAT1,ALAT2,ALON1,ALON2                         MGP. 27
      ANEWX = XMAX + 10.                                              MGP. 893
      OLDOFF = YOFF                                                   MGP. 894
      CALL CONVRT(ALAT2,ALON2,X,YMAX)
      YOFF = 3.0*HCHAR*(1+NLINE)                                      MGP. 904
      BORD = YOFF + 3.*HCHAR                                          MGP. 905
      IF(IROT .EQ. 0) GC TO 2345                                      MGP. 906
      CALL CONVRT(ALAT1,ALON1,X,YMAX)                                 MGP. 907
      YOFF = 3.*HCHAR                                                 MGP. 908
      BORD = YOFF + 3.*HCHAR                                          MGP. 909
C----- MOVE ORIGIN                                                    MGP. 910
 2345 CONTINUE                                                        MGP. 911
C      MOVE TO POSITION FOR NEXT PLOT                                 MGP. 912
      RELY =YOFF - OLDOFF                                             MGP. 913
      CALL PLTT(ANEWX,RELY,-103)
      VSNEWX=ANEWX                                                    MGP. 915
      IF (NEWVS .EQ. 1) VSNEWX = -XMN                                 MGP. 916
      NEWVS = 0                                                       MGP. 917
      CALL PLTT(VSNEWX,RELY,-203)
C------- PRINT + TO CHECK FOR TRANSMISSION ERRORS. ------             MGP. 919
      XMNPL = XMN + .2                                                MGP. 920
      IF(SHIF .EQ. 0) CO TO 2346
      CALL PLTT(SHIFX,SHIFY,230)
      SHIF = 0
 2346 CALL FORMS(0.,.4,XMNPL,0.)                                      MGP. 921
      WRITE(6,2348)                                                   MGP. 922
 2348 FORMAT(17H DRAW MAP OUTLINE/)                                   MGP. 923
      CALL OUTLIN                                                     MGP. 924
      RIGHT = XMAX + 10
      TOP = YMAX + YOFF
      WRITE(6,2349) RIGHT,TOP
 2349 FORMAT("      PLOT DIMENSIONS:"/
     1 "        LENGTH ALONG EDGE OF PAPER = ",F6.2,"IN"/
     2 "        WIDTH OF PLOT =              ",F6.2,"IN"/)
      RETURN
      END
      SUBROUTINE BEFPLT                                               MGP. 1222
C ------ BEFORE PLOTTING, TRUNCATE DATA, CHOOSE SYMBOL AND SIZE, AND  MGP. 1223
C           CONVERT TO X AND Y IN INCHES. ----------------------------MGP. 1224
      COMMON ACHAR(9001),ALLA(9001),ALLO(9001),ALLSE(3,9001),ALLZ(9001),MGP. 1225
     2DATA(4,9001),IAZ(3,9001),IDATE(9001),IDP(3,9001),IHRMN(9001),IKEY MGP. 1226
     3(9001),IQTRN(9001),JSYM(9001),NUMSC(9001),PHI(9001),XXSV(9001), MGP. 1227
     4XXX(9001),YYSV(9001),YYY(9001),ZZZ(9001)                        MGP. 1228
      COMMON /ALL/ PI,RPD,DPR                                         MGP. 1229
      COMMON /CB/ AZNTH                                               MGP. 1230
      COMMON /DBMPTX/ MAXDA                                           MGP. 1231
      COMMON /MBCLOT/ ALAT1,ALAT2,ALON1,ALON2                         MGP. 1232
      COMMON /MBCLT/ PSKALE,OBLAT,OBLON,FLAT,CMER                     MGP. 1233
      COMMON /MB/ IPRN,NMSYM,NDSYM,NCSYM,SMINT(16),ISYM(15),IALLSM    MGP. 1234
      COMMON /MB1/ NMSIZ,NDSIZ,NCSIZ,SZINT(16),SIZE(15),ALLSZ         MGP. 1235
      COMMON /MB2/ NMTRD(5),NDTRD(5),TRUN1(5),TRUN2(5),NCTRD          MGP. 1236
      COMMON /MB3/ NMALP,NCALP,IQOK(15),NFLOT                         MGP. 1237
      COMMON /MBDX/ NOFILE                                              MGP. 1238
      DATA IOUT /4H OUT/                                                MGP. 1239
      DATA ICAT/4HCATE/                                                 MGP. 1240
      NPLOT = 0                                                         MGP. 1241
      IF(IPRN .EQ. 0) GO TO 15                                          MGP. 1242
      IF (NOFILE .NE. 6) WRITE(6,5)                                     MGP. 1243
    5 FORMAT(1X,"   TRUNCATING DATA AND CONVERTING TO X AND Y..."/)     MGP. 1244
      WRITE(NOFILE,10)                                                  MGP. 1245
   10 FORMAT(1H1,1X,"BEFORE PLOTTING>  TRUNCATE DATA, CHOOSE SYMBOL AND MGP. 1246
     1SIZE, AND CONVERT TO X AND Y IN INCHES."/                         MGP. 1247
     2 /T10,"DATE",T16,"HRMN",T25,"LAT",T33,"LON",T39,"DEPTH",T47,
     3" DATA1   DATA2   DATA3   DATA4",T79,"AZ DP  STD ER   AZ DP  STD "MGP. 1248
     4 ,"ER   AZ DP  STD ER  Q  SKIP")                                  MGP. 1249
      IF(MAXDA .EQ. 0) GO TO 1005                                       MGP. 1250
   15 DO 20 N = 1,MAXDA                                                 MGP. 1251
      PHI(N) = 0.0                                                      MGP. 1252
      JSYM(N) = IALLSM                                                  MGP. 1253
      ACHAR(N) = ALLSZ                                                  MGP. 1254
      XX(N) = 0.0                                                       MGP. 1255
   20 YY(N) = 0.0102030                                                 MGP. 1256
      DO 1000 N = 1,MAXDA                                               MGP. 1257
C                                                                       MGP. 1258
C------ FIND SYMBOL OR SKIP EARTHQUAKE. ---------------------------------MGP. 1259
C                                                                       MGP. 1260
      IF(NMSYM .EQ. ICAT) GO TO 75                                      MGP. 1261
      IF(NCSYM .EQ. 0) GO TO 100                                        MGP. 1262
      DO 50 I = 1,NCSYM                                                 MGP. 1263
      IF((SMINT(I) - DATA(NDSYM,N))*(SMINT(I+1)-DATA(NDSYM,N)).GT.0.0)  MGP. 1264
     1 GO TO 50                                                         MGP. 1265
      IF(SMINT(I+1) .EQ. DATA(NDSYM,N)) GO TO 50                        MGP. 1266
      JSYM(N) = ISYM(I)                                                 MGP. 1267
      GO TO 100                                                         MGP. 1268
   50 CONTINUE                                                          MGP. 1269
      IF((IPRN .NE. 1) .AND. (IPRN .NE. 3)) GO TO 1000                  MGP. 1270
      IALPH = NMSYM                                                     MGP. 1271
      GO TO 900                                                         MGP. 1272
   75 JSYM(N) = IGTRN(N)                                                MGP. 1273
C                                                                       MGP. 1274
C------ FIND SIZE OR SKIP EARTHQUAKE. -----------------------------------MGP. 1275
C                                                                       MGP. 1276
  100 IF(NCSIZ .EQ. 0) GO TO 300                                        MGP. 1277
      DO 200 I= 1,NCSIZ                                                 MGP. 1278
      IF((SZINT(I)-DATA(NDSIZ,N))*(SZINT(I+1)-DATA(NDSIZ,N)).GT. 0.0)   MGP. 1279
     1  GO TO 200                                                       MGP. 1280
      IF(SZINT(I+1) .EQ. DATA(NDSIZ,N)) GO TO 200                       MGP. 1281
      ACHAR(N) = SIZE(I)                                                MGP. 1282
      GO TO 300                                                         MGP. 1283
  200 CONTINUE                                                          MGP. 1284
      IF((IPRN .EQ. 0) .OR. (IPRN .EQ. 2)) GO TO 1000                   MGP. 1285
      IALPH = NMSIZ                                                     MGP. 1286
      GO TO 900                                                         MGP. 1287
C                                                                       MGP. 1288
C------ IS EQ DATA WITHIN ASSIGNED LIMITS? ------------------------------MGP. 1289
C                                                                       MGP. 1290
  300 IF(NCTRD .EQ. 0) GO TO 500                                        MGP. 1291
      DO 400 I = 1,NCTRD                                                MGP. 1292
      JJ = NDTRD(I)                                                     MGP. 1293
      IF((TRUN1(I)-DATA(JJ,N))*(TRUN2(I)-DATA(JJ,N)).GT. 0.) GO TO 425  MGP. 1294
  400 CONTINUE                                                          MGP. 1295
      GO TO 500                                                         MGP. 1296
  425 IF((IPRN .EQ. 0) .OR. (IPRN .EQ. 1)) GO TO 1000                   MGP. 1297
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      IALPH = NMTRD(I)                                                  MGP.1298
      GO TO 900                                                         MGP.1299
C                                                                       MGP.1300
C------ CHECK FOR ALPHANUMERIC CUTOFF. ----------------------------------MGP.1301
C                                                                       MGP.1302
  500 IF(NCALP .EQ. 0) GO TO 700                                        MGP.1303
      DO 550 I = 1,NCALP                                                MGP.1304
      IF(IQOK(I) .EQ. IGTRN(N)) GO TO 700                               MGP.1305
  550 CONTINUE                                                          MGP.1306
      IF((IPRN .EQ. 0) .OR. (IPRN .EQ. 2)) GO TO 1000                   MGP.1307
      IALPH = NMALP                                                     MGP.1308
      GO TO 900                                                         MGP.1309
C                                                                       MGP.1310
C------ CHECK IF POINT IS ON MAP. ---------------------------------------MGP.1311
C                                                                       MGP.1312
  700 ALA = ALLA(N)                                                     MGP.1313
      ALO = ALLO(N)                                                     MGP.1314
      IF(PSKALE .GE. 0.0) GO TO 725                                     MGP.1315
      ALAC = FLATC(ALLA(N),FLAT)                                        MGP.1316
      CALL NEWPOL(ALAC    ,ALLO(N),ALA,ALO,OBLAT,OBLON)                 MGP.1317
  725 IF((ALA-ALAT1)*(ALA-ALAT2) GT. 0.0) GO TO 750                     MGP.1318
      DIF = ALON2 - ALON1                                               MGP.1319
      IF(DIF .LT. 0.0) DIF = 360  + DIF                                 MGP.1320
      DALO = ALO - ALON1                                                MGP.1321
      IF(DALO .LT. 0.0) DALO = 360. + DALO                              MGP.1322
      IF(DALO .GT. DIF) GO TO 750                                       MGP.1323
      GO TO 800                                                         MGP.1324
  750 IF((IPRN .EQ. 0) .OR. (IPRN EQ.2)) GO TO 1000                     MGP.1325
      IALPH = IOUT                                                      MGP.1326
      GO TO 900                                                         MGP.1327
C                                                                       MGP.1328
C------ THIS EQ HAS MET ALL SPECIFICATIONS. -----------------------------MGP.1329
C                                                                       MGP.1330
  800 IF((IPRN .EQ. 0) .OR. (IPRN .EQ. 1)) GO TO 850                    MGP.1331
      WRITE(NOFILE,825) N,IDATE(N),IHRMN(N),ALLA(N),ALLO(N),ALLZ(N),    MGP.1332
     1 (DATA(J,N),J=1,4),(IAZ(J,N),IDP(J,N),ALLSE(J,N),J=1,3),IGTRN(N)  MGP.1333
  825 FORMAT(1X,I4,2X,2I6,7F8.2,3(I5,"/",I2,F8.2),2X,A1)                MGP.1334
  850 CALL CONVRT(ALA,ALO,XXX(N),YYY(N))                                MGP.1335
      ALAP = ALA + 0.1                                                  MGP.1336
      CALL CONVRT(ALAP,ALO,X,Y)                                         MGP.1337
      PHI(N) = ATAN2(X-XXX(N),Y-YYY(N))                                 MGP.1338
      NPLOT = NPLOT + 1                                                 MGP.1339
      GO TO 1000                                                        MGP.1340
C                                                                       MGP.1341
C------ THIS EQ FAILED TO MEET SPECIFICATIONS. -------------------------MGP.1342
C                                                                       MGP.1343
  900 WRITE(NOFILE,975) N,IDATE(N),IHRMN(N),ALLA(N),ALLO(N),ALLZ(N),    MGP.1344
     1 (DATA(J,N),J=1,4),(IAZ(J,N),IDP(J,N),ALLSE(J,N),J=1,3),IGTRN(N)  MGP.1345
     2  IALPH                                                           MGP.1346
  975 FORMAT(1X,I4,2X,2I6,7F8.2,3(I5,"/",I2,F8.2),2X,A1," *",A4,"*")    MGP.1347
 1000 CONTINUE                                                          MGP.1348
 1005 WRITE(6,1010) NPLOT                                               MGP.1349
      IF (NOFILE .NE. 6) WRITE(NOFILE,1010) NPLOT                       MGP.1350
 1010 FORMAT(/1X,I10," EARTHQUAKES ARE WITHIN THE SPECIFIED AREA AND",  MGP.1351
     1 " MEET ALL QUALIFICATIONS ")                                     MGP.1352
      RETURN                                                            MGP.1353
      END                                                               MGP.1354
      SUBROUTINE CONVRT(BLA,BLO,X,Y)                                    MGP.1355
C                                                                       MGP.1356
C------ CONVERT LAT,LON TO X,Y FOR A GIVEN PROJECTION. -----------------MGP.1357
C                                                                       MGP.1358
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      COMMON /ALL/ PI,RPD,DPR                                           MGP.1359
      COMMON /CB/ AZNTH                                                 MGP.1360
      COMMON /MBCLOT/ ALAT1,ALAT2,ALON1,ALON2                           MGP.1361
      COMMON /MBCLT/ PSKALE,OBLAT,OBLON,FLAT,CMER                       MGP.1362
      COMMON /MC/ ALFA1,ALFA2,MAPRO,NC,SKALE,SINTH,COSTH,SHFTH,QSKALE   MGP.1363
      COMMON /MC1/ XMULT,YMULT
      COMMON /MCO/ SINRA,COSRA,SHIFT                                    MGP.1364
      COMMON /MCOT/ ROTA                                                MGP.1365
      SIND(Z) = SIN(Z*RPD)                                              MGP.1366
      COSD(Z) = COS(Z*RPD)                                              MGP.1367
      TAND(Z) = TAN(Z*RPD)                                              MGP.1368
      RHO(ALAT)=SKALE*COSQ*COS(RPD*ALAT)/(SDIF*SAVE*COS(RPD*ALAT-ALBAR))MGP.1369
      RHO2(ALAT) = SQRT(CON + RADSQ*(1.0-SIN(RPD*ALAT)/SAVE))           MGP.1370
      RHO3(ALAT) = RM*(TAN(RPD*ALAT/2.)**SAVE)                          MGP.1371
C-------- PHI IS A FUNCTION SUBPROGRAM AND FOLLOWS SUBROUTINE OUTLIN.   MGP.1372
      XX(R,P) = R*SIN(RPD*P) - R1SP1                                    MGP.1373
      YY(R,P) = R1 - R*COS(RPD*P)                                       MGP.1374
      EARTH=2.508E08                                                    MGP.1375
      ALA = BLA                                                         MGP.1376
      IF(ABS(ALA) .GT. 180.)ALA=-(360.-ABS(ALA))*ALA/ABS(ALA)           MGP.1377
      IF(PSKALE .GE. 0.0) ALA = FLATC(ALA,FLAT)                         MGP.1378
      ALO = BLO                                                         MGP.1379
      IF(ABS(ALO) .GT. 180.)ALO=-(360.-ABS(ALO))*ALO/ABS(ALO)           MGP.1380
      GO TO (60,70,80,90,100,110),MAPRO                                 MGP.1381
C                                                                       MGP.1382
C-------- CENTRAL PROJECTION CONIC                                      MGP.1383
C                                                                       MGP.1384
   60 IF(NC .EQ. 1) GO TO 65                                            MGP.1385
      ALF1C = ALFA1                                                     MGP.1386
      ALF2C = ALFA2                                                     MGP.1387
      IF(PSKALE .EQ. 0.0) ALF1C = FLATC(ALFA1,FLAT)                     MGP.1388
      IF(PSKALE .EQ. 0.0) ALF2C = FLATC(ALFA2,FLAT)                     MGP.1389
      COSQ = COSD((ALF2C-ALF1C)/2 )**2                                  MGP.1390
      SDIF = SIND(ALF2C-ALF1C)                                          MGP.1391
      ALBAR = (ALF1C + ALF2C)*0.5                                       MGP.1392
C       DIF IS LONGITUDE FROM 1 TO 2 CLOCKWISE.                         MGP.1393
      DIF = ALON2 - ALON1                                               MGP.1394
      IF(DIF .LT. 0.0) DIF = 360. + DIF                                 MGP.1395
      ALOBR = ALON1 + DIF*0.5                                           MGP.1396
      SAVE = SIND(ALBAR)                                                MGP.1397
      ALA1C = ALAT1                                                     MGP.1398
      IF(PSKALE .GE. 0.0) ALA1C = FLATC(ALAT1,FLAT)                     MGP.1399
      R1 = RHO(ALA1C)                                                   MGP.1400
      P1 = PHI(ALON1,ALOBR,SAVE)                                        MGP.1401
      SP1 = SIND(P1)                                                    MGP.1402
      R1SP1 = R1*SP1                                                    MGP.1403
   65 CONTINUE                                                          MGP.1404
      WRITE(6,1000) RPD,COSQ,SDIF,ALBAR,SAVE,R1,P1,SP1,ALA,ALO          MGP.1405
      WRITE(6,1000) ALAT1,ALAT2,ALON1,ALON2,ALFA1,ALFA2,SKALE           MGP.1406
 1000 FORMAT(10E12.4)                                                   MGP.1407
      R = RHO(ALA)                                                      MGP.1408
      P = PHI(ALO,ALOBR,SAVE)                                           MGP.1409
      AZNTH = -P*RPD                                                    MGP.1410
      X = XX(R,P)                                                       MGP.1411
      Y = YY(R,P)                                                       MGP.1412
      NC = 1                                                            MGP.1413
      GO TO 300                                                         MGP.1414
C                                                                       MGP.1415
C-------- ALBERS EQUAL AREA CONIC PROJECTION. ---------------------------MGP.1416
C                                                                       MGP.1417
   70 IF(NC .EQ. 1) GO TO 75                                            MGP.1418
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      ALF1C = ALFA1                                                     MGP.1419
      ALF2C = ALFA2                                                     MGP.1420
      IF(PSKALE .EQ. 0.0) ALF1C = FLATC(ALFA1,FLAT)                     MGP.1421
      IF(PSKALE .EQ. 0.0) ALF2C = FLATC(ALFA2,FLAT)                     MGP.1422
      SAVE = (SIND(ALF1C) + SIND(ALF2C))/2.0                            MGP.1423
      RAD = (SAVE*SKALE)/ (COSD(ALF1C)-COSD(ALF2C))                     MGP.1424
      RADSQ = 2.0*RAD**2                                                MGP.1425
C        DIF IS LONGITUDE FROM 1 TO 2 CLOCKWISE.                        MGP.1426
      DIF = ALON2 - ALON1                                               MGP.1427
      IF(DIF .LT. 0.0) DIF = 360. + DIF                                 MGP.1428
      ALOBR = ALON1 + DIF*0.5                                           MGP.1429
      CON = SKALE**2*(COSD(ALF1C)**2+COSD(ALF2C)**2)/                   MGP.1430
     1  (2.0*(COSD(ALF1C) - COSD(ALF2C))**2)                            MGP.1431
      ALA1C = ALAT1                                                     MGP.1432
      IF(PSKALE .GE. 0.0) ALA1C = FLATC(ALAT1,FLAT)                     MGP.1433
      R1 = RHO2(ALA1C)                                                  MGP.1434
      P1 = PHI(ALON1,ALOBR,SAVE)                                        MGP.1435
      SP1 = SIND(P1)                                                    MGP.1436
      R1SP1 = R1*SP1                                                    MGP.1437
   75 CONTINUE                                                          MGP.1438
      R = RHO2(ALA)                                                     MGP.1439
      P = PHI(ALO,ALOBR,SAVE)                                           MGP.1440
      AINTH = -P*RPD                                                    MGP.1441
      X = XX(R,P)                                                       MGP.1442
      Y = YY(R,P)                                                       MGP.1443
      NC = 1                                                            MGP.1444
      GO TO 300                                                         MGP.1445
C                                                                       MGP.1446
C------- LAMBERT CONFORMAL CONIC PROJECTION. ---------------------------MGP.1447
C                                                                       MGP.1448
   80 IF(NC .EQ. 1) GO TO 85                                            MGP.1449
C IF PSKALE IS  >  ZERO, THEN PROJ 3 IS WITH RESPECT TO AN OBLIGUE      MGP.1450
C        POLE AND PSKALE DETERMINES RADIUS OF EARTH FOR PROJECTION      MGP.1451
      ALF1C = ALFA1                                                     MGP.1452
      ALF2C = ALFA2                                                     MGP.1453
      IF(PSKALE .EQ. 0.0) ALF1C = FLATC(ALFA1,FLAT)                     MGP.1454
      IF(PSKALE .EQ. 0.0) ALF2C = FLATC(ALFA2,FLAT)                     MGP.1455
      ACO1 = 90. - ALF1C                                                MGP.1456
      ACO2 = 90. - ALF2C                                                MGP.1457
      SAVE=ALOG(SIN(RPD*ACO1)/SIN(RPD*ACO2))/ALOG(TAN(RPD*ACO1/2.)/     MGP.1458
     1 TAN(RPD*ACO2/2.))                                                MGP.1459
      RAD = (SAVE*SKALE)/(COSD(ALF1C)-COSD(ALF2C))                      MGP.1460
      IF(PSKALE .GT. 0.0) RAD = EARTH/PSKALE                            MGP.1461
      RM = RAD*SIND(ACO1)/(SAVE*TAN(RPD*ACO1/2.)**SAVE)                 MGP.1462
      IF(PSKALE.GT.0.)GO TO 81                                          MGP.1463
C        DIF IS LONGITUDE FROM 1 TO 2 CLOCKWISE.                        MGP.1464
      DIF = ALON2 - ALON1                                               MGP.1465
      IF(DIF .LT. 0.0) DIF = 360. + DIF                                 MGP.1466
      ALOBR = ALON1 + DIF*0.5                                           MGP.1467
      ALA1C = ALAT1                                                     MGP.1468
      IF(PSKALE .GE. 0.0) ALA1C = FLATC(ALAT1,FLAT)                     MGP.1469
      R1 = RM*(TAN(RPD*(90.-ALA1C)/2.)**SAVE)                           MGP.1470
      P1 = PHI(ALON1,ALOBR,SAVE)                                        MGP.1471
      SP1 = SIND(P1)                                                    MGP.1472
      R1SP1 = R1*SP1                                                    MGP.1473
      GO TO 86                                                          MGP.1474
   81 CONTINUE                                                          MGP.1475
      ALA1C = FLATC(ALAT1,FLAT)                                         MGP.1476
      CALL NEWPOL(ALA1C,ALON1,BETA1,BETA2,OBLAT,OBLON)                  MGP.1477
      ALOBR=BETA2                                                       MGP.1478
      R1 = RM*(TAN(RPD*(90.-BETA1)/2.)**SAVE)                           MGP.1479
      P1 = PHI(BETA2,ALOBR,SAVE)                                        MGP.1480
      SP1=SIND(P1)                                                      MGP.1481
      R1SP1 = R1*SP1                                                    MGP.1482
   85 CONTINUE                                                          MGP.1483
      IF(PSKALE.LE.0.)GO TO 86                                          MGP.1484
      CALL NEWPOL(ALA,ALO,PLA,PLO,OBLAT,OBLON)                          MGP.1485
      GO TO 88                                                          MGP.1486
   86 CONTINUE                                                          MGP.1487
      PLA = ALA                                                         MGP.1488
      PLO = ALO                                                         MGP.1489
   88 CONTINUE                                                          MGP.1490
      R = RM*(TAN(RPD*(90.-PLA)/2.)**SAVE)                              MGP.1491
      P = PHI(PLO,ALOBR,SAVE)                                           MGP.1492
      X = XX(R,P)                                                       MGP.1493
      Y = YY(R,P)                                                       MGP.1494
C-------- ROTATE COORDINATES FOR OBLIQUE POLE.                          MGP.1495
      IF(SINTH .EQ. 10.) GO TO 89                                       MGP.1496
      XA = X                                                            MGP.1497
      YA = Y                                                            MGP.1498
      X = XA*COSTH + YA*SINTH                                           MGP.1499
      Y = -XA*SINTH + YA*COSTH + SHFTH                                  MGP.1500
   89 CONTINUE                                                          MGP.1501
      AZNTH = -P*RPD                                                    MGP.1502
      NC = 1                                                            MGP.1503
      GO TO 300                                                         MGP.1504
   90 CONTINUE                                                          MGP.1505
C                                                                       MGP.1506
C-------- MERCATOR"S PROGECTION WITH QSKALE INCHES PER DEGREE OF LONG   MGP.1507
C                                                                       MGP.1508
      IF(PSKALE .GT. 0.0) GO TO 96                                      MGP.1509
C-------- NORMAL PLOT OR OBLIQUE WINDOW AND POLE.                       MGP.1510
      IF(NC .EQ. 1) GO TO 125                                           MGP.1511
      FOR = 45.*RPD                                                     MGP.1512
      NC = 1                                                            MGP.1513
      ALA1C = ALAT1                                                     MGP.1514
      IF(PSKALE .GE. 0.0) ALA1C = FLATC(ALAT1,FLAT)                     MGP.1515
      YZERO = ALOG(TAN(FOR+ALA1C*RPD/2.0))                              MGP.1516
  125 X = (ALO-ALON1)*QSKALE                                            MGP.1517
      Y = QSKALE*(ALOG(TAN(FOR+ALA*RPD/2.0))-YZERO)/RPD                 MGP.1518
      GO TO 300                                                         MGP.1519
C-------- NORMAL WINDOW BUT OBLIQUE POLE                                MGP.1520
   96 IF(NC .EQ. 1) GO TO 98                                            MGP.1521
      ALA1C = FLATC(ALAT1,FLAT)                                         MGP.1522
      CALL NEWPOL(ALA1C,ALON1,BETA1,BETA2,OBLAT,OBLON)                  MGP.1523
      FOR = 45.*RPD                                                     MGP.1524
      YZERO = ALOG(TAN(FOR+BETA1*RPD/2.0))                              MGP.1525
      NC = 1                                                            MGP.1526
   98 CALL NEWPOL(ALA,ALO,PLA,PLO,OBLAT,OBLON)                          MGP.1527
      X = (PLO-BETA2)*QSKALE                                            MGP.1528
      Y = QSKALE*(ALOG(TAN(FOR+PLA*RPD/2.0))-YZERO)/RPD                 MGP.1529
      IF(SINTH .EQ. 10.) GO TO 300                                      MGP.1530
      XA = X                                                            MGP.1531
      YA = Y                                                            MGP.1532
      X = XA*COSTH + YA*SINTH                                           MGP.1533
      Y = -XA*SINTH + YA*COSTH + SHFTH                                  MGP.1534
      GO TO 300                                                         MGP.1535
C                                                                       MGP.1536
C------- POLYCONIC.                                                     MGP.1537
C                                                                       MGP.1538
  100 IF(NC .EQ. 1) GO TO 105                                           MGP.1539
      RAD = EARTH/QSKALE                                                MGP.1540
      ALA1C = FLATC(ALAT1,FLAT)                                         MGP.1541
      R1 = RAD/TAN(RPD*ALA1C)                                           MGP.1542
      SAVE = SIND(ALA1C)                                                MGP.1543
      P1 = PHI(ALON1,CMER,SAVE)                                         MGP.1544
      SP1 = SIND(P1)                                                    MGP.1545
      R1SP1 = R1*SP1                                                    MGP.1546
      R1 = RAD*(90.-ALA1C)*RPD                                          MGP.1547
  105 SAVE = SIND(ALA)                                                  MGP.1548
      P = PHI(ALO,CMER,SAVE)                                            MGP.1549
      R = RAD/TAN(RPD*ALA)                                              MGP.1550
      X = XX(R,P)                                                       MGP.1551
      Y = YY(R,P) + R - RAD*(90.-ALA)*RPD                               MGP.1552
      NC = 1                                                            MGP.1553
      GO TO 300                                                         MGP.1554
C                                                                       MGP.1555
C------- AZIMUTHAL EQUIDISTANT PROJECTION                               MGP.1556
C                                                                       MGP.1557
  110 IF(NC .EQ. 1) GO TO 115                                           MGP.1558
      RAD = EARTH/QSKALE                                                MGP.1559
      ALA1C = FLATC(ALAT1,FLAT)                                         MGP.1560
      CALL NEWPOL(ALA1C,ALON1,BETA1,BETA2,OBLAT,OBLON)                  MGP.1561
      R1 = (90. - BETA1)*RPD*RAD                                        MGP.1562
      R1SP1 = 0.                                                        MGP.1563
      NC = 1                                                            MGP.1564
  115 CALL NEWPOL(ALA,ALO,PLA,PLO,OBLAT,OBLON)                          MGP.1565
      P = PHI(PLO,BETA2,1.0)                                            MGP.1566
      R = (90. - PLA)*RPD*RAD                                           MGP.1567
      X = XX(R,P)                                                       MGP.1568
      Y = YY(R,P)                                                       MGP.1569
      GO TO 300                                                         MGP.1570
  300 X = X*XMULT
      Y = Y*YMULT
      IF(ROTA .EQ. 0.0) GO TO 400
      XA = X                                                            MGP.1572
      YA = Y                                                            MGP.1573
      X = XA*COSRA + YA*SINRA
      Y = -XA*SINRA + YA*COSRA + SHIFT
  400 CONTINUE                                                          MGP.1576
      RETURN                                                            MGP.1577
      END                                                               MGP.1578
      SUBROUTINE DATAIN(IWRT,IDECI,FMT1,FMT2,FMT3,MOREQ)
      SAVE
      EXTERNAL YOUMIX(DESCRIPTORS)
      CHARACTER*80 FMT1,FMT2,FMT3,NNCD
      COMMON ACHAR(9001),ALLA(9001),ALLO(9001),ALLSE(3,9001),ALLZ(9001),MGP.1581
     2DATA(4,9001),IAZ(3,9001),IDATE(9001),IDP(3,9001),IHRMN(9001),IKEY MGP.1582
     3(9001),IQTRN(9001),JSYM(9001),NUMSC(9001),PHI(9001),XXSV(9001),   MGP.1583
     4XXX(9001),YYSV(9001),YYY(9001),ZZZ(9001)                          MGP.1584
      COMMON /ALL/ PI,RPD,DPR                                           MGP.1585
      COMMON /DBMPTX/ MAXDA                                             MGP.1586
      COMMON /DEBUG/ IDBUG                                              MGP.1587
      COMMON /DY/ IY,IM,ID,IH,IN,DLA,ISNLA,ALA,DLO,ISNLO,ALO,ISECK(3)   MGP.1588
      COMMON /MBDX/ NCFILE                                              MGP.1589
      COMMON /MD/ DEFLT,MIX,IFILE                                       MGP.1590
      DATA JS,JE/1HS,1HE/                                               MGP.1591
      DATA MBK/1H /                                                     MGP.1592
C           IDBUG>  NORMALLY LEAVE = 1.    SET TO 1 FOR PRINTOUT OF X-SEMGP.1593
C           COORDINATES IN INCHES.  SET TO 2 FOR DETAILS OF ERROR ELLIPSEMGP.1594
C           CALCULATIONS ALSO.                                          MGP.1595
      IDBUG = 1                                                         MGP.1596
      ALA = 0.0                                                         MGP.1597
      ALO = 0.0                                                          MGP.1598
      MOREQ = 0                                                          MGP.1599
C                                                                        MGP.1600
C                                                                        MGP.1601
      IF(IWRT .EQ. 0) GO TO 75                                           MGP.1602
C-------- WRITE HEADING. ----------------------------------------------MGP.1603
      WRITE(NOFILE,915)                                                  MGP.1604
  915 FORMAT(                                                            MGP.1605
     2 /T10,"DATE",T16,"HRMN",T25,"LAT",T33,"LON",T39,"DEPTH",T47,       MGP.1606
     3 "DATA1    DATA2    DATA3    DATA4",T79,"AZ DP  STD ER   AZ DP  STD "MGP.1607
     4  ,"ER   AZ DP  STD ER  Q"/)                                       MGP.1608
   75 I = 0                                                              MGP.1609
      K = 0                                                              MGP.1610
C                                                                        MGP.1611
C-------- READ HYPOCENTER CARDS AND LIST IF IWRT .NE. 0 ----------------MGP.1612
C                                                                        MGP.1613
  100 I = I + 1                                                          MGP.1614
      IF(I .EQ. 9001) GO TO 125                                          MGP.1615
      READ(IFILE,105,END=150) NNCD                                       MGP.1616
  105 FORMAT(A80)                                                        MGP.1617
   99 IF(IDECI .NE. 1) GO TO 106                                         MGP.1618
      DECODE(NNCD,FMT1) IY,IM,ID,IH,IN,DLA,ISNLA,     DLO,ISNLO,         MGP.1619
     1  ALLZ(I),(IAZ(J,I),IDP(J,I),ALLSE(J,I),J=1,3)                     MGP.1620
      GO TO 107                                                          MGP.1621
  106 DECODE(NNCD,FMT1) IY,IM,ID,IH,IN,DLA,ISNLA,ALA,DLO,ISNLO,ALO,      MGP.1622
     1  ALLZ(I),(IAZ(J,I),IDP(J,I),ALLSE(J,I),J=1,3)                     MGP.1623
  107 DECODE(NNCD,FMT2) (DATA(J,I),J=1,4)
      DECODE(NNCD,FMT3) IQTRN(I)                                         MGP.1625
      ALLA(I) = DLA + ALA/60.                                            MGP.1626
      ALLO(I) = -DLO-ALO/60.                                             MGP.1627
      IF(DLA  EQ. 90.) GO TO 150                                         MGP.1628
      IF(ISNLA .EQ. JS) ALLA(I) = -ALLA(I)                               MGP.1629
      IF(ISNLO .EQ. JE) ALLO(I) = - ALLO(I)                              MGP.1630
      IF(ID  LT. 0) IM = IM + 1                                          MGP.1631
      IDATE(I) = IY*10000+IM*100+ID                                      MGP.1632
      IHRMN(I) = IH*100+IN                                               MGP.1633
      IF(MIX .EQ. 1) CALL YOUMIX(I)                                      MGP.1634
      DO 110 J = 1,3                                                     MGP.1635
      IF((ALLSE(J,I) .NE. 0.0) .AND.(ALLSE(J,I) .LE. DEFLT)) GO TO 110  MGP.1636
      ALLSE(J,I) = DEFLT                                                 MGP.1637
  110 CONTINUE                                                           MGP.1638
      IF(IWRT .EQ. 0) GO TO 100                                          MGP.1639
      WRITE(NOFILE,930) I,IDATE(I),IHRMN(I),ALLA(I),ALLO(I),ALLZ(I),     MGP.1640
     1 (DATA(J,I),J=1,4),(IAZ(J,I),IDP(J,I),ALLSE(J,I),J=1,3),IQTRN(I)  MGP.1641
  930 FORMAT(1X,I4,2X,2I6,7F8.2,3(I5,"/",I2,F8.2),2X,A1)                 MGP.1642
      GO TO 100                                                          MGP.1643
C                                                                        MGP.1644
C-------- IF MORE THAN 9000 CARDS ARE IN DECK, SKIP OVER EXCESS. --------MGP.1645
C                                                                        MGP.1646
  125 MOREQ = 1                                                          MGP.1647
      WRITE(6,975)                                                       MGP.1648
  975 FORMAT(1X," *** MORE THAN 1000 EARTHQUAKES.  PLOT IN TWO STEPS"/) MGP.1649
  150 MAXDA = I - 1                                                      MGP.1650
      WRITE(6,1000) MAXDA                                                MGP.1651
 1000 FORMAT(1X,I7," HYPOCENTER CARDS READ"/)                            MGP.1652
      RETURN                                                             MGP.1653
      END                                                                MGP.1654
      SUBROUTINE ELLIPS                                                  MGP.1655
C-------- PROGRAM TO FIND SHADOW PROJECTION OF THE ERROR ELLIPSE ON      MGP.1656
C          A HORIZONTAL PLANE OR ON ANY VERTICAL PLANE.                  MGP.1657
C-------- MORSE = 0 FOR MAP PROJECTION = 1 FOR X-SECTION. --------------MGP.1658
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      COMMON ACHAR(9001),ALLA(9001),ALLO(9001),ALLSE(3,9001),ALLZ(9001),MGP.1659
     2DATA(4,9001),IAZ(3,9001),IDATE(9001),IDP(3,9001),IHRMN(9001),IKEY MGP.1660
     3(9001),IQTRN(9001),JSYM(9001),NUMSC(9001),PHI(9001),XXSV(9001),    MGP.1661
     4XXX(9001),YYSV(9001),YYY(9001),ZZZ(9001)                           MGP.1662
      COMMON /ALL/ PI,RPD,DPR                                            MGP.1663
      COMMON /ET/ AEL,BEL,CEL                                            MGP.1664
      COMMON /ME/ PPAZ                                                   MGP.1665
      COMMON /MEOT/ MORSE                                                MGP.1666
      COMMON /MET/ ELFAC                                                 MGP.1667
      COMMON /DEBUG/ IDBUG                                               MGP.1668
      COMMON /TE/ NN                                                     MGP.1669
      DIMENSION PAUV(3,3),TPACS(3,3),TEACS(3,3)                          MGP.1670
      IF(IDBUG .LE. 1) GO TO 50                                          MGP.1671
      WRITE(6,900) NN                                                    MGP.1672
  900 FORMAT(/,"   *** SUBROUTINE ELLIPSE ***          EARTHQUAKE NUMBERMGP.1673
     1",I5,/)                                                            MGP.1674
   50 DO 150 I = 1,3                                                     MGP.1675
      DO 150 J = 1,3                                                     MGP.1676
      TPACS(I,J) = 0.0                                                   MGP.1677
      PAUV(I,J) = 0.0                                                    MGP.1678
  150 TEACS(I,J) = 0.0                                                   MGP.1679
C------- FIND ELLIPSE PRINCIPAL AXIS VECTORS IN TERMS OF THE PROJECTION MGP.1680
C          PLANE COORDINATES.  Z OF THE PROJECTION PLANE COORDS IS THE   MGP.1681
C          PROJECTION DIRECTION.                                         MGP.1682
      IF(MORSE .EQ. 1) GO TO 230                                         MGP.1683
C------- FOR MAP PROJECTION. --------------------------------------------MGP.1684
      DO 225 I = 1,2                                                     MGP.1685
      DP = IDP(I,NN)*RPD                                                 MGP.1686
      AZ = IAZ(I,NN)*RPD                                                 MGP.1687
      APP = AZ + PHI(NN)                                                 MGP.1688
      IF(IDBUG .LE. 1) GO TO 220                                         MGP.1689
      WRITE(6,1000) IAZ(I,NN),IDP(I,NN)                                  MGP.1690
 1000 FORMAT(" AZ = ",I3,7X," DP = ",I3,7X)                              MGP.1691
  220 PAUV(I,1) = COS(DP)*SIN(APP)                                       MGP.1692
      PAUV(I,2) = COS(DP)*COS(APP)                                       MGP.1693
  225 PAUV(I,3) = -SIN(DP)                                               MGP.1694
      GO TO 240                                                          MGP.1695
C------- FOR X-SECTION PROJECTION. --------------------------------------MGP.1696
  230 DO 235 I = 1,2                                                     MGP.1697
      DP = IDP(I,NN)*RPD                                                 MGP.1698
      AZ = IAZ(I,NN)*RPD                                                 MGP.1699
      APP = AZ + PHI(NN)                                                 MGP.1700
      IF(IDBUG .LE. 1) GO TO 233                                         MGP.1701
      WRITE(6,1000) IAZ(I,NN),IDP(I,NN)                                  MGP.1702
  233 PAUV(I,1) = COS(DP)*COS(APP-PPAZ)                                  MGP.1703
      PAUV(I,2) = -SIN(DP)                                               MGP.1704
  235 PAUV(I,3) = COS(DP)*SIN(APP-PPAZ)                                  MGP.1705
C------- CROSS MULTIPLY TO FIND THIRD UNIT VECTOR.                       MGP.1706
  240 PAUV(3,1) = PAUV(1,2)*PAUV(2,3)-PAUV(2,2)*PAUV(1,3)                MGP.1707
      PAUV(3,2) = PAUV(2,1)*PAUV(1,3)-PAUV(1,1)*PAUV(2,3)                MGP.1708
      PAUV(3,3) = PAUV(1,1)*PAUV(2,2)-PAUV(2,1)*PAUV(1,2)                MGP.1709
      IF(IDBUG .LE. 1) GO TO 250                                         MGP.1710
      WRITE(6,1015)                                                      MGP.1711
 1015 FORMAT(/1X,"TRANSFORMATION TENSOR FROM PRINCIPAL AXIS TO ",        MGP.1712
     1 "PROJECTION PLANE COORDINATES"/)                                  MGP.1713
      DO 260 I = 1,3                                                     MGP.1714
  260 WRITE(6,1020) (PAUV(I,J),J=1,3)                                    MGP.1715
 1020 FORMAT(3F12.2)                                                     MGP.1716
C------- SET UP TENSOR REPRESENTING ELLIPSOID IN PRINCIPAL COORDINATES.  MGP.1717
  250 DO 275 I = 1,3                                                     MGP.1718
  275 TPACS(I,I) = 1.0/(ALLSE(I,NN)*ELFAC)**2                            MGP.1719
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C -------- TRANSFORM THIS TENSOR TO THE PROJECTION COORDINATE SYSTEM.      MGP. 1720
      DO 375 I = 1,3                                                        MGP. 1721
      DO 375 J = I,3                                                        MGP. 1722
      DO 350 K = 1,3                                                        MGP. 1723
      DO 350 L = 1,3                                                        MGP. 1724
      TEACS(I,J) = TEACS(I,J) + PAUV(K,I)*PAUV(L,J)*TPACS(K,L)              MGP. 1725
  350 CONTINUE                                                              MGP. 1726
  375 TEACS(J,I) = TEACS(I,J)                                               MGP. 1727
      IF(IDBUG .LE. 1) GO TO 400                                            MGP. 1728
      WRITE(6,1050)                                                         MGP. 1729
 1050 FORMAT(/" ERROR ELLIPSOID IN PRINCIPAL COORDINATES",10X,              MGP. 1730
     1  "ERROR ELLIPSOID IN PROJECTION COORDINATES"/)                       MGP. 1731
      DO 380 I = 1,3                                                        MGP. 1732
  380 WRITE(6,1075) (TPACS(I,J),J=1,3),(TEACS(I,J),J=1,3)                   MGP. 1733
 1075 FORMAT(3F12.2,13X,3F12.2)                                             MGP. 1734
C -------- ELLIPSE IS X.TEACS.X - 1 = F = 0                                 MGP. 1735
C ------ GRAD F IS A NORMAL VECTOR.                                         MGP. 1736
C -------- GRAD F .K = 0 DEFINES THE PLANE>                                 MGP. 1737
C -------- TEACS(1,3)*X + TEACS(2,3)*Y + TEACS(3,3)*Z = 0                   MGP. 1738
C -------- SOLVE FOR Z AND SUBSTITUTE IN F EQUATION TO OBTAIN ELLIPSE. ----MGP. 1739
C -------- THE ELLIPSE IS>  AEL*X**2 + BEL*X*Y + CEL*Y**2 = 1               MGP. 1740
  400 AEL =     (TEACS(1,1)-TEACS(1,3)*TEACS(1,3)/TEACS(3,3))               MGP. 1741
      BEL =     2.0*(TEACS(1,2)-TEACS(1,3)*TEACS(2,3)/TEACS(3,3))           MGP. 1742
      CEL =     (TEACS(2,2)-TEACS(2,3)*TEACS(2,3)/TEACS(3,3))               MGP. 1743
      IF(IDBUG .LE. 1) RETURN                                               MGP. 1744
      WRITE(6,1100) AEL,BEL,CEL                                             MGP. 1745
 1100 FORMAT(/" AEL =",F8.4," BEL =",F8.4," CEL =",F8.4)                    MGP. 1746
      RETURN                                                                MGP. 1747
      END                                                                   MGP. 1748
      FUNCTION FLATC(ALAT,FLAT)                                             MGP. 1749
      RPD = 1.745329251994E-2                                               MGP. 1750
      FLATC = ALAT                                                          MGP. 1751
      IF(ABS(ALAT) .GT. 89.9) RETURN                                        MGP. 1752
      IF(FLAT .GT. 0.0) FLATC = ATAN(FLAT*TAN(ALAT*RPD))/RPD                MGP. 1753
      RETURN                                                                MGP. 1754
      END                                                                   MGP. 1755
      SUBROUTINE FORMS (I,ZIZ,XO,YO)                                        MGP. 1756
      COMMON /ALL/ PI,RPD,DPR                                               MGP. 1757
C        REGULAR SYMBOLS OF SIZE ZIZ CENTERED ON (XO,YO)                    MGP. 1758
C        LIST OF SYMBOLS   I=0 PLUS, 1 CROSS, 2 TRIANGLE(UP),               MGP. 1759
C             3 TRIANGLE(RIGHT), 4 TRIANGLE(DOWN), 5 TRIANGLE(LEFT),        MGP. 1760
C           6 DIAMOND, 7 SQUARE, 8 CIRCLE, 9 STAR.                          MGP. 1761
      II=I+1                                                                MGP. 1762
      Z = ZIZ*0.5                                                           MGP. 1763
      Z1=.866*Z                                                             MGP. 1764
      GO TO (1,10,20,30,40,50,60,70,80,90),II                               MGP. 1765
C        I=0  PLUS                                                          MGP. 1766
    1 Y=YO+Z                                                                MGP. 1767
      CALL PLTT (XO,Y,3)                                                    MGP. 1768
      Y=YO-Z                                                                MGP. 1769
      CALL PLTT (XO,Y,2)                                                    MGP. 1770
      X=XO-Z                                                                MGP. 1771
      CALL PLTT (X,YO,3)                                                    MGP. 1772
      X=XO+Z                                                                MGP. 1773
      CALL PLTT (X,YO,2)                                                    MGP. 1774
      CALL PLTT (X,YO,3)                                                    MGP. 1775
      RETURN                                                                MGP. 1776
C        I=1  CROSS                                                         MGP. 1777
   10 Z=.707*Z                                                              MGP. 1778
      X=XO-Z                                                                MGP. 1779
      Y=YO+Z                                                                MGP. 1780
      CALL PLTT (X,Y,3)                                                 MGP.1781
      X=XO+Z                                                            MGP.1782
      Y=YO-Z                                                            MGP.1783
      CALL PLTT (X,Y,2)                                                 MGP.1784
      Y=YO+Z                                                            MGP.1785
      CALL PLTT (X,Y,3)                                                 MGP.1786
      X=XO-Z                                                            MGP.1787
      Y=YO-Z                                                            MGP.1788
      CALL PLTT (X,Y,2)                                                 MGP.1789
      CALL PLTT (X,Y,3)                                                 MGP.1790
      RETURN                                                            MGP.1791
C         I=2  TRIANGLE, POINTING UP                                    MGP.1792
   20 Y=YO+Z                                                            MGP.1793
      CALL PLTT (XO,Y,3)                                                MGP.1794
      X=XO-Z1                                                           MGP.1795
      Y=YO-Z/2                                                          MGP.1796
      CALL PLTT (X,Y,2)                                                 MGP.1797
      X=XO+Z1                                                           MGP.1798
      CALL PLTT (X,Y,2)                                                 MGP.1799
      Y=YO+Z                                                            MGP.1800
      CALL PLTT (XO,Y,2)                                                MGP.1801
      CALL PLTT (XO,Y,3)                                                MGP.1802
      RETURN                                                            MGP.1803
C         I=3  TRIANGLE, POINTING TO RIGHT                              MGP.1804
   30 X=XO+Z                                                            MGP.1805
      CALL PLTT (X,YO,3)                                                MGP.1806
      Y=YO+Z1                                                           MGP.1807
      X=XO-Z/2                                                          MGP.1808
      CALL PLTT (X,Y,2)                                                 MGP.1809
      Y=YO-Z1                                                           MGP.1810
      CALL PLTT (X,Y,2)                                                 MGP.1811
      X = XO + Z                                                        MGP.1812
      CALL PLTT (X,YO,2)                                                MGP.1813
      CALL PLTT (X,YO.3)                                                MGP.1814
      RETURN                                                            MGP.1815
C         I=4  TRIANGLE, POINTING DOWN                                  MGP.1816
   40 Y=YO-Z                                                            MGP.1817
      CALL PLTT (XO,Y,3)                                                MGP.1818
      X=XO+Z1                                                           MGP.1819
      Y=YO+Z/2                                                          MGP.1820
      CALL PLTT (X,Y,2)                                                 MGP.1821
      X=XO-Z1                                                           MGP.1822
      CALL PLTT (X,Y,2)                                                 MGP.1823
      Y=YO-Z                                                            MGP.1824
      CALL PLTT (XO,Y,2)                                                MGP.1825
      CALL PLTT (XO,Y,3)                                                MGP.1826
      RETURN                                                            MGP.1827
C         I=5  TRIANGLE, POINTING TO LEFT                               MGP.1828
   50 X=XO-Z                                                            MGP.1829
      CALL PLTT (X,YO.3)                                                MGP.1830
      X=XO+Z/2                                                          MGP.1831
      Y=YO-Z1                                                           MGP.1832
      CALL PLTT (X,Y,2)                                                 MGP.1833
      Y=YO+Z1                                                           MGP.1834
      CALL PLTT (X,Y,2)                                                 MGP.1835
      X=XO-Z                                                            MGP.1836
      CALL PLTT (X,YO,2)                                                MGP.1837
      CALL PLTT (X,YO,3)                                                MGP.1838
      RETURN                                                            MGP.1839
C         I=6  DIAMOND                                                  MGP.1840
   60 X=XO-Z                                                            MGP.1841
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      CALL PLTT (X,YO,3)                                         MGP.1842
      Y=YO-Z                                                     MGP.1843
      CALL PLTT (XO,Y,2)                                         MGP.1844
      X=XO+Z                                                     MGP.1845
      CALL PLTT (X,YO,2)                                         MGP.1846
      Y=YO+Z                                                     MGP.1847
      CALL PLTT (XO,Y,2)                                         MGP.1848
      X=XO-Z                                                     MGP.1849
      CALL PLTT (X,YO,2)                                         MGP.1850
      CALL PLTT (X,YO,3)                                         MGP.1851
      RETURN                                                     MGP.1852
C        I=7  SQUARE                                             MGP.1853
   70 Z=.707*Z                                                   MGP.1854
      X=XO-Z                                                     MGP.1855
      Y=YO-Z                                                     MGP.1856
      CALL PLTT (X,Y,3)                                          MGP.1857
      X=XO+Z                                                     MGP.1858
      CALL PLTT (X,Y,2)                                          MGP.1859
      Y=YO+Z                                                     MGP.1860
      CALL PLTT (X,Y,2)                                          MGP.1861
      X=XO-Z                                                     MGP.1862
      CALL PLTT (X,Y,2)                                          MGP.1863
      Y=YO-Z                                                     MGP.1864
      CALL PLTT (X,Y,2)                                          MGP.1865
      CALL PLTT (X,Y,3)                                          MGP.1866
      RETURN                                                     MGP.1867
C        I=8  CIRCLE                                             MGP.1868
   80 X=XO+Z                                                     MGP.1869
      CALL PLTT (X,YO,3)                                         MGP.1870
      N = 20*SQRT(Z*20.)                                         MGP.1871
      IF(N .LT. 10) N = 10                                       MGP.1872
      AN=N                                                       MGP.1873
      DO 81 J=1,N                                                MGP.1874
      X=XO+Z*COS(6.2832*J/AN)                                    MGP.1875
      Y=YO+Z*SIN(6.2832*J/AN)                                    MGP.1876
      CALL PLTT (X,Y,2)                                          MGP.1877
   81 CONTINUE                                                   MGP.1878
      CALL PLTT (X,Y,3)                                          MGP.1879
      RETURN                                                     MGP.1880
C        I=9 STAR                                                MGP.1881
   90 Y = YO + Z                                                 MGP.1882
      CALL PLTT (XO,Y,3)                                         MGP.1883
      DO 91 J = 1,5                                              MGP.1884
      X = XO + Z*SIN(6.2832*0.4*J)                               MGP.1885
      Y = YO + Z*COS(6.2832*0.4*J)                               MGP.1886
      CALL PLTT (X,Y,2)                                          MGP.1887
   91 CONTINUE                                                   MGP.1888
      CALL PLTT (X,Y,3)                                          MGP.1889
      RETURN                                                     MGP.1890
      END                                                        MGP.1891
      SUBROUTINE GRIDPT(DDD)                                     MGP.1892
      COMMON /ALL/ PI,RPD,DPR                                    MGP.1893
      COMMON /MBCLOT/ ALAT1,ALAT2,ALON1,ALON2                    MGP.1894
      COMMON /MBCLT/ PSKALE,OBLAT,OBLON,FLAT,CMER                MGP.1895
      DIMENSION DDD(7)                                           MGP.1896
      IFST = 1                                                   MGP.1897
      ALAT = DDD(1)                                              MGP.1898
      ALON = DDD(2)                                              MGP.1899
      AZ = DDD(3)                                                MGP.1900
      DEGMIN = DDD(4)                                            MGP.1901
      DEGMAX = DDD(5)                                            MGP.1902
      DEGINC = DDD(6)                                                   MGP.1903
      IF((ALAT .EQ. 0.0) .AND. (ALON .EQ. 0.0)) GO TO 1000              MGP.1904
      IF(IFST .EQ. 1) WRITE(6,200)                                      MGP.1905
  200 FORMAT(/"           LAT         LON         AZ    DEGMIN    DEGMAX",MGP.1906
     1  "     DEGINC"/)                                                 MGP.1907
      WRITE(6,150) ALAT,ALON,AZ,DEGMIN,DEGMAX,DEGINC                    MGP.1908
      ALAT = FLATC(ALAT,FLAT)                                           MGP.1909
  150 FORMAT("     PLOT GREAT CIRCLES WRT POLE AT",2F10.2,/,            MGP.1910
     1      "                         DEG MIN, MAX",2F10.2,/,           MGP.1911
     2      "                      DEG INCREMENT =",F10.2/)             MGP.1912
      NPT = ABS((DEGMAX-DEGMIN)/DEGINC) + 1.5                           MGP.1913
      IF(NPT .EQ. 0) NPT = 1                                            MGP.1914
      DEG = DEGMIN - DEGINC                                             MGP.1915
      IFST = 2                                                          MGP.1916
      DO 800 I = 1,NPT                                                  MGP.1917
C                                                                       MGP.1918
      DEG = DEG + DEGINC                                                MGP.1919
      IF(AZ .GT. 180.) AZ = AZ - 360.                                   MGP.1920
      CODEG = 90. - DEG                                                 MGP.1921
      CALL NEWPOL(CODEG,-AZ,ALATF,Y,ALAT,0.0)                           MGP.1922
      ALONF = 180. + Y + ALON                                           MGP.1923
      IF(ALONF .GT. 180.) ALONF = ALONF - 360.                          MGP.1924
      PLAT = ALATF                                                      MGP.1925
      PLON = ALONF                                                      MGP.1926
      IF(PSKALE .LT. 0) CALL NEWPOL(ALATF,ALONF,PLAT,PLON,OBLAT,OBLON)  MGP.1927
      IF((PLAT-ALAT1)*(PLAT-ALAT2) .GT. 0.0) GO TO 800                  MGP.1928
      DIF = ALON2 - ALON1                                               MGP.1929
      IF(DIF .LT. 0.0) DIF = 360 + DIF                                  MGP.1930
      DALO = PLON - ALON1                                               MGP.1931
      IF(DALO .LT. 0.0) DALO = 360. + DALO                              MGP.1932
      IF(DALO .GT. DIF) GO TO 800                                       MGP.1933
      CALL CONVRT(PLAT,PLON,A,B)                                        MGP.1934
C                                                                       MGP.1935
      AZP = AZ + 0.01                                                   MGP.1936
      CALL NEWPOL(CODEG,-AZP,ALATF,Y,ALAT,0.0)                          MGP.1937
      ALONF = 180. + Y + ALON                                           MGP.1938
      IF(ALONF .GT. 180) ALONF = ALONF - 360.                           MGP.1939
      PLAT = ALATF                                                      MGP.1940
      PLON = ALONF                                                      MGP.1941
      IF(PSKALE .LT. 0.0) CALL NEWPOL(ALATF,ALONF,PLAT,PLON,OBLAT,OBLON)MGP.1942
      CALL CONVRT(PLAT,PLON,A1,B1)                                      MGP.1943
C                                                                       MGP.1944
      CODEP = CODEG - 0.01                                              MGP.1945
      CALL NEWPOL(CODEP,-AZ,ALATF,Y,ALAT,0.0)                           MGP.1946
      ALONF = 180. + Y + ALON                                           MGP.1947
      IF(ALONF .GT. 180.) ALONF = ALONF - 360.                          MGP.1948
      PLAT = ALATF                                                      MGP.1949
      PLON = ALONF                                                      MGP.1950
      IF(PSKALE .LT. 0) CALL NEWPOL(ALATF,ALONF,PLAT,PLON,OBLAT,OBLON)  MGP.1951
      CALL CONVRT(PLAT,PLON,A2,B2)                                      MGP.1952
C                                                                       MGP.1953
      CALL PLTT(A1,B1,3)                                                MGP.1954
      CALL PLTT(A,B,2)                                                  MGP.1955
      CALL PLTT(A2,B2,2)                                                MGP.1956
      CALL NUMBER(A2,B2 -0.1,0.06,AZ,0.0,2)                             MGP.1957
      CALL NUMBER(A2,B2,0.06,DEG,0.0,2)                                 MGP.1958
  800 CONTINUE                                                          MGP.1959
 1000 RETURN                                                            MGP.1960
      END                                                               MGP.1961
      SUBROUTINE LINPLT                                                 MGP.1962
      COMMON /ALL/ PI,RPD,DPR                                           MGP.1963
      COMMON /MBCLOT/ ALAT1,ALAT2,ALON1,ALON2                           MGP.1964
      COMMON /MBCLT/ PSKALE,OBLAT,OBLON,FLAT,CMER                       MGP.1965
      COMMON /ML/ NPPC,LFILE,IREAD                                      MGP.1966
      CHARACTER*80 FMTL                                                 MGP.1967
      DIMENSION DLA(20),DLO(20)                                         MGP.1968
      JOBLI = 1                                                         MGP.1969
      IUP = 1                                                           MGP.1970
      READ(IREAD ,100) FMTL
  100 FORMAT(A80)                                                       MGP.1972
      WRITE(6,110) FMTL                                                 MGP.1973
  110 FORMAT(/" LINE FORMAT ",/,1X,A80/)                                MGP.1974
  200 READ (LFILE,FMTL) (DLA(I), DLO(I), I=1,NPPC)                      MGP.1975
      DO 800 I = 1,NPPC                                                 MGP.1976
      IF(DLA(I) .GE. 90.) GO TO 900                                     MGP.1977
  202 ALAT = DLA(I)                                                     MGP.1978
      ALON = DLO(I)                                                     MGP.1979
      IF(ALON .NE. 0.0) GO TO 220                                       MGP.1980
      IF(ALAT .NE. 0.0) GO TO 205                                       MGP.1981
      GO TO 800                                                         MGP.1982
  205 IF(ALAT .NE. 0.03) GO TO 210                                      MGP.1983
      IUP = 1                                                           MGP.1984
      GO TO 800                                                         MGP.1985
  210 IF(ALAT .NE. 0.10) GO TO 215                                      MGP.1986
      JOBLI = 1                                                         MGP.1987
      GO TO 800                                                         MGP.1988
  215 IF(ALAT .NE. 0.20) GO TO 220                                      MGP.1989
      JOBLI = 2                                                         MGP.1990
      GO TO 800                                                         MGP.1991
  220 PLAT = ALAT                                                       MGP.1992
      PLON = ALON                                                       MGP.1993
      IF((PSKALE .GE. 0) .AND. (JOBLI .EQ. 2)) GO TO 240                MGP.1994
      IF((PSKALE .LT. 0) .AND. (JOBLI .EQ. 1)) GO TO 250                MGP.1995
      GO TO 260                                                         MGP.1996
C ------ CHANGE OBLIGUE COORDINATES TO EARTH - NORTH POLE COORDS.       MGP.1997
  240 CALL NEWPOL(ALAT,ALON,PLAT,PLON,OBLAT,180.)                       MGP.1998
      IF(FLAT .GT. 0.0) PLAT = ATAN(TAN(PLAT*RPD)/FLAT)/RPD             MGP.1999
      PLON = -(180. - ABS(PLON))*PLON/ABS(PLON) + OBLON                 MGP.2000
      IF(ABS(PLON).GT. 180.) PLON=-(360.-ABS(PLON))*PLON/ABS(PLON)      MGP.2001
      GO TO 260                                                         MGP.2002
C-------- CHANGE EARTH - NORTH POLE COORDS TO OBLIQUE COORDS.          MGP.2003
  250 ALAT=FLATC(ALAT,FLAT)                                             MGP.2004
      CALL NEWPOL(ALAT,ALON,PLAT,PLON,OBLAT,OBLON)                      MGP.2005
C-------- CHECK IF POINT IS ON MAP.                                    MGP.2006
  260 IF((PLAT-ALAT1)*(PLAT-ALAT2) .LE. 0.0) GO TO 280                  MGP.2007
      IUP = 1                                                           MGP.2008
      GO TO 800                                                         MGP.2009
  280 DIF = ALON2 - ALON1                                               MGP.2010
      IF(DIF .LT. 0.0) DIF = 360. + DIF                                 MGP.2011
      DALO = PLON- ALON1                                                MGP.2012
      IF(DALO .LT. 0.0) DALO = 360. + DALO                              MGP.2013
      IF(DALO .LE. DIF) GO TO 300                                       MGP.2014
      IUP = 1                                                           MGP.2015
      GO TO 800                                                         MGP.2016
  300 CALL CONVRT(PLAT,PLON,X,Y)                                        MGP.2017
      J = 2                                                             MGP.2018
      IF(IUP .EQ. 1) J = 3                                              MGP.2019
      CALL PLTT(X,Y,J)                                                  MGP.2020
      IUP = 0                                                           MGP.2021
  800 CONTINUE                                                          MGP.2022
      GO TO 200                                                         MGP.2023
  900 RETURN                                                            MGP.2024
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      END                                                               MGP.2025
      SUBROUTINE NEWPOL(ALA,ALO,PLAT,PLON,OBLAT,OBLON)                  MGP.2026
      EXTERNAL ASIN(DESCRIPTORS),ACOS(DESCRIPTORS)
      COMMON /ALL/ PI,RPD,DPR                                           MGP.2027
      IF(OBLAT .NE. 90.) GO TO 100                                      MGP.2028
      PLAT = ALA                                                        MGP.2029
      PLON = ALO                                                        MGP.2030
      RETURN                                                            MGP.2031
  100 PIO2 = PI*.5                                                      MGP.2032
C      COMPUTE DIFFERENCE IN LONGITUDE (ANGLE A)                        MGP.2033
      A=ALO-OBLON                                                       MGP.2034
C                                                                       MGP.2035
C    BB IS COLATITUDE OF DATA POINT                                     MGP.2036
      BB=(90.-ALA)*RPD                                                  MGP.2037
C    CC IS COLATITUDE OF NEW POLE                                       MGP.2038
      CC = (90. -OBLAT)*RPD                                             MGP.2039
C                                                                       MGP.2040
      IF(A.GT.180.)A=A-360.                                             MGP.2041
      IF(A.LT.-180.)A=360.+A                                            MGP.2042
C    HEMIS IS +1 FOR EAST LONGITUDE AND -1 FOR WEST LONGITUDE           MGP.2043
      HEMIS=1.0                                                         MGP.2044
      IF(A.LT.0.)HEMIS=-1.0                                             MGP.2045
C    CONVERT ANGLE A TO RADIANS                                         MGP.2046
      A=ABS(A)*RPD                                                      MGP.2047
C    A NOW POSITIVE,LESS THAN 180 DEGREES, AND IN RADIANS               MGP.2048
C                                                                       MGP.2049
C    CALCULATE SIDE AA (CO-LATITUDE OF DATA POINT WITH RESPECT          MGP.2050
C    TO NEW POLE)                                                       MGP.2051
C                                                                       MGP.2052
      ARG=COS(BB)*COS(CC)+SIN(BB)*SIN(CC)*COS(A)                        MGP.2053
      AA=ACOS(ARG)
      ARG=SIN(A)*SIN(BB)/SIN(AA)                                        MGP.2055
C    BS IS SMALL VALUE FOR ANGLE B                                      MGP.2056
C    BL IS LARGE VALUE FOR ANGLE B                                      MGP.2057
      BS=ASIN(ARG)
      BL=PI-BS                                                          MGP.2059
      ARG=SIN(A)*SIN(CC)/SIN(AA)                                        MGP.2060
      CS=ASIN(ARG)
      CL=PI-CS                                                          MGP.2062
C                                                                       MGP.2063
      IF(BS.GT.CS)GO TO 500                                             MGP.2064
      B=BS                                                              MGP.2065
      IF(BB.GT.CC)B=BL                                                  MGP.2066
      GO TO 600                                                         MGP.2067
  500 IF(BS.NE.CS)GO TO 550                                             MGP.2068
      B=BS                                                              MGP.2069
      IF(BB .GT. PIO2) B = BL                                           MGP.2070
      GO TO 600                                                         MGP.2071
  550 C=CS                                                              MGP.2072
      IF(CC.GT.BB)C=CL                                                  MGP.2073
      ARG=-COS(A)*COS(C)+SIN(A)*SIN(C)*COS(BB)                          MGP.2074
      B=ACOS(ARG)
  600 XLONG=PI-B                                                        MGP.2076
      IF(HEMIS.LT.0.)XLONG=-(PI-B)                                      MGP.2077
      PLON=XLONG/RPD                                                    MGP.2078
      XLAT = PIO2 - AA                                                  MGP.2079
      PLAT=XLAT/RPD                                                     MGP.2080
C    PLAT ) PLON  ARE NEW CO-ORDS                                       MGP.2081
      RETURN                                                            MGP.2082
      END                                                               MGP.2083
      SUBROUTINE NUMBER(X,Y,H,FPN,THETA,NN)                             MGP.2084
      EXTERNAL ALPHA$LETTER(DESCRIPTORS)
      DOUBLE PRECISION SIEVE,ANP                                        MGP.2086
      DIMENSION L(14)                                                   MGP.2087
      CHARACTER*4 ONE,TWO,THR,FOR,FIV,SIX,SEV,EIT,NIN,ZER,NUM,DEC       MGP.2088
      DATA ONE/4H1000/,TWO/4H2000/,THR/4H3000/,FOR/4H4000/,FIV/4H5000/, MGP.2089
     1SIX/4H6000/,SEV/4H7000/,EIT/4H8000/,NIN/4H9000/,ZER/4H0000/,      MGP.2090
     2DEC/4H.000/                                                       MGP.2091
      IH=THETA+SIGN(0.5,THETA)                                          MGP.2092
      RAD=0.0174533*THETA                                               MGP.2093
      CS=H*COS(RAD)                                                     MGP.2094
      SS=H*SIN(RAD)                                                     MGP.2095
      M=(H+.03)/.06                                                     MGP.2096
      XX=X                                                              MGP.2097
      YY=Y                                                              MGP.2098
      IF(X .EQ. 999.) CALL PLTT(XX,DUM,0)                               MGP.2099
      IF(Y .EQ. 999.) CALL PLTT(DUM,YY,0)                               MGP.2100
      N=NN                                                              MGP.2101
      I=0                                                               MGP.2102
      II=1                                                              MGP.2103
      ANP=ABS(FPN)                                                      MGP.2104
      IF(ANP.LE.0.0)GO TO 25                                            MGP.2105
      IF(ANP .LT. 1.D7) GO TO 11                                        MGP.2106
C     the following occurs if number wanted gt 9,999,999                MGP.2107
      WRITE(6,12)FPN                                                    MGP.2108
   12 FORMAT(" ","the number",E15.7,"is too large to plot")             MGP.2109
      RETURN                                                            MGP.2110
   11 IF(FPN.GE.0.0)GO TO 10                                            MGP.2111
C     write minus sign                                                  MGP.2112
      CALL ALPHA$LETTER(1,M,IH,XX,YY,1H-)                               MGP.2113
      XX=XX+CS                                                          MGP.2114
      YY=YY+SS                                                          MGP.2115
   10 CONTINUE                                                          MGP.2116
      IF(N.GE.0)ANP=ANP+0.5*1.D1**(-N)                                  MGP.2117
      IF(N.LT 0)ANP=ANP+0.5                                             MGP.2118
C     the preceding statement rounds number to n places                 MGP.2119
C     now we fill array l with values of digits to be plotted           MGP.2120
      ICOUNT=0                                                          MGP.2121
      SIEVE=1.D6                                                        MGP.2122
      JJ=6                                                              MGP.2123
      DO 13 I=1,14                                                      MGP.2124
   16 ANP=ANP-SIEVE                                                     MGP.2125
      IF(ANP.LE.0.0)GO TO 15                                            MGP.2126
      ICOUNT=ICOUNT+1                                                   MGP.2127
      GO TO 16                                                          MGP.2128
   15 IF(ANP.NE.0.0)GO TO 17                                            MGP.2129
      L(I)=ICOUNT+1                                                     MGP.2130
      IF(I.GE.14)GO TO 30                                               MGP.2131
      II=I+1                                                            MGP.2132
      GO TO 25                                                          MGP.2133
   17 L(I)=ICOUNT                                                       MGP.2134
      ANP=ANP+SIEVE                                                     MGP.2135
      JJ=JJ-1                                                           MGP.2136
      SIEVE=1.D1**JJ                                                    MGP.2137
      ICOUNT=0                                                          MGP.2138
   13 CONTINUE                                                          MGP.2139
      GO TO 30                                                          MGP.2140
   25 DO 18 K=II,14                                                     MGP.2141
      L(K)=0                                                            MGP.2142
   18 CONTINUE                                                          MGP.2143
   30 N=-8                                                              MGP.2144
      IFLAG=-100                                                        MGP.2145
      DO 40 I=1,14                                                      MGP.2146
      LI=L(I)                                                           MGP.2147
      IF(L(I) EQ.0)GO TO 200                                            MGP.2148
      GO TO(     210,220,230,240,250,260,270,280,290),LI                MGP.2149
200   NUM=ZER                                                           MGP.2150
      GO TO 50                                                          MGP.2151
210   NUM=ONE                                                           MGP.2152
      GO TO 50                                                          MGP.2153
220   NUM=TWO                                                           MGP.2154
      GO TO 50                                                          MGP.2155
230   NUM=THR                                                           MGP.2156
      GO TO 50                                                          MGP.2157
240   NUM=FOR                                                           MGP.2158
      GO TO 50                                                          MGP.2159
250   NUM=FIV                                                           MGP.2160
      GO TO 50                                                          MGP.2161
260   NUM=SIX                                                           MGP.2162
      GO TO 50                                                          MGP.2163
270   NUM=SEV                                                           MGP.2164
      GO TO 50                                                          MGP.2165
280   NUM=EIT                                                           MGP.2166
      GO TO 50                                                          MGP.2167
290   NUM=NIN                                                           MGP.2168
50    N=N+1                                                             MGP.2169
      IF(N.GT.NN)GO TO 100                                              MGP.2170
      IF(L(I).GT.0)IFLAG=100                                            MGP.2171
      IF(IFLAG.GT.0.OR.N.GT.-2)GO TO 101                                MGP.2172
      GO TO 40                                                          MGP.2173
101   CONTINUE                                                          MGP.2174
      IF(N.NE.0)GO TO 102                                               MGP.2175
      CALL ALPHA$LETTER(1,M,IH,XX,YY,DEC)                               MGP.2176
      XX=XX+CS                                                          MGP.2177
      YY=YY+SS                                                          MGP.2178
      N=N+1                                                             MGP.2179
      IF(N.GT.NN)GO TO 100                                              MGP.2180
102   CALL ALPHA$LETTER(1,M,IH,XX,YY,NUM)                               MGP.2181
      YY=YY+SS                                                          MGP.2182
      XX=XX+CS                                                          MGP.2183
40    CONTINUE                                                          MGP.2184
100   CONTINUE                                                          MGP.2185
      RETURN                                                            MGP.2186
      END                                                               MGP.2187
      SUBROUTINE OUTLIN                                                 MGP.2188
C-------- PLOT AND LABEL MAP BOUNDARIES. -------------------------------MGP.2189
C-------- HCHAR IS THE CHARACTER WIDTH. --------------------------------MGP.2190
C-------- CHARACTERS ARE 1.5 TIMES HIGHER THAN THEY ARE WIDE.           MGP.2191
      CHARACTER*80 CHARR                                                MGP.2192
      COMMON /ALL/ PI,RPD,DPR                                           MGP.2193
      COMMON /OMPX/ XINT,XMAX                                           MGP.2194
      COMMON /MBCLOT/ ALAT1,ALAT2,ALON1,ALON2                           MGP.2195
      COMMON /MCO/ SINRA,COSRA,SHIFT                                    MGP.2196
      COMMON /MCOT/ ROTA                                                MGP.2197
      COMMON /MEOT/ MORSE                                               MGP.2198
      COMMON /MO/ ATINC,HCHAR,NCHAR,NLINE,ONINC,TTH,XMN,ATEDG,ONEDG     MGP.2199
      COMMON /MO1/ DINC,ZMAX,ZINC,PTRSZ,YOFF,SINPD,YMAX,CHARR(5),TICSZ  MGP.2200
      COMMON /MOT/ IMORS                                                MGP.2201
      COMMON /MOTX/ SINPK                                               MGP.2202
      H2 = 2.*HCHAR                                                     MGP.2203
      IF(MORSE .EQ. 1) GO TO 122                                        MGP.2204
      SAVAE = ATEDG                                                     MGP.2205
      IF((ALAT2-ALAT1) .LT. ATEDG) ATEDG = ALAT2-ALAT1                  MGP.2206
      NLAT = (ALAT2-ALAT1)/ATEDG                                        MGP. 2207
      EXLAT = (ALAT2-ALAT1)-NLAT*ATEDG                                  MGP. 2208
      DLON = ALON2-ALON1                                                MGP. 2209
      SAVOE = ONEDG                                                     MGP. 2210
      IF(DLON .LT. ONEDG) ONEDG = DLON                                  MGP. 2211
      IF(DLON .LT. 0) DLON = 360. + DLON                                MGP. 2212
      NLON = DLON/ONEDC                                                 MGP. 2213
      EXLON = DLON-NLON*ONEDG                                           MGP. 2214
      LLON = ONEDG*4.0                                                  MGP. 2215
      AMID = PI*0.5 - (ALAT1+ALAT2)*0.5*RPD                             MGP. 2216
      DLA = HCHAR*0.5/SINPD                                             MGP. 2217
      DLO = DLA/SIN(AMID)
C------ LOWER LEFT LABEL. -----------------------------------------------MGP. 2219
      AT = ALAT1 + ATINC                                                MGP. 2220
      CALL CONVRT(ALAT1,ALON1,XO,YO)                                    MGP. 2221
      XBL = XO                                                          MGP. 2222
      YBL = YO                                                          MGP. 2223
      CALL CONVRT(AT,ALON1,X1,Y1)                                       MGP. 2224
      TH = ATAN2(Y1-YO,X1-XO)                                           MGP. 2225
      X = XO + H2*COS(TH+.24)                                           MGP. 2226
      Y = YO + H2*SIN(TH+.24)                                           MGP. 2227
      TH = TH*DPR                                                       MGP. 2228
      CALL NUMBER(X,Y,HCHAR,ALON1,TH,2)                                 MGP. 2229
      B = 0.5*PI - ALAT1*RPD                                            MGP. 2230
      OT = ALON1 + 7.*HCHAR/(SINPD*SIN(B))                              MGP. 2231
      CALL CONVRT (ALAT1,OT,X1,Y1)                                      MGP. 2232
      TH = ATAN2(Y1-YO,X1-XO)                                           MGP. 2233
      X = XO + H2*COS(TH-.78)                                           MGP. 2234
      Y = YO + H2*SIN(TH-.78)                                           MGP. 2235
      TH = TH*DPR                                                       MGP. 2236
      CALL NUMBER(X,Y,HCHAR,ALAT1,TH,2)                                 MGP. 2237
C------ BOTTOM. ---------------------------------------------------------MGP. 2238
      A = ALON1                                                         MGP. 2239
      AT = ALAT1 + DLA                                                  MGP. 2240
      CALL PLTT(XO,YO,3)                                                MGP. 2241
      DO 21 J = 1,NLON                                                  MGP. 2242
      IF(LLON .EQ. 0) GO TO 20                                          MGP. 2243
      DO 17 I = 1,LLON
      A = A + 0.25                                                      MGP. 2245
      CALL CONVRT(ALAT1,A,X,Y)                                          MGP. 2246
   17 CALL PLTT(X,Y,2)                                                  MGP. 2247
   20 A = ALON1 + J*ONEDG                                               MGP. 2248
      CALL CONVRT(ALAT1,A,X,Y)                                          MGP. 2249
      CALL PLTT(X,Y,2)                                                  MGP. 2250
      CALL CONVRT(AT,A,XT,YT)                                           MGP. 2251
      CALL PLTT(XT,YT,2)                                                MGP. 2252
   21 CALL PLTT(X,Y,3)                                                  MGP. 2253
      IF(EXLON .LE. 0.25) GO TO 23                                      MGP. 2254
      LXON = EXLON*4.0                                                  MGP. 2255
      DO 22 I = 1,LXON                                                  MGP. 2256
      A = A + 0.25                                                      MGP. 2257
      CALL CONVRT(ALAT1,A,X,Y)                                          MGP. 2258
   22 CALL PLTT(X,Y,2)                                                  MGP. 2259
C------ RIGHT. ----------------------------------------------------------MGP. 2260
   23 A = ALAT1                                                         MGP. 2261
      AT = ALON2 - DLO                                                  MGP. 2262
      CALL CONVRT(A,ALON2,X,Y)                                          MGP. 2263
      XMAX = X                                                          MGP. 2264
      IF(ROTA .NE. 0.0) CALL CONVRT(ALAT2,ALON2,XMAX,Z)                 MGP. 2265
      CALL PLTT(X,Y,2)                                                  MGP. 2266
      DO 25 J = 1,NLAT                                                  MGP. 2267
      A = A + ATEDG                                                     MGP.2268
      CALL CONVRT(A,ALON2,X,Y)                                          MGP.2269
      CALL PLTT(X,Y,2)                                                  MGP.2270
      CALL CONVRT(A,AT,XT,YT)                                           MGP.2271
      CALL PLTT(XT,YT,2)                                                MGP.2272
   25 CALL PLTT(X,Y,3)                                                  MGP.2273
      CALL CONVRT(ALAT2,ALON2,XO,YO)                                    MGP.2274
      CALL PLTT(XO,YO,2)                                                MGP.2275
C-------- UPPER RIGHT LABEL. --------------------------------------------MGP.2276
      AT = ALAT2 - ATINC                                                MGP.2277
      CALL CONVRT(AT,ALON2,X1,Y1)                                       MGP.2278
      TH = ATAN2(Y1-YO,X1-XO)                                           MGP.2279
      X = XO + H2*COS(TH+.24)                                           MGP.2280
      Y = YO + H2*SIN(TH+.24)                                           MGP.2281
      TH = TH*DPR                                                       MGP.2282
      CALL NUMBER(X,Y,HCHAR,ALON2,TH,2)                                 MGP.2283
      B = 0.5*PI - ALAT2*RPD                                            MGP.2284
      AT = ALON2 - 7.*HCHAR/(SINPD*SIN(B))                              MGP.2285
      CALL CONVRT(ALAT2,AT,X1,Y1)                                       MGP.2286
      TH = ATAN2(YO-Y1,XO-X1)                                           MGP.2287
      X = XO - 3.*H2*COS( TH)                                           MGP.2288
      THPR = TH - 5.0*RPD
      Y = YO - 3.*H2*SIN( THPR)
      TH = TH*DPR                                                       MGP.2290
      CALL NUMBER(X,Y,HCHAR,ALAT2,TH,2)                                 MGP.2291
C-------- TOP. ----------------------------------------------------------MGP.2292
      A = ALON2                                                         MGP.2293
      AT = ALAT2 - DLA                                                  MGP.2294
      CALL PLTT(XO,YO,3)                                                MGP.2295
      IF(EXLON .LE. 0.25) GO TO 2520                                    MGP.2296
      DO 2510 I = 1,LXON                                                MGP.2297
      A = A - 0.25                                                      MGP.2298
      CALL CONVRT(ALAT2,A,X,Y)                                          MGP.2299
 2510 CALL PLTT(X,Y,2)                                                  MGP.2300
      CALL CONVRT(AT,A,XT,YT)                                           MGP.2301
      CALL PLTT(XT,YT,2)                                                MGP.2302
      CALL PLTT(X,Y,2)                                                  MGP.2303
 2520 DO 31 K = 1,NLON                                                  MGP.2304
      IF(LLON .EQ. 0) GO TO 30                                          MGP.2305
      DO 27 I = 1,LLON                                                  MGP.2306
      A = A - 0.25                                                      MGP.2307
      CALL CONVRT(ALAT2,A,X,Y)                                          MGP.2308
   27 CALL PLTT(X,Y,2)                                                  MGP.2309
   30 A = ALON2 - K*ONEDG-EXLON                                         MGP.2310
      CALL CONVRT(ALAT2,A,X,Y)                                          MGP.2311
      CALL PLTT(X,Y,2)                                                  MGP.2312
      CALL CONVRT(AT,A,XT,YT)                                           MGP.2313
      CALL PLTT(XT,YT,2)                                                MGP.2314
   31 CALL PLTT(X,Y,3)                                                  MGP.2315
C-------- LEFT. ---------------------------------------------------------MGP.2316
      A = ALAT2                                                         MGP.2317
      AT = ALON1 + DLO                                                  MGP.2318
      CALL CONVRT(A,ALON1,X,Y)                                          MGP.2319
      CALL PLTT(X,Y,2)                                                  MGP.2320
      A = A - EXLAT                                                     MGP.2321
      CALL CONVRT(A,ALON1,X,Y)                                          MGP.2322
      CALL PLTT(X,Y,2)                                                  MGP.2323
      CALL CONVRT(A,AT,XT,YT)                                           MGP.2324
      CALL PLTT(XT,YT,2)                                                MGP.2325
      CALL PLTT(X,Y,2)                                                  MGP.2326
      K = NLAT - 1                                                      MGP.2327
      IF(K .EQ. 0) GO TO 47                                             MGP. 2328
      DO 45 J = 1,K                                                     MGP. 2329
      A = A - ATEDG                                                     MGP. 2330
      CALL CONVRT(A,ALON1,X,Y)                                          MGP. 2331
      CALL PLTT(X,Y,2)                                                  MGP. 2332
      CALL CONVRT(A,AT,XT,YT)                                           MGP. 2333
      CALL PLTT(XT,YT,2)                                                MGP. 2334
   45 CALL PLTT(X,Y,3)                                                  MGP. 2335
   47 CALL PLTT(XBL,YBL,2)                                              MGP. 2336
      CALL PLTT(XBL,YBL,3)                                              MGP. 2337
C-------- DRAW INTERSECTIONS. -------------------------------------------MGP. 2338
      I = 0                                                             MGP. 2339
      IF((ALAT2 - ALAT1) .LE. ATINC) GO TO 120                          MGP. 2340
      IF(DLON .LE. ONINC) GO TO 120                                     MGP. 2341
      NLAT = (ALAT2-ALAT1)/ATINC                                        MGP. 2342
      EXLAT = (ALAT2-ALAT1)-NLAT*ATINC                                  MGP. 2343
      NLON = DLON/ONINC                                                 MGP. 2344
      EXLON = DLON-NLON*ONINC                                           MGP. 2345
      LLON = ONINC*4.0                                                  MGP. 2346
      IF(EXLAT .GE. ATINC/4.0) I = 1                                    MGP. 2347
      NLAT = NLAT - 1 + I                                               MGP. 2348
      IF(EXLON .LT. ONINC/4.0) GO TO 50                                 MGP. 2349
      I = 1                                                             MGP. 2350
      EON = ONINC - EXLON                                               MGP. 2351
      GO TO 55                                                          MGP. 2352
   50 I = 0                                                             MGP. 2353
      EON = -EXLON                                                      MGP. 2354
   55 NLON = NLON - 1 + I                                               MGP. 2355
      A = ALAT1                                                         MGP. 2356
      B = ALON1                                                         MGP. 2357
      IALT = -1                                                         MGP. 2358
      DLA = TICSZ*0.5/SINPD
      DLO = DLA/SIN(AMID)
      DO 60 I = 1,NLAT                                                  MGP. 2359
      IALT = -IALT                                                      MGP. 2360
      A = A + ATINC                                                     MGP. 2361
      A1 = A - DLA                                                      MGP. 2362
      A2 = A + DLA                                                      MGP. 2363
      DO 65 J = 1,NLON                                                  MGP. 2364
      B = B + ONINC*IALT                                                MGP. 2365
      B1 = B - DLO*IALT                                                 MGP. 2366
      B2 = B + DLO*IALT                                                 MGP. 2367
      CALL CONVRT(A,B1,X,Y)                                             MGP. 2368
      CALL PLTT(X,Y,3)                                                  MGP. 2369
      CALL CONVRT(A,B2,X,Y)                                             MGP. 2370
      CALL PLTT(X,Y,2)                                                  MGP. 2371
      CALL CONVRT(A1,B,X,Y)                                             MGP. 2372
      CALL PLTT(X,Y,3)                                                  MGP. 2373
      CALL CONVRT(A2,B,X,Y)                                             MGP. 2374
   65 CALL PLTT(X,Y,2)                                                  MGP. 2375
      B = ALON2 + EON                                                   MGP. 2376
      IF(IALT .LT. 0) B = ALON1                                         MGP. 2377
   60 CONTINUE                                                          MGP. 2378
C-------- TITLE PLOT. --------------------------------------------------MGP. 2379
  120 ATEDG = SAVAE                                                     MGP. 2380
      ONEDG = SAVOE                                                     MGP. 2381
  122 IF(NLINE .LE. 0) GO TO 1000                                       MGP. 2382
      Y = -1.5*HCHAR - ZMAX*SINPK*MORSE                                 MGP. 2383
      A = XMAX                                                          MGP. 2384
      IF((ROTA .NE. 0.0) .AND. (MORSE .EQ. 0)) A = YMAX                 MGP. 2385
      X = (A-HCHAR*NCHAR)*0.5                                           MGP. 2386
      DO 125 J = 1,NLINE                                                MGP.2387
      Y = Y - 3.0*HCHAR                                                 MGP.2388
      WRITE(6,920) CHARR(J)                                             MGP.2389
  920 FORMAT(/1X,A80)                                                   MGP.2390
      A = X                                                             MGP.2391
      B = Y                                                             MGP.2392
      C = 0.                                                            MGP.2393
      IF((ROTA .EQ. 0.0) .OR. (MORSE .EQ. 1)) GO TO 130                 MGP.2394
      A = X*COSRA + Y*SINRA                                             MGP.2395
      B = -X*SINRA+Y*COSRA+SHIFT                                        MGP.2396
      C =-ROTA*DPR                                                      MGP.2397
  130 CALL PLTT(A,B,3)                                                  MGP.2398
  125 CALL SYMBOL(A,B,HCHAR,CHARR(J),C,NCHAR)                           MGP.2399
 1000 IF(MORSE .EQ. 0) RETURN                                           MGP.2400
C-------- DRAW X-SECTION AXES. ------------------------------------------MGP.2401
      X = -9.*HCHAR                                                     MGP.2402
      NDIST = XMAX/(DINC*SINPK) + 0.9                                   MGP.2403
      CALL PLTT(0.0,0.0,3)                                              MGP.2404
      X = 0.0                                                           MGP.2405
      DO 200 I = 1,NDIST                                                MGP.2406
      X = X + DINC*SINPK                                                MGP.2407
      CALL PLTT(X,0.0,2)                                                MGP.2408
      CALL PLTT(X,-HCHAR,2)                                             MGP.2409
  200 CALL PLTT(X,0.0,2)                                                MGP.2410
C-------- LABEL UPPER RIGHT AND LEFT. -----------------------------------MGP.2411
      X = X - 3.5*HCHAR                                                 MGP.2412
      Y = 0.5*HCHAR                                                     MGP.2413
      D = DINC*NDIST                                                    MGP.2414
      CALL NUMBER(X,Y,HCHAR,D,0.0,2)                                    MGP.2415
      X =   -1.5*HCHAR                                                  MGP.2416
      CALL SYMBOL(X,Y,HCHAR,3H  0,0.0,3)                                MGP.2417
      Y = -0.5*HCHAR                                                    MGP.2418
      X = -5.0*HCHAR                                                    MGP.2419
      CALL SYMBOL(X,Y,HCHAR,5H    0,0.0,5)                              MGP.2420
      NDEP = ZMAX/ZINC + 0.9                                            MGP.2421
      CALL PLTT(0.0,0.0,3)                                              MGP.2422
      Y = 0.0                                                           MGP.2423
      DO 300 I = 1,NDEP                                                 MGP.2424
      Y = Y - ZINC*SINPK                                                MGP.2425
      CALL PLTT(0.0,Y,2)                                                MGP.2426
      CALL PLTT(HCHAR,Y,2)                                              MGP.2427
  300 CALL PLTT(0.0,Y,2)                                                MGP.2428
      X = -6.0*HCHAR                                                    MGP.2429
      Y = Y - 0.5*HCHAR                                                 MGP.2430
      D = ZINC*NDEP                                                     MGP.2431
      CALL NUMBER(X,Y,HCHAR,D,0.0,2)                                    MGP.2432
      RETURN                                                            MGP.2433
      END                                                               MGP.2434
      FUNCTION PHI(ALON,ALOBR,SAVE)                                     MGP.2435
      DIF = ALON-ALOBR                                                  MGP.2436
      IF(ABS(DIF) .GT. 180.) DIF=-(360.-ABS(DIF))*DIF/ABS(DIF)          MGP.2437
      PHI = DIF*SAVE                                                    MGP.2438
      RETURN                                                            MGP.2439
      END                                                               MGP.2440
      SUBROUTINE PLSORT                                                 MGP.2497
C                                                                       MGP.2498
C     SUBROUTINE TO SORT POINTS BEFORE PLOTTING                         MGP.2499
C     ARGUMENTS                                                         MGP.2500
C           X      THE ARRAY OF INDEPENDENT VARIABLES                   MGP.2501
C           Y      THE ARRAY OF DEPENDENT VARIABLES                     MGP.2502
C           NP     THE NUMBER OF POINTS                                 MGP.2503
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C           KEY    AN ARRAY OF VARIABLE SUBSCRIPTS FORMED BY PLSORT       MGP. 2504
C           XMIN   THE MINIMUM VALUE OF X                                 MGP. 2505
C           YINT   THE X AXIS IS BROKEN UP INTO INTERVALS OF LENGTH XINT MGP. 2506
C                  FOR THE PURPOSE OF SORTINO                             MGP. 2507
C           XMAX   THE MAXIMUM VALUE OF X                                 MGP. 2508
C     USES SUBROUTINE SORT                                                MGP. 2509
C                                                                         MGP. 2510
      EXTERNAL RANDOM (DESCRIPTORS)                                       MGP. 2511
      COMMON ACHAR(9001),ALLA(9001),ALLO(9001),ALLSE(3,9001),ALLZ(9001),MGP. 2512
     2DATA(4,9001),IAZ(3,9001),IDATE(9001),IDP(3,9001),IHRMN(9001), KEY MGP. 2513
     3(9001),IQTRN(9001),JSYM(9001),NUMSC(9001),PHI(9001),XXSV(9001),    MGP. 2514
     4  X(9001),YYSV(9001),   Y(9001),ZZZ(9001)                           MGP. 2515
C----NOTE NAME CHANGE TO KEY, X, Y                                        MGP. 2516
      COMMON /OMPX/ XINT,XMAX                                             MGP. 2517
      COMMON /DBMPTX/ MAXDA                                               MGP. 2518
      COMMON /MP/ FILT,SCAT                                               MGP. 2519
      DIMENSION TEMP(9001),J1(2,100),KK(9001),KEMP(9001),A(2)             MGP. 2520
C                                                                         MGP. 2521
      IF(MAXDA .LE. 0) RETURN                                             MGP. 2522
      NP = MAXDA                                                          MGP. 2523
      XMIN = - 1.0                                                        MGP. 2524
      IF(XINT.LE..001) XINT=(XMAX-XMIN)/10.                               MGP. 2525
      CALL SORT(X,KEY,NP,1)                                               MGP. 2526
      DO 10 I=1,NP                                                        MGP. 2527
   10 TEMP(I)=Y(I)                                                        MGP. 2528
      DO 20 I=1,NP                                                        MGP. 2529
      IK = KEY(I)                                                         MGP. 2530
   20 Y(I)=TEMP(IK)                                                       MGP. 2531
      NN=(XMAX-XMIN)/XINT+1.                                              MGP. 2532
      IF(XMAX.LE.XMIN+(NN-1)*XINT) NN=NN-1                                MGP. 2533
      DO 30 I=1,NN                                                        MGP. 2534
      J1(1,I)=0                                                           MGP. 2535
      J1(2,I)=0                                                           MGP. 2536
   30 CONTINUE                                                            MGP. 2537
      J=1                                                                 MGP. 2538
      DO 50 I=1,NP                                                        MGP. 2539
      IF(X(I).LT.XMIN.OR.X(I).GT.XMAX) GO TO 50                           MGP. 2540
   40 IF(X(I).LE.XMIN+J*XINT) GO TO 45                                    MGP. 2541
      J=J+1                                                               MGP. 2542
      GO TO 40                                                            MGP. 2543
   45 IF(J1(1,J).EQ.0) J1(1,J)=I                                          MGP. 2544
      J1(2,J)=I                                                           MGP. 2545
   50 CONTINUE                                                            MGP. 2546
      IND=-1                                                              MGP. 2547
      DO 110 I=1,NN                                                       MGP. 2548
      NS=J1(1,I)                                                          MGP. 2549
      NF=J1(2,I)                                                          MGP. 2550
      IF(NS.EQ.NF) GO TO 110                                              MGP. 2551
      ICOUNT=0                                                            MGP. 2552
      DO 60 J=NS,NF                                                       MGP. 2553
      ICOUNT=ICOUNT+1                                                     MGP. 2554
      TEMP(ICOUNT)=Y(J)                                                   MGP. 2555
   60 CONTINUE                                                            MGP. 2556
      IND=-IND                                                            MGP. 2557
      CALL SORT(TEMP,KK,ICOUNT,IND)                                       MGP. 2558
      DO 70 J=1,ICOUNT                                                    MGP. 2559
      JJ=NS-1+J                                                           MGP. 2560
      KEMP(J)=KEY(JJ)                                                     MGP. 2561
      TEMP(J)=X(JJ)                                                       MGP. 2562
   70 CONTINUE                                                            MGP. 2563
      DO 80 J=1,ICOUNT                                                    MGP. 2564
      JJ=NS-1+J                                                         MGP.2565
      IK = KK(J)                                                        MGP.2566
      X(JJ) = TEMP(IK)
      KEY(JJ) = KEMP(IK)                                                MGP.2567
   80 CONTINUE                                                          MGP.2568
      DO 90 J=1,ICOUNT                                                  MGP.2569
      JJ=NS-1+J                                                         MGP.2570
      TEMP(J)=Y(JJ)                                                     MGP.2571
   90 CONTINUE                                                          MGP.2572
      DO 100 J=1,ICOUNT                                                 MGP.2573
      JJ=NS-1+J                                                         MGP.2574
      IK = KK(J)                                                        MGP.2575
      Y(JJ) = TEMP(IK)                                                  MGP.2576
  100 CONTINUE                                                          MGP.2577
  110 CONTINUE                                                          MGP.2578
C                                                                       MGP.2579
C  ------ FILTER AND SCATTER IF REQUIRED.                               MGP.2580
      IF(SCAT .EQ. 0.0) GO TO 210                                       MGP.2581
C------- UNIFORM DISTRIBUTION BETWEEN + AND - SCAT.                     MGP.2582
      XX = X(1)                                                         MGP.2583
      YY = Y(1)                                                         MGP.2584
      DO 200 I = 2,NP                                                   MGP.2585
      IF((X(I) .EQ. 0.) .AND. (Y(I) .EQ. 0.0102030)) GO TO 200          MGP.2586
      IF((XX-X(I)) * (YY-Y(I)) .NE. 0.0) GO TO 160                      MGP.2587
      CALL RANDOM_$UNIFORM(RAND)                                        MGP.2588
      X(I) = X(I) + SCAT*2.0*(RAND      - 0.5)                          MGP.2589
      CALL RANDOM_$UNIFORM(RAND)                                        MGP.2590
      Y(I) = Y(I) + SCAT*2.0*(RAND      - 0.5)                          MGP.2591
      GO TO 200                                                         MGP.2592
  160 XX = X(I)                                                         MGP.2593
      YY = Y(I)                                                         MGP.2594
  200 CONTINUE                                                          MGP.2595
C                                                                       MGP.2596
  210 IF(FILT .EQ. 0.0) RETURN                                          MGP.2597
      NFILT = 0                                                         MGP.2598
      XX = X(1)                                                         MGP.2599
      YY = Y(1)                                                         MGP.2600
      DO 140 I = 2,NF                                                   MGP.2601
      IF((X(I) .EQ. 0) .AND. (Y(I) .EQ. 0.0102030)) GO TO 140           MGP.2602
      IF((XX-X(I))**2+(YY-Y(I))**2 .GT. FILT) GO TO 130                 MGP.2603
      X(I) = 0.0                                                        MGP.2604
      Y(I) = 0.0102030                                                  MGP.2605
      NFILT = NFILT + 1                                                 MGP.2606
      GO TO 140                                                         MGP.2607
  130 XX = X(I)                                                         MGP.2608
      YY = Y(I)                                                         MGP.2609
  140 CONTINUE                                                          MGP.2610
      WRITE(6,300) NFILT                                                MGP.2611
  300 FORMAT(/,1X,I10," EARTHQUAKES WERE FILTERED OUT"/)                MGP.2612
      RETURN                                                            MGP.2613
      END                                                               MGP.2614
      SUBROUTINE SORT(X,KEY,NO,IND)                                     MGP.2615
C     SORT ARRANGES THE ELEMENTS OF X IN ASCENDING OR DESCENDING ORDER  MGP.2616
C     AND CONSTRUCTS AN ARRAY KEY OF SUBSCRIPTS OF X                    MGP.2617
C     ARGUMENTS                                                         MGP.2618
C           X      THE ARRAY TO BE ORDERED, REAL                        MGP.2619
C           KEY    THE ARRAY OF SUBSCRIPTS OF X FORMED BY SORT          MGP.2620
C           NO     THE NUMBER OF ELEMENTS IN THE X ARRAY                MGP.2621
C           IND    =1  IF NUMBERS ARE TO BE SORTED IN ASCENDING ORDER   MGP.2622
C                  =-1 IF NUMBERS ARE TO BE SORTED IN DESCENDING ORDER  MGP.2623
C                                                                       MGP.2624
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      DIMENSION X(NO),KEY(NO)
      DO 1 I=1,NO
    1     KEY(I)=I
      IF(IND.EQ.1) GO TO 5
      DO 3 I=1,NO
    3 X(I)=-X(I)
    5 MO=NO
    2 IF(MO-15)21,21,23
   21 IF(MO-1)9,9,22
   22 MO=2*(MO/4)+1
      GO TO 24
   23 MO=2*(MO/8)+1
   24 KO=NO-MO
      JO=1
   25 I=JO
   26 IF(X(I)-X(I+MO))28,28,27
   27 TEMP=X(I)
      X(I)=X(I+MO)
      X(I+MO)=TEMP
      KEMP=KEY(I)
      KEY(I)=KEY(I+MO)
      KEY(I+MO)=KEMP
      I=I-MO
      IF(I-1)28,26,26
   28 JO=JO+1
      IF(JO-KO)25,25,2
    9 IF(IND.EQ.1) RETURN
      DO 10 I=1,NO
   10 X(I)=-X(I)
      RETURN
      END
      SUBROUTINE SYMBOL(X,Y,H,ALP,TH,N)
      EXTERNAL ALPHA$LETTER(DESCRIPTORS)
      DIMENSION ALP(1)
c * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
c symbol plots the string of 'n' characters stored in 'alp' at an angle
c of 'th' degrees. each character will be 'h' inches in heigth and
c (x,y) is the lower left-hand corner of the string.
c * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
c
c convert th to an integer.
      ITH=TH+SIGN(0.5,TH)
c compute number (rounded of plotter units in h.
      M=(H+0.03)/0.06
      XX=X
      YY=Y
      IF(Y .EQ. 999.) CALL PLTT(DUM,YY,0)
      IF(X .EQ. 999.) CALL PLTT(XX,DUM,0)
      CALL ALPHA$LETTER(N,M,ITH,XX,YY,ALP)
      RETURN
      END
      SUBROUTINE SYMTAB(X,Y)
      CHARACTER*4 CNMSIZ,CNMSYM
      CHARACTER*1 CISYM
      CHARACTER*4 JSTAT
      COMMON/MB/IPRN,NMSYM,NDSYM,NCSYM,SMINT(16),ISYM(15),IALLSM
      COMMON/MB1/NMSIZ,NDSIZ,NCSIZ,SZINT(16),SIZE(15),ALLSZ
      COMMON/MT2/JSTAT(351), LSPEC,AZPL,DPPL
      COMMON/MO/ATINC,HCHAR,NCHAR,NLINE,ONINC,TTH,XMN,ATEDG,ONEDG
      COMMON/OMPX/XINT,XMAX
      DIMENSION DY(16)
      DATA IQSM/1HX/                                                    MGP.2686
      IF(NCSYM.GE.0) GO TO 999                                          MGP.2687
      LSPEC = 1                                                         MGP.2688
      ISYM(1) = IQSM                                                    MGP.2689
      NCSYM = 1                                                         MGP.2690
  999 IF(NCSYM.EQ.0) ISYM(1) = IALLSM                                   MGP.2691
      IF(NCSYM.EQ.0)NCSYM = 1                                           MGP.2692
      IF(NCSIZ.LE.0) SIZE(1) = ALLSZ                                    MGP.2693
      IF(NCSIZ.LE.0)     NCSIZ = 1                                      MGP.2694
      DX = SIZE(NCSIZ) + 1.0                                            MGP.2695
      DO 1000 I = 1,NCSIZ                                               MGP.2696
      J = NCSIZ -I +1                                                   MGP.2697
      DY(I) = SIZE(J) + .4                                              MGP.2698
 1000 CONTINUE                                                          MGP.2699
      XX = 1.7 + DX*NCSYM                                               MGP.2700
      XMAX = X + XX                                                     MGP.2701
      CALL PLTT(X,Y,-3)                                                 MGP.2702
      CALL PLTT(XX,0.,2)                                                MGP.2703
      YSUM = 0.                                                         MGP.2704
      XL = .96                                                          MGP.2705
      YL = DY(1)/2 - .04                                                MGP.2706
      L = NCSIZ +1                                                      MGP.2707
      IF (NCSIZ.LE.1) GO TO 1002                                        MGP.2708
      CALL NUMBER(XL,YL, 12,SZINT( L       ), 0.,2)                     MGP.2709
      CALL SYMBOL(.84,YL,.12,1H-,0.,1)                                  MGP.2710
 1002 DO 2000 I = 1,NCSIZ                                               MGP.2711
      YL = DY(I)/2 - .04                                                MGP.2712
      J = NCSIZ -I +1                                                   MGP.2713
      IF(NCSIZ.LE.1) GO TO 1003                                         MGP.2714
      CALL NUMBER(.12,YL,.12,SZINT(J),0.,2)                             MGP.2715
      CALL SYMBOL(.84,YL,.12,1H-,0.,1)                                  MGP.2716
 1003 CALL PLTT(0.,DY(I),-3)                                            MGP.2717
      CALL PLTT(XX,0.,2)                                                MGP.2718
      YSUM = DY(I) + YSUM                                               MGP.2719
 2000 CONTINUE                                                          MGP.2720
      YY = 1.5                                                          MGP.2721
      CALL PLTT(XX,YY,3)                                                MGP.2722
      CALL PLTT(OO.,YY,2)                                               MGP.2723
      CALL PLTT(0.,-YSUM,-2)                                            MGP.2724
      CALL PLTT (1.7,0.,-3)                                             MGP.2725
      YYY = YY + YSUM                                                   MGP.2726
      CALL PLTT(0.,YYY,2)                                               MGP.2727
      XL = .24                                                          MGP.2728
      YL = YSUM + .8                                                    MGP.2729
      DO 3000 I = 1,NCSYM                                               MGP.2730
      IF(NCSYM.LE.1) GO TO 2001                                         MGP.2731
      CALL NUMBER(XL,YL,.12,SMINT(I),0.,2)                              MGP.2732
      CALL SYMBOL(.84,YL,.12,1H-, 0.,1)                                 MGP.2733
 2001 CALL PLTT(DX,0.,-3)                                               MGP.2734
      CALL PLTT(0.,YYY,2)                                               MGP.2735
 3000 CONTINUE                                                          MGP.2736
      IF(NCSYM.LE.1) GO TO 3001                                         MGP.2737
      K = NCSYM +1                                                      MGP.2738
      XL = .24 - DX                                                     MGP.2739
      YL = YL-.24                                                       MGP.2740
      CALL NUMBER(XL ,YL, .12,SMINT( K       ), 0.,2)                   MGP.2741
 3001 XX = -DX*NCSYM + DX/2                                             MGP.2742
      YY = DY(1)/2                                                      MGP.2743
      CALL PLTT(XX,YY,-3)                                               MGP.2744
      IF(LSPEC.EQ.1) GO TO 7001                                         MGP.2745
      DO 4000 J = 1, NCSYM                                              MGP.2746
      HSUM = 0.                                                         MGP. 2747
      DO 5000 I = 1,NCSIZ                                               MGP. 2748
      H = DY(I)- .4                                                     MGP. 2749
      M = .50001 + H / .06                                              MGP. 2750
      H = .06*M                                                         MGP. 2751
      IF(H.EQ.0.) H = .01                                               MGP. 2752
      CALL FORMS(ISYM(J),H,0.,0.)                                       MGP. 2753
      IF(I .EQ.NCSIZ)GO TO 5001                                         MGP. 2754
      HH=DY(I)/2 + DY(I+1)/2                                            MGP. 2755
      HSUM = HSUM + HH                                                  MGP. 2756
      CALL PLTT(0.,HH,-3)                                               MGP. 2757
 5000 CONTINUE                                                          MGP. 2758
 5001 CALL PLTT(DX,-HSUM,-3)                                            MGP. 2759
 4000 CONTINUE                                                          MGP. 2760
      GO TO 6000                                                        MGP. 2761
 1001 DO 6000 J=1,NCSYM                                                 MGP. 2762
      HSUM = 0.                                                         MGP. 2763
      DO 7000 I = 1,NCSIZ                                               MGP. 2764
      H= DY(I) - .4                                                     MGP. 2765
      M = 0.5000001 + H/.06                                             MGP. 2766
      SZZ = 0.06*M                                                      MGP. 2767
      H3 = -M*.02                                                       MGP. 2768
      H2 = -M*.03                                                       MGP. 2769
      ENCODE(CISYM,7002)ISYM(J)                                         MGP. 2770
 7002 FORMAT(A1)                                                        MGP. 2771
      CALL SYMBOL(H3,H2,SZZ,CISYM  ,0.,1)                               MGP. 2772
      IF(I .EQ. NCSIZ) GO TO 6001                                       MGP. 2773
      HH=DY(I)/2 + DY(I+1)/2                                            MGP. 2774
      HSUM = HSUM + HH                                                  MGP. 2775
      CALL PLTT(0.,HH,-3)                                               MGP. 2776
 7000 CONTINUE                                                          MGP. 2777
 6001 CALL PLTT(DX,-HSUM,-3)                                            MGP. 2778
 6000 CONTINUE                                                          MGP. 2779
      XX = 1.7 + DX*NCSYM + DX/2                                        MGP. 2780
      CALL PLTT(-XX,-YY,-3)                                             MGP. 2781
      YS = YSUM/2 - .24                                                 MGP. 2782
      IF(NCSIZ.EQ.1) GO TO 1004                                         MGP. 2783
      ENCODE(CNMSIZ,6010) NMSIZ                                         MGP. 2784
 6010 FORMAT(A4)                                                        MGP. 2785
      CALL SYMBOL(-.5,YS,.12,CNMSIZ,90.,4)                              MGP. 2786
 1004 XS = (1.7 + DX*NCSYM)/2 -.24                                      MGP. 2787
      YYS = YYY+ .5                                                     MGP. 2788
      IF(NCSYM.EQ.1) GO TO 1005                                         MGP. 2789
      ENCODE(CNMSYM,6010) NMSYM                                         MGP. 2790
      CALL SYMBOL(XS,YYS,.12,CNMSYM,0.,4)                               MGP. 2791
 1005 CALL PLTT(0.  ,-Y,-3)                                             MGP. 2792
      RETURN                                                            MGP. 2793
      END                                                               MGP. 2794
      FUNCTION TAN(ARG)                                                 MGP. 2795
      TAN=SIN(ARG)/COS(ARG)                                             MGP. 2796
      RETURN                                                            MGP. 2797
      END                                                               MGP. 2798
      SUBROUTINE TOLPDA                                                 MGP. 2799
C                                                                       MGP. 2800
C---- ---- PLOT DATA SET. ---------------------------------------------MGP. 2801
C                                                                       MGP. 2802
      CHARACTER*4 JSTAT                                                 MGP. 2803
      CHARACTER*1 CISTSM,CJSYM                                          MGP. 2804
      INTEGER NUMSC                                                     MGP. 2805
      COMMON ACHAR(9001),ALLA(9001),ALLO(9001),ALLSE(3,9001),ALLZ(9001),MGP. 2806
     2DATA(4,9001),IAZ(3,9001),IDATE(9001),IDP(3,9001),IHRMN(9001), KEY MGP. 2807
     3(9001),IGTRN(9001),JSYM(9001),NUMSC(9001),PHI(9001),XXSV(9001),    MGP.2808
     4XXX(9001),YYSV(9001),YYY(9001),ZZZ(9001)                           MGP.2809
C----NOTE NAME CHANGE TO KEY                                             MGP.2810
      COMMON /ALL/ PI,RPD,DPR                                            MGP.2811
      COMMON /TE/ NN                                                     MGP.2812
      COMMON /MBCLOT/ ALAT1,ALAT2,ALON1,ALON2                            MGP.2813
      COMMON /MBCLT/ PSKALE,OBLAT,OBLON,FLAT,CMER                        MGP.2814
      COMMON /MCOT/ ROTA                                                 MGP.2815
      COMMON /MEOT/ MORSE                                                MGP.2816
      COMMON /MET/ ELFAC                                                 MGP.2817
      COMMON /MOT/ IMORS                                                 MGP.2818
      COMMON /MOTX/ SINPK                                                MGP.2819
      COMMON /MT/ STASZ,ISTYP,ISTSM,NSTA,STALA(351),STALO(351),ISTAT     MGP.2820
      COMMON /MT1/ MIT,MSTER,EYHT,EYX,EYY,ITRUE,EYSOT,JSEC,PAPD          MGP.2821
      COMMON /MT2/ JSTAT(351),LSPEC,AZPL,DPPL                            MGP.2822
      COMMON /DBMPTX/ MAXDA                                              MGP.2823
      COMMON /ET/ AEL,BEL,CEL                                            MGP.2824
      WRITE(6,200)                                                       MGP.2825
  200 FORMAT(1X,"   WRITING EARTHQUAKE PLOT FILE..."/)                   MGP.2826
      S = SIN(-ROTA)                                                     MGP.2827
      C = COS(-ROTA)                                                     MGP.2828
      AANG = -ROTA*DPR-SIGN(0.5,ROTA)                                    MGP.2829
      IF((MORSE .EQ. 1) .OR.                                             MGP.2830
     1   (NSTA .LE. 0) .OR. (MIT .EQ. 2)) GO TO 350                      MGP.2831
      IF((IMORS .LT. 0) .AND. (ISTAT .EQ. 0)) GO TO 350                  MGP.2832
      IF(STASZ .LE. 0.0) STASZ = 0.01                                    MGP.2833
C-------- HEIGHT=0.06*M  HALF HT=HD2  THIRD HT=HD3                     MGP.2834
      M = 0.500001 + STASZ/0.06                                          MGP.2835
      STASZ = 0.06*M                                                     MGP.2836
      HD3 = M*0.02                                                       MGP.2837
      HD2 = M*0.03                                                       MGP.2838
      DO 300 I = 1,NSTA                                                  MGP.2839
      STLA = STALA(I)                                                    MGP.2840
      STLO = STALO(I)                                                    MGP.2841
      IF(PSKALE .GE. 0.0) GO TO 230                                      MGP.2842
      STAC = FLATC(STALA(I),FLAT)                                        MGP.2843
      CALL NEWPOL(STAC    ,STALO(I),STLA,STLO,OBLAT,OBLON)               MGP.2844
  230 IF((STLA - ALAT1)*(STLA - ALAT2) .GT. 0.0) GO TO 300               MGP.2845
      DIF = ALON2 - ALON1                                                MGP.2846
      IF(DIF .LT. 0.0) DIF = 360. + DIF                                  MGP.2847
      DALO = STLO - ALON1                                                MGP.2848
      IF(DALO .LT. 0.0) DALO = 360. + DALO                               MGP.2849
      IF(DALO .GT. DIF) GO TO 300                                        MGP.2850
      CALL CONVRT(STLA,STLO,X,Y)                                         MGP.2851
      IF(ISTYP .EQ. 1) GO TO 250                                         MGP.2852
      CALL FORMS(ISTSM,STASZ,X,Y)                                        MGP.2853
      X = X + (HD3 + 0.1)*C - HD2*S                                      MGP.2854
      Y = Y - HD2*C - (HD3 + 0.1)*S                                      MGP.2855
      GO TO 275                                                          MGP.2856
  250 X = X - HD3*C + HD2*S                                              MGP.2857
      Y = Y - HD2*C - HD3*S                                              MGP.2858
      ENCODE(CISTSM,255)ISTSM                                            MGP.2859
  255 FORMAT(A1)                                                         MGP.2860
      CALL SYMBOL(X,Y,STASZ,CISTSM  ,AANG,1)                             MGP.2861
      CALL PLTT(X,Y,2)                                                   MGP.2862
      CALL PLTT(X,Y,3)                                                   MGP.2863
      X=X + (2.*HD3 + 0.1)*C                                             MGP.2864
      Y = Y + (2.*HD3 + 0.1)*S                                           MGP.2865
  275 CALL SYMBOL(X,Y,STASZ,JSTAT(I),AANG,4)                             MGP.2866
  300 CONTINUE                                                           MGP.2867
  350 CONTINUE                                                           MGP.2868
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      IF(MAXDA .LE. 0) RETURN                                           MGP.2869
      DO 1000 N = 1,MAXDA                                               MGP.2870
      NN = KEY(N)                                                       MGP.2871
      IF(XXX( N) + YYY( N) .EQ. 0.010203) GO TO 1000                    MGP.2872
      IF((MORSE .EQ. 1) .AND. (NUMSC(NN) .NE. JSEC)) GO TO 1000         MGP.2873
      XSTER = XXX(N)                                                    MGP.2874
      YSTER = YYY(N)                                                    MGP.2875
      IF(MSTER .EQ. 0) GO TO 450                                        MGP.2876
      DBIN = ZZZ(NN)                                                    MGP.2877
      IF(MORSE .EQ. 0) DBIN = (ALLZ(NN)-PAPD)*SINPK                     MGP.2878
      IF(ITRUE .EQ. 0) GO TO 425                                        MGP.2879
C-------- TRUE STEREO VIEW                                              MGP.2880
      XSTER = XSTER + DBIN*(EYX+(2.*MIT-3.)*EYSOT-XSTER)/(EYHT+DBIN)    MGP.2881
      YSTER = YSTER + DBIN*(EYY-YSTER)/(EYHT+DBIN)                      MGP.2882
      GO TO 450                                                         MGP.2883
C-------- STEREO FROM ABOVE EACH POINT.                                 MGP.2884
  425 XSTER = XSTER + DBIN*(2.*MIT-3.)*EYSOT/(EYHT+DBIN)                MGP.2885
  450 IF((DPPL .EQ. 0.0) .OR. (MORSE .EQ. 1)) GO TO 475                 MGP.2886
      SFT = ALLZ(NN)*SINPK/TAN(DPPL*RPD)                                MGP.2887
      XSTER = XSTER - SFT*SIN(AZPL*RPD)                                 MGP.2888
      YSTER = YSTER - SFT*COS(AZPL*RPD)                                 MGP.2889
  475 IF(LSPEC .EQ. 1) GO TO 500                                        MGP.2890
      H = ACHAR(NN)                                                     MGP.2891
      IF(H .LE. 0.0) H = 0.01                                           MGP.2892
      I = JSYM(NN)                                                      MGP.2893
      CALL FORMS(I,H,XSTER,YSTER)                                       MGP.2894
      GO TO 600                                                         MGP.2895
  500 M = 0.500001 + ACHAR(NN)/0.06                                     MGP.2896
      SZZ = 0.06*M                                                      MGP.2897
      HD3 = M*0.02                                                      MGP.2898
      HD2 = M*0.03                                                      MGP.2899
      X = XSTER - HD3*C + HD2*S                                         MGP.2900
      Y = YSTER - HD2*C - HD3*S                                         MGP.2901
      ENCODE(CJSYM,550) JSYM(NN)                                        MGP.2902
  550 FORMAT(A1)                                                        MGP.2903
      CALL SYMBOL(X,Y,SZZ,CJSYM   ,AANG,1)                              MGP.2904
                                                                        MGP.2907
C-------- PLOT PROJECTION OF ERROR ELLIPSE ------------------------------MGP.2908
                                                                        MGP.2909
  600 IF(ELFAC .EQ. 0.0) GO TO 1000                                     MGP.2910
      CALL ELLIPS                                                       MGP.2911
C-------- 1 = AEL*X**2 + BEL*X*Y + CEL*Y**2 -----------------------------MGP.2912
C-------- 1 = AEL*R**2*COS(THETA)**2 + BEL*R**2*COS(THETA)*SIN(THETA) +  MGP.2913
C             CEL*R**2*SIN(THETA)**2  -----------------------------------MGP.2914
      IF(AEL .EQ. CEL) GO TO 650                                        MGP.2915
      THETA = 0.5*ATAN(BEL/(AEL-CEL))                                   MGP.2916
      GO TO 675                                                         MGP.2917
  650 THETA = 45.0*RPD                                                  MGP.2918
  675 DTHET = 18.0*RPD                                                  MGP.2919
      DO 700 I = 1,21                                                   MGP.2920
      CS = COS(THETA)                                                   MGP.2921
      SN = SIN(THETA)                                                   MGP.2922
      RA =  1.0/SQRT(AEL*CS**2+BEL*CS*SN+CEL*SN**2)                     MGP.2923
      X = RA*CS*SINPK + XSTER                                           MGP.2924
      Y = RA*SN*SINPK + YSTER                                           MGP.2925
      IF(I .EQ. 1) CALL PLTT(X,Y,3)                                     MGP.2926
      CALL PLTT(X,Y,2)                                                  MGP.2927
  700 THETA = THETA + DTHET                                             MGP.2928
      CALL PLTT(X,Y,3)                                                  MGP.2929
 1000 CONTINUE                                                          MGP.2930
      RETURN                                                            MGP.2931
      END                                                               MGP.2932
      SUBROUTINE XOSECT                                                 MGP.2933
C-------- ROTATE CO-ORDINATES SO THAT XXX(I) IS DISTANCE ALONG SECTION  MGP.2934
C          AND YYY(I) IS DEPTH. ----------------------------------------MGP.2935
C-------- YYY(N) IS SET TO 0.010203  IF LOCATION IS OUT OF X-SECTION AREAMGP.2936
      INTEGER NUMSC                                                     MGP.2937
      COMMON ACHAR(9001),ALLA(9001),ALLO(9001),ALLSE(3,9001),ALLZ(9001),MGP.2938
     2DATA(4,9001),IAZ(3,9001),IDATE(9001),IDP(3,9001),IHRMN(9001),IKEY MGP.2939
     3(9001),IQTRN(9001),JSYM(9001),NUMSC(9001),PHI(9001),XXSV(9001),   MGP.2940
     4XXX(9001),YYSV(9001),YYY(9001),ZZZ(9001)                          MGP.2941
      COMMON /MOTX/ SINPK                                               MGP.2942
      COMMON /MX/ X1,Y1,NOSEC,DSVIN(16),CTH,STH                         MGP.2943
      COMMON /DBMPTX/ MAXDA                                             MGP.2944
      COMMON /DEBUG/ IDBUG                                              MGP.2945
      COMMON /OMPX/ XINT,XMAX                                           MGP.2946
      COMMON /MB/ IPRN,IGARB  (35)                                      MGP.2947
      COMMON /MBDX/ NOFILE                                              MGP.2948
      NXPLT = 0                                                         MGP.2949
      IF(IDBUG .EQ. 0) GO TO 22                                         MGP.2950
      IF (IPRN .EQ. 0) GO TO 22                                         MGP.2951
      IF (NOFILE .NE. 6) WRITE(6,10)                                    MGP.2952
   10 FORMAT(1X,"   CALCULATING X,Y VALUES FOR X-SECTION..."/)          MGP.2953
      WRITE(NOFILE,20)                                                  MGP.2954
   20 FORMAT(/" X-SECTION PLOT "/" NUMBER  DIST ALONG SECTION (IN)   DISMGP.2955
     1T FROM SECTION (IN)     DEPTH (KM)      DEPTH (IN)")              MGP.2956
   22 DO 1000 N = 1,MAXDA                                               MGP.2957
      IF(XXSV(N) + YYSV(N) .NE. 0.010203) GO TO 30                      MGP.2958
      IF (IPRN.EQ.0 .OR. IPRN.EQ.2) GO TO 70                            MGP.2959
      WRITE(NOFILE,25) N,ALLZ(N)                                        MGP.2960
   25 FORMAT(I7,52X,F10.2,"  EITHER OFF MAP OR FAILED TO QUALIFY")      MGP.2961
      GO TO 70                                                          MGP.2962
   30 ROTX = (XXSV(N)-X1)*CTH - (YYSV(N)-Y1)*STH + XMAX/2.0             MGP.2963
      ROTY = (XXSV(N)-X1)*STH + (YYSV(N)-Y1)*CTH                        MGP.2964
      ZZZ(N) = ROTY                                                     MGP.2965
      XXX(N) = ROTX                                                     MGP.2966
      IF(ROTX*(ROTX-XMAX) .GT. 0.0) GO TO 125                           MGP.2967
      DO 120 I = 1,NOSEC                                                MGP.2968
      IF((ROTY-DSVIN(I))*(ROTY-DSVIN(I+1)) .GT. 0.0) GO TO 120          MGP.2969
      NUMSC(N) = I                                                      MGP.2970
      GO TO 130                                                         MGP.2971
  120 CONTINUE                                                          MGP.2972
  125 IF (IPRN.EQ.0 .OR. IPRN.EQ.2) GO TO 70                            MGP.2973
      WRITE (NOFILE,50) N,ROTX,ROTY,ALLZ(N)                             MGP.2974
   50 FORMAT(I7,7X,F10.2,16X,F10.2,9X,F10.2,"  OUT OF SECTION AREA")    MGP.2975
   70 XXX(N) = 0.0                                                      MGP.2976
      YYY(N) = 0.010203                                                 MGP.2977
      GO TO 1000                                                        MGP.2978
  130 YYY(N) = -ALLZ(N)*SINPK                                           MGP.2979
      NXPLT = NXPLT + 1                                                 MGP.2980
      IF(IDBUG .EQ. 0) GO TO 1000                                       MGP.2981
      IF (IPRN.LE.1) GO TO 1000                                         MGP.2982
      WRITE(NOFILE,150) N,ROTX,ROTY,NUMSC(N),ALLZ(N),YYY(N)             MGP.2983
  150 FORMAT(I7,7X,F10.2,16X,F10.2,I5,9X,F10.2,5X,F10.2)                MGP.2984
 1000 CONTINUE                                                          MGP.2985
      WRITE(6,1100) NXPLT                                               MGP.2986
      IF (NOFILE .NE. 6) WRITE(NOFILE,1100) NXPLT                       MGP.2987
 1100 FORMAT(/,1X,I10," EARTHQUAKES WILL BE PLOTTED IN X-SECTION"/)     MGP.2988
      RETURN                                                            MGP.2989
      END                                                               MGP.2990
      SUBROUTINE PLTT(X,Y,I)                                            MGP.2441
       EACH PLOT PACKAGE MUST                                           MGP.2443
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C      DRAW LINES                                                       MGP.2444
C      KEEP TRACK OF ORIGIN CHANGES                                     MGP.2445
C      KEEP TRACK OF MAXIMUM LIMITS OF PLOT                             MGP.2446
C      KEEP TRACK OF SCALE FACTORS                                      MGP.2447
C      I = +  1, 2, OR 3 TO PLOT
C      I = 15 TO CHANGE vERSATEC PEN SIZE (X IS SIZE OF PEN)
C      I = 20 TO RESET SCALE FACTORS                                    MGP.2450
C      I = 30 TO SHIFT vERSATEC PLOT WITHIN A WINDOW
C      I = 99 TO TERMINATE PLOT                                         MGP.2452
C      I = -103 TO MOVE TO NEW POSITION FOR bENSON IEHNER PLOT
C      I = -200 TO MAKE INITIAL CALL TO vERSATEC PLOTTER (PLOTS)
C      I = -203 TO MOVE TO NEW POSITION FOR vERSATEC PLOT
C      I = 299 TO TERMINATE CURRENT vERSATEC PLOT
C       BL AND V CONTROL WHICH OUTPUT DEVICES ARE USED.
      COMMON /MPPP/ BL,DK,V  ,TX,GDS                                    MGP.2455
      DATA IOLD/3/                                                      MGP.2456
      IPASS = I
      IF(IABS(I) .EQ. 1) IPASS = IOLD                                   MGP.2457
      IOLD = IPASS                                                      MGP.2458
      ISAVE = IPASS
      IF (BL .EQ. 1.) CALL PLOTBL(X,Y,IPASS)
      IPASS = ISAVE
      IF(V .EQ. 1.0) CALL PLOTVS(X,Y,IPASS)                             MGP.2460
      RETURN                                                            MGP.2461
      END                                                               MGP.2462
      SUBROUTINE PLOTBL(X,Y,I)
      EXTERNAL PLOT_BL(DESCRIPTORS)
    1 IP = IABS(I)
      IF (IP .GE. 100) GO TO 100
      CALL PLOT_BL$PLOT(X,Y,I)
      RETURN
C----- CHECK FOR SPECIAL COMMANDS ----
  100 IF ((IABS(I)/100) .NE. 1) RETURN
      I = ISIGN(1,I) * (IABS(I) - 100)
      GO TO 1
      END
      SUBROUTINE PLOTVS(X,Y,I)                                          MGP.2463
      EXTERNAL PLOT_V(DESCRIPTORS)                                      MGP.2465
      SAVE
      DATA XF,YF,XZ,YZ,SLX,SLY/1.0,1.0,0.,0 ,0.,0./
    1 IP = IABS(I)                                                      MGP.2468
      XX = X*XF + XZ +SLX                                               MGP.2469
      YY = Y*YF + YZ + SLY                                              MGP.2470
C     XX AND YY NOW IN ABSOLUTE PLOT SPACE.                             MGP.2471
      IF((IP .NE. 2) .AND. (IP .NE. 3)) GO TO 100                       MGP.2472
      IF(I .GT. 0) GO TO 1000                                           MGP.2473
C------ RESET vERSATEC ORIGIN ----
      XZ = XX - SLX                                                     MGP.2474
      YZ = YY - SLY                                                     MGP.2475
      GO TO 1000                                                        MGP.2476
C------ RESET X AND Y SCALE FACTORS ----
  100 IF(IP .NE. 20) GO TO 200                                          MGP.2477
      XF = X                                                            MGP.2478
      YF = Y                                                            MGP.2479
      RETURN                                                            MGP.2480
C------ SHIFT RELATIVE ORIGIN ----
  200 IF(I .NE. 30) GO TO 300                                           MGP.2481
      SLX = X - XZ                                                      MGP.2482
      SLY = Y - YZ                                                      MGP.2483
      RETURN                                                            MGP.2484
C------ NEW PEN SIZE ----
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  300 IF (I .NE. 15) GO TO 500
      NPEN = X + .2
      CALL PLOT_V$NEWPEN(NPEN)
      RETURN
C------ INITIAL CALL TO VERSATEC PLOTTER ----
  500 IF (I .NE. 200) GO TO 600
      WRITE(6,10)
   10 FORMAT(1X,"----- INITIALIZATION PARAMETERS FOR VERSATEC PLOTTER:")
      CALL PLOT_V$PLOTS(0,0,0)
      RETURN
C------ TERMINATE CURRENT PLOT ----
  600 IF (I .NE. 299) GO TO 700
      CALL PLOT_V$PLOT(0.,0.,999)                                        MGP.2489
      XZ=0.                                                              MGP.2490
      SLX=0.                                                             MGP.2491
      SLY=0.                                                             MGP.2492
      RETURN                                                             MGP.2493
C------ TERMINATE ALL PLOTTING ----
  700 IF(I .NE. 99)  GO TO 800                                           MGP.2485
      CALL PLOT_V$PLOT(0.,0.,-999)                                       MGP.2486
      RETURN                                                             MGP.2487
C------ CHECK FOR SPECIAL VERSATEC COMMAND ---
  800 IF (((IABS(I))/100) .NE. 2) RETURN
      I = ISIGN(1,I) * (IP - 200)
      GO TO 1
C------ MOVE PEN ----
 1000 CALL PLOT_V$PLOT(XX,YY,IP)                                         MGP.2494
      RETURN                                                             MGP.2495
      END                                                                MGP.2496
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