INTRODUCTION

Welcome to the GEODOS system.

GEODOS is a SURVEYING SOFTWARE PACKAGE for the hand held
computer PSION Organiser II model XP and LZ.
The examples in this manual are made for model XP.
The only difference between XP and LZ is the display functions.

This manual describes how to handle GEODOS. The manual is
designed to be used in the field and contains instructions
and examples of the different surveying methods.

The first chapter describes the most important and commonly
used functions in order to quickly get the user more easily
aguainted with the system.

Please start by reading the first 15 pages (chapters 1-4)
in the "Operating Manual" for the PSION computer.

The introduction example on page 10 in this manual will
give You a quick idea of how to handle the MENU, which is
the key feature to the whole system.

There are also descriptions with training examples for each
program. Most of the programs contain common functions, error
messages and routines. They will not be repeated on each
page, so start by reading chapter "General instructions"
on page 14 before you run the different programs.

You will soon recognise the logic in the system. The different
programs access common databases called JOB-files.
A JOB-file may contain coordinates, survey-data, roadline-
elements such as straight, arc, transition curve data etc.

You will soon discover that you are working with an advanced
software package contained in a very powerful computer.

GEODOS is being developed continously with the help from you
the USER. Small differences may therefore occour between the
verion of the manual and the programs.
You are very welcome to come with your own suggestions regarding
how to improve the GEODOS system.
Together we will continue to develope the GEODOS-system.

Welcome to the team.

PARTILLE, SWEDEN   SEP 1994

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GEODOS ver 5 and 6 contains the following programs.

PREG   POINT REGISTRATION
        Entering Pno,Code,North-,East- and Height-coordinates.

POLSO   POLAR SETOUT
        Calculate polar set-out data in 3 dimensions.
        Totalstations can be used on line.

POLMS   POLAR MEASUREMENT
        Coordinate-calculation or survey data collection.
        Possibility to eccentric corrections. After surveydata-
        collection calculation can be made with program
        "CSDTA" below.

EDIT   EDIT JOB
        Search, Edit, Erase, Insert in the JOB-file.

ORTSO   RECTANGULAR SETOUT
        Calculation of rectangular set-out data in 3 dimensions
        from north-,east- and height-coordinates.

ORTMS   RECTANGULAR MEASUREMENT
        Calculation of coordinates in 3 dimensions from
        rectangular dimensions e.g. from design drawings.

2PRES   TWO POINT RESECTION
        Determination of free station coordinates in three
        dimensions from two known points.

ARES   ANGLE RESECTION
        Determination of free station coordniates in three dim.
        by angle measurement toward three or four known points.

FREST   FREE STATION
        Determination of free station coordinates in three dim.
        by angle and distance measurement to optional number
        of known points. (Helmert tranformation).

TRVRS   TRAVERSE MEASUREMENT
        Coordinate calculation of traverse measurement in three
        dim. Closed or unclosed.

AINT   ANGLE INTERSECTION
        Calculation of coordiantes in three dimensions from
        two or three standpoints. Average and deviations.
        Different totalstations can be on line connected (RMS).

DINT   DISTANCE INTERSECTION   (Trilateration)
        Coordinate-calculation (North,East) from two distances
        from two known station points.

HTRNS   HELMERT TRANSFORMATION
         Transformation of all data in a JOB from one grid system
         to another. The program searches for points with common
         names in two different JOBs. These are used as common
         points to build the transformation formula.

AREA   AREA CALCULATION
         Calculation of bearings,distances and area within polygon

CHECK   CHECK MEASUREMENT PRINTING
         Comparsion of coordinates between two JOB-files.
         Points with the same names will be compared and
         coordinate-differences will be printed out or displayed.

PRINT   PRINT JOB
         Printout coordinate-list of whole or part of a JOB.

SEND   DATA-TRANSMISSION of JOB-files to or from optional
RECIV   computer-systems. Software for implementation under
         MSDOS is included.

JBDIR   JOB DIRECTORY
         Listing of existing JOBs in the computer.

ERASE   ERASE JOB-files.

TRIG   Calculation of distance and height. (Cosine theorem)

RLDES   ROAD-LINE DESIGN
         Calculation of intersection-, tangent-, and center-
         points from paralell-distances and radius from
         existing road lines.

RLREG   ROAD-LINE REGISTRATION
         Definition of roadline in three dimensions (PLANE,
         PROFILE, and SECTION) for setting out ("RLSO").
         Road-line can be defined as follow:
            PLANE: Straight, Arc and Transition-curve)
            PROFILE: Slant and vertical-curve
            SECTION: Any number of design-points in section.

RLSO   ROAD-LINE SETOUT
         Calculation of polar set out of optional section point
         and off-set. Heights will be interpolated from design
         profile and section if present.

DIGI   DIGITIZING
         Input of coordinates by digitizing with XPLAN 360i
         PLANIX-5000 or DIGICOORD. Optional input of heights.

PLOT   PLOTTING
         Automatic plotting whith HP-GL compatible plotter of
         grid net, coordinatetext, points, point namnes, height-
         text and lines. Optional scale and format.

CODTAB CODE-TABLE
        Create, Edit, and Print out table. Code-table is used
        for translation of field codes to transfer codes and
        plot symbols.

CSDATA CALCULATE SURVEY DATA
        Calculation of polar survey data stored whith program
        "POLMS".

STNH   STANDPOINT-HEIGHT
        Determination of instrument height by measuring
        vertical angles to known height-points.

REFLIN REFERENCE LINE DEFINITION
        Definition of baseline for direct calculation of
        rectangular dimensions. Works in combination
        with "POLSO" and "POLMS". Reference line can either
        be STRAIGHT LINE, ARC or TRANSITION CURVE (Roadline).

PROF   PROFILE CALCULATION.
        Calculation of profile data (Length, Offset and Height)
        from a reference line and offset limit. The program
        is scanning tha database and creates e new file with
        the profile data. Plot of profile and sections.

VOLUME VOLUME CALCULATION.
        Calculation of volume from the 3D database along
        optional reference line.

APROG   ADDITIONAL PROGRAM.
        Optional program entry. You can add your own
        software to the GEODOS-system.

USER   This is a PROCEDURE FILE for setting/resetting
        certain system parameters with which the calculation
        programs work.

GEODOS-PC Software for MSDOS computers to transform GEODOS
           data to and from other surveying systems, DXF-files
           etc. Coordinate calculations and transformations.

GETTING STARTED

Insert the battery with the positive terminal first.

Insert the GEODOS-pack in port B:

Insert the DATA-pack (RAM-pack) in port C:

Switch ON by pressing ON/CLEAR twice.

```
        The Main Menu will be displayed:
                ----------------
                GEODOS FIND SAVE
                DIARY CALC PROG
                ----------------
```

```
Check that GEODOS is available as follows:
        Cursor on "G" in GEODOS          ----------------
        Press "EXE"             Display:"*GEODOS* ver5.xx
                                         JOB=C:
        Press "EXE"                      ----------------
```

Display shows "A:TMPJOB" a short while. You have now entered
the GEODOS-menu:

```
                ----------------
                PREG POLSO POLMS
                EDIT ORTSO ORTMS etc
                ----------------
        Press ON/CLEAR to return to the Main Menu.
```

When the battery requires changing, ensure first that
PSION is switched off. Remove the RAM-pack to ensure no loss of
important data if you make any mistake during the change.
When You have safely installed the new battery and checked the
functions , switch off and reinsert the RAM-pack.

PSION, seen from the back.

Port B

Port C

NOTE , minus
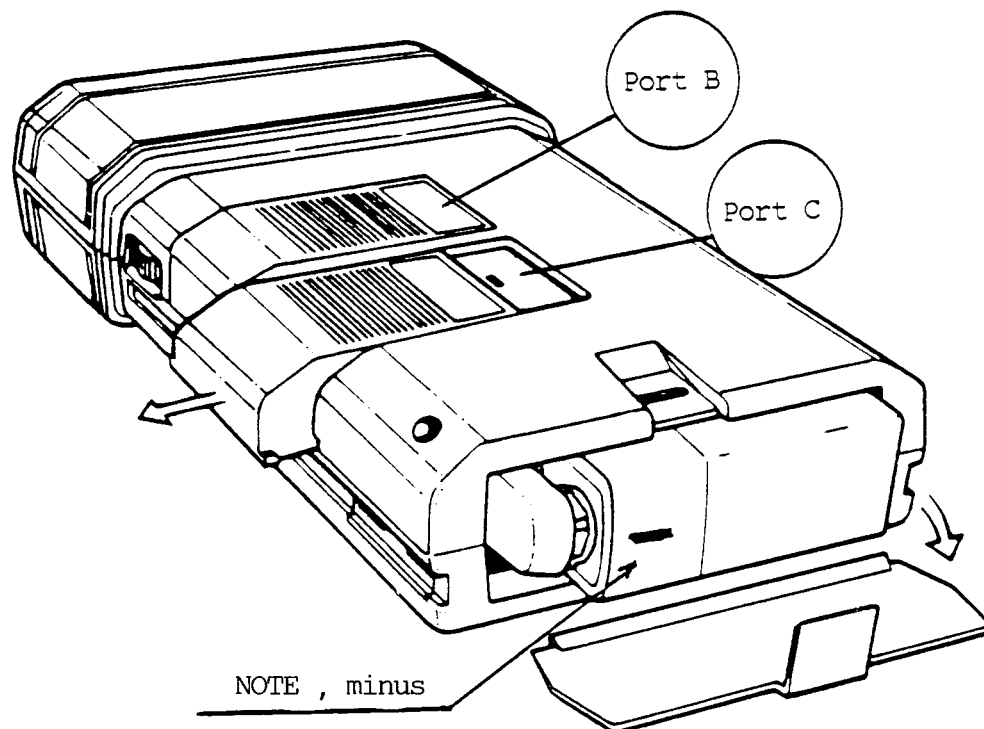
To connect the battery, slide it into the opening, making sure that the smaller, positive, terminal enters first. If the battery only slides in half way, then you have tried to put it in the wrong way round. Turn the battery over so that the other metal contact slides into the battery connector first, and try again.

KEYBOARD

There are 36 keys on the keyboard. Each key has up to four
functions. The numeric keyboard has a blue background. When
using programs within GEODOS, the keyboard is default set to
numeric, wuth the exeption of Pcode. If you so desire, you
can change this with USER, page 80.

1. ON/CLEAR   Step back one level in the MENU-structure.
               Finish programs and JOB:s

2. MODE   Used in GETTING STARTED to complete the
               main menu.

3. ARROWS   Move the cursor across menu or results.
               Stop and turn when results are displayed
               scrolling.

4. CAP,NUM   To be used in combination with SHIFT to switch
               the keyboard. You normally don't need these in
               GEODOS.

5. SHIFT   Used to access the characters marked above each
               key. In GEODOS the programs take care of this,
               You need it only when you mix characters and
               figures in pointname and code.

6 DEL   Delete last character keyed in from keyboard.

7. SPACE   Important function in GEODOS. To be used in
               combination with "EXE" to return to previous
               state or to complete entry in data input.

8. EXE   The most important key. EXECUTE.

9. Y / N   Answer Yes or No to question "Y/N ?".

10 ON+Q   "Escape Quit" to stop unwanted loops etc.
               Press keys simultaneously until program stops.

               If a question mark (?) is diplayed during input,
               the program demands a numerical input.

In program "EDIT" some keys have special functions which You
can read about on page 24.

GEODOS, common KEY functions.
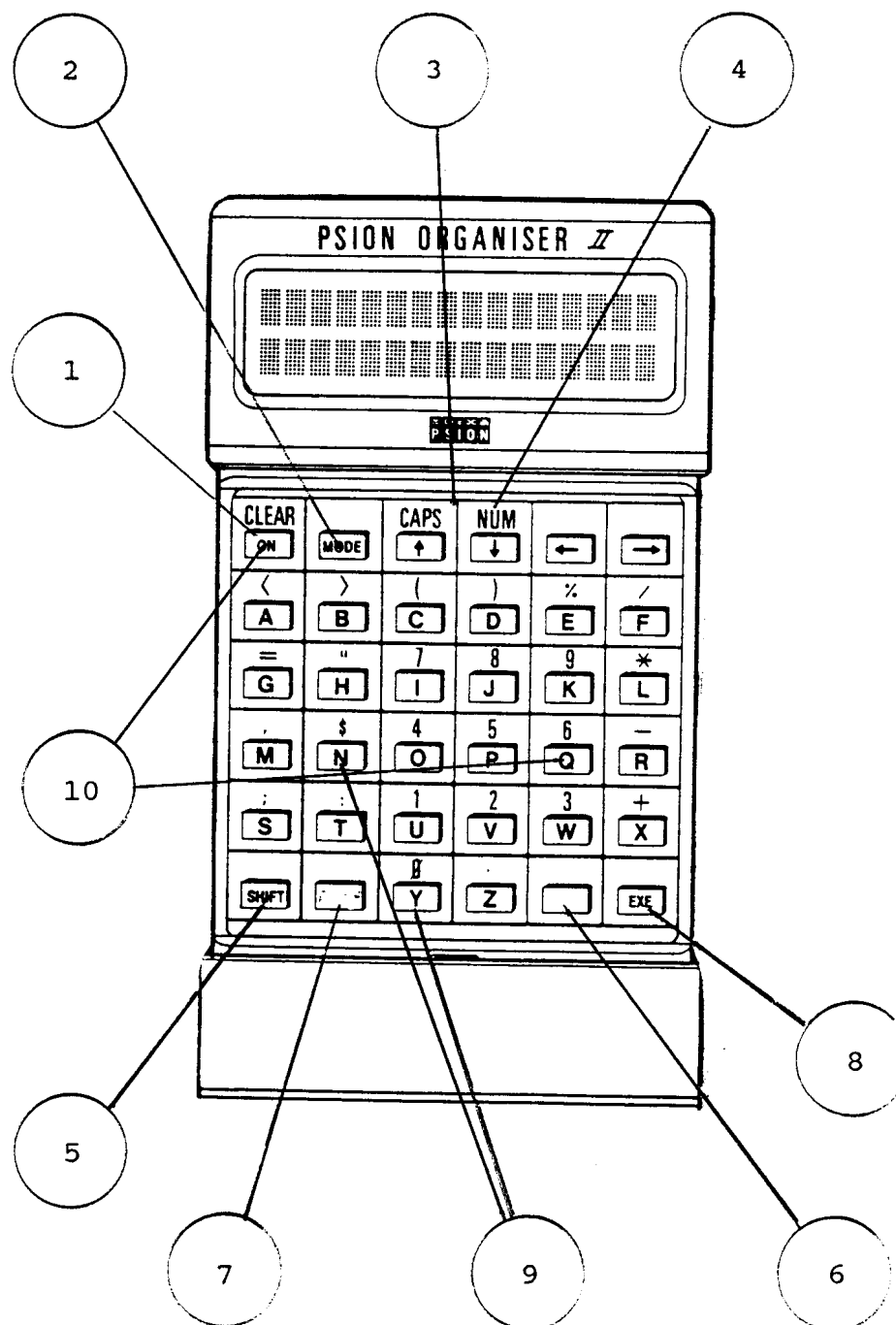
INTRODUCTION EXAMPLE.

This is a basic example that describes, step for step, how to
start a program in GEODOS. Compare with the instructions on
pages 16-19.

```
                              ------------------
       1. Press <ON>          GEODOS FIND SAVE
                              DIARY CALC PROG
                              ------------------
       2. Press <EXE>         *GEODOS* ver5.99
          Key in "EXAMPLE"    JOB=
          Press <EXE>         ------------------
                              CREATE NEW JOB
       3. Press <Y>           Y/N ?
                              ------------------
       4. Press <EXE>         COORDINATES
                              SURVEYDATA
                              FREE SPACE 935 PNT
                              ------------------
       5. Press <EXE>         PREG POLSO POLMS     Select prog
                              EDIT ORTSO ORTMS     "PREG"
                              ------------------
       6. Press <EXE>         **** GEODOS ***
                              *   POINT REG   *
                              ------------------   PSION suggest
       7. Type  101 <EXE>     Pno=1=               latest PNO+1
            "    PP <EXE>      Cod==                and same CODE
            "    1254.208 <EXE> N=                 and Z coord.
            "    2012.292 <EXE> E=                 as previous.
            "    48.342 <EXE>  Z=0.000=
          Press <EXE>         Pno=102=
            "    <EXE>         Cod=PP=
          Type 1474.381 <EXE> N=
            "    2037.436 <EXE> E=
            "    48.455 <EXE>  Z=48.342=
          Press <SPACE> <EXE> Pno=103=             Finish "PREG"
                              ------------------
       8. Press < -> ><EXE>   PREG POLSO POLMS     You now select
                              EDIT ORTSO ORTMS     prog "POLSO"
                              ------------------
       9. Press <EXE>         **** GEODOS ****
                              *   POL SETOUT   *
                              STATION
      10. Press 101 <EXE>     Pno=102=             PSION suggests
                              ------------------   point number.
      11. Press Arrow Keys    Pno=101              Scan with the
            "       "      "  Cod=PP               arrow keys
            "    <EXE>         N=    1254.208       if You want to
                              E=    2012.292...    look at coord
                              ------------------
      12. Press <EXE>         MANUAL-INPUT         Select input
                              WILD-TC WILD-TD...   media.
                              ------------------
      13. Press <EXE>         CHECK SURVEYDATA     <N> for fast
                              Y/N ?                without control
```

DESCRIPTION OF JOB-FILES

The GEODOS-programs access databases called JOB-files.

When you start GEODOS you will be asked for JOB-name.
```
    *GEODOS* ver5.xx   (ver6.xx for LZ)
    JOB=C:
```
Enter JOB-name with max EIGHT CHARACTERS (A-Z, 0-9).
The first character must always be a letter.

If you only press <EXE> a temporary JOB-file will be created
called "A:TMPJOB". Previous TMPJOB will be deleted.

You can store a JOB in the internal memory (A:) or in the
datapack (C:). Default is C:. If you want to store in A:
you must type "A:" before the JOB-name (e.g. A:HELLO).

You can store data in a special JOB-file called "C:PBANK".
From this file data can be read from any other JOB-file.
Add only a "*" to the pointnumber when you search. (e.g. *12345)

Your JOB-files are safer in the DATA-packs if you e.g have to
change the battery or if you accidently reset the internal
memory.

You can easily copy JOB-files from one device to another with
the function COPY in the main menu. See page 86.

You can handle an optional number of JOB:s within the memory
capacity, which makes about 800-1000 POINTS per 32K memory.

A JOB-file contains records which are called "POINTS".
A Point-record is as follows:

```
    1. Pno= Pointnumber
    2. Cod= Point information code   (Max 12 char.)
    3. N=   Northing coordinate      ( "    "    "  )
    4. E=   Easting coordinate       (Real value)
    5. Z=   Height coordinate        ( "        "  )
    6. D=   Quality value.           ( "        "  )
    7. Rem= Remark                   ( "        "  )
                                     (Max 254 char.)
```

By survey data collection:

```
    1. Pno=  As above
    2. Code= "      "
    3. Ha=   Horizontal angle   (Ih, instr.height at stn)
    4. Va=   Vertical angle
    5. Sd=   Slope distance
    6. Th=   Target height
    7. Rem=  Remark
```

Totally there is enough room for about 800-1000 points per 32K
memory. This depends on how many characters Pno,Code and Remark
and also how many digits the coordinates comprise of.

PROGRAM START, GEODOS-MENU

When You switch on PSION, you normally enter the Main Menu. After
you have plugged in the GEODOS program pack it has the following
apperance: ----------------
                  GEODOS FIND SAVE
                  DIARY CALC PROG

The cursor is in position GEODOS, PRESS ONLY <EXE>.
PSION asks for JOB-name:

                  GEODOS ver5.99
                  *JOB=

If you only want to use a temporary JOB, PRESS <EXE>:

You are now in the GEODOS environment. There are 33 routines
contained in the GEODOS MAIN MENU. The first six are now visible
in the display, with the cursor on "P" of PREG

                  PREG   POLSO POLMS
                  EDIT   ORTSO ORTMS

                  2PRES ARES FREST
                  TRVRS AINT DINT
                  HTRNS AREA CHECK
                  PRINT SEND RECIV
                  JBLST ERASE TRIG
                  RLDES RLREG RLSO
                  DIGI   PLOT CODTAB
                  CSDTA ZSTN REFLIN
                  PROF   VOLUM APROG

Just move the cursor with the arrow keys to selected a program
and press <EXE>. You can also use the first letter in the
program name for accessing the program quickly. If the first
letter is unique the program starts directly.

PSION always answers with the program header e.g:

                  **** GEODOS ****
                  *   POINT REG   *

Continue : press <EXE>.
Quit   : press ON/CLEAR.

INSTRUCTIONS

You can store and work with a JOB in either internal memory A:
or in the datapack in port C:. It is safer to store data in C:
which has its own battery and is removable. Default is to store
in C:. If you want to store in A:, You have to enter A: previous
to the JOB-name. (e,g. (JOB=A:TEST).

You can work in a temporary JOB if you press only <EXE>. Your
JOB is then automaticaly called A:TMPJOB. All data will be erased
in the previous "TMPJOB" when you enter it this way.

You can use MENU-technic. Press <X>. You will enter a menu
containing all existing JOB-files. Use the arrow-keys and <EXE>
to choose JOB. Be aware that there is a limit of 256 characters
in each menu.

| DISPLAY | COMMENTS |

Example 1
GEODOS ver5.99   Program version is displayed
*JOB=TEST   Enter JOB-name.
                              JOB-file will be stored in the datapack.
CREATE NEW JOB
Y/N?   When you enter a NEW JOB, you must choose
COORDINATES   if it will contain COORDINATES or raw
SURVEYDATA   SURVEYDATA. You can not mix coordinates
                              and rawdata. If you choose surveydata
INFO 0   you can key in an INFORMATION BLOCK =
>   one text string and four numerical data.
INFO 1 etc....   This data IS NOT USED IN GEODOS calc.
                              but will be transmitted by SEND (page 52)
                              Press just <EXE> if you do not want it.

Example 2.
GEODOS* ver5.99
JOB=X   Enter <X>
MENU WORKING..
A:TMPJOB......   If there are many JOB-files it can take
                              some seconds.
A:TMPJOB(3p)   You can now use the arrow keys. Press
A:FURULUND(123p)   <EXE> for your choice. If you have many
C:TEST(456p)   JOBs, dots may appear on the last line.
C:EXEMPEL(45p)   Each dot is a JOB. You will get the names
 ....(236)   in a new menu if you choose the dot line.

Example 3
GEODOS ver 5.99
*JOB=   Press <EXE>
A:TMPJOB   Data will be stored in a temporary file
                              Previous TMPJOB will be deleted.

GENERAL INSTRUCTIONS

The following messages are general. They will not be specially described in the following program instructions.

DISPLAY	INSTRUCTIONS
**** GEODOS *** * PROGRAM *	After program selection from the menu, the program name is displayed. Press <EXE> to continue or <ON/CLEAR> to escape.
(SURVEYDATA)	The following programs have access to SURVEYDATA POLMS, EDIT, SEND, RECIV, ERASE, CSDTA.
Y/N ?	Press Yes<Y> or No<N> WITHOUT pressing <EXE>.
Pno=101=	Enter POINT NAME. Maximum 12 characters. It is an advantage to use only numbers .PSION then suggests the previous number incremented Press <EXE> to accept.
Pno=100>10 Pno=195<5	You can change the incremental value directly by using the keys ">" or "<" after the number. followed by the value. (See also USER page 82)
P=1 PP EXISTS Y/N ? Diff N=0.002... OK Y/N ? KEEP NEW MEAN	The point name must be unique. You can measure to an existing point. Then you will get the difference and you can choose to keep the old coordinates, change to new or store the mean value. Select in the MENU.
Cod=PP=	Enter point code. PSION suggests same code as previous. The keyboard is, as standard, set to CHARACTER input. Use <SHIFT> for numerical input. You can go back to PNO by pressing <SHIFT> <EXE> if you want to correct.
ex. STATION Pno=#101=	Enter station point name. PSION suggests the previous station. Press <EXE> if you accept. If the point does not exist, you will be asked to enter code and coordinates that will be stored in the JOB-file and you can continue the computation. You can access points from the special POINTBANK (C:PBANK). Enter an asterisk (*) before the number (ex. *101)
101 HC F,L,R,X +EXE	If you enter <+>, you can choose a point in the JOB-file with the following keys: <F>=first,<L>=last,<R>=previous,<X>=next. Press <EXE>.
Pno=101 COD=TP N=1234.567 E=2345.678 Z=12.345 D=0.012	When you enter known points or a result from coordinate calculations, Pno and Code are displayed. Use the arrow keys to display the coordinates.

Stn=1 Back=2 Ha=0.0.. If you keep the station point number you
Y/N ?   can choose to keep your station establishment.

CREATE NEW JOB   Confirm when you enter a NEW JOB-file.
Y/N ?
HEIGHT MEAS   If you answer No<N>, You will not get any
Y/N ?   further questions concerning height measurement

WORKING...   PSION works with larger computations.
                        Mostly You get answers immediately, but large
                        transformations, traverse computations etc.
                        may take a few seconds.

N=0.002 E=0.041.. Standard deviation from the meaned result is
DIFF OK Y/N ?   displayed scrolling. You can stop the scroll,
                        change direction with the horizontal arrows.

DEVIATION   Warning regarding use of point with large dev-
0.465 OK Y/N ?   iation. You can continue or quit. The limit is
                        set to 0.1. You can change this parameter in
                        the USER file. See page 82.

KEEP CHANGE   Menu to select action when measuring a point
MEAN   that exists in the JOB file.

UTM-projection   This questions appears only if the UTM-flag is
Y/N ?   activated in the USER-file. After You have
                        answered Yes, the distances will be scale
                        corrected to the UTM coordinate system.

PSION will be automatically switched off after approximately
5 min if you don't press any keys. When you restart it returns
to the state where it was when it was switched off.

If PSION appears to have locked, try with <ON/CLEAR> <Q>. If that
does not work you can try removing the battery and replacing it.
Data in the internal memory (A:) could be deleted. Do not remove
the RAM pack during computation.

Be careful when connecting unknown pheripherial equipment such as
plotter, printer, computer etc with own power supply. In some
cases you can lose data in the RAM-pack. Use FLASH EPROM if you
want safer data storage.
Be sure that PSION and the pheripherial equipment are
compatible.
IT IS YOU AND YOU ALONE WHO IS RESPONSIBLE FOR YOUR DATA.
Do not forget the possibility of making BACKUP-copies of your
JOB-files.

```
* * * G E O D O S * * *        FUNCTION

* *    POINT - REG   * *        Manual input of point-
                               codes and coordinates.
-------------------------------------------------------------
INSTRUCTIONS
-------------------------------------------------------------
Automatic incrementation of point NUMBER plus duplication of
previous chosen point CODE
Optional input of height values.
It is an advantage to use this program to allow manual input
during program running of known points unnecessary.
You can also use the calculation programs directly and enter
your known points manually.
A point may also be ORIGIN of a FIGURE, that is a JOB with
local coordinates.
-------------------------------------------------------------
DISPLAY             COMMENTS.
-------------------------------------------------------------
                    Press <EXE>

Pno=101=            Enter point number. Maximum 12 characters.
                    <SPACE> <EXE> = Back to the MENU.

Cod=PP=             Enter Code. Maximum 12 characters.
COD=/HOUSE/50       If you enter slash before the code, the code
                    refere to a JOB that contains a figure with
                    local coordinates. You can enter a rotaion
                    angle after another slash. In this example
                    the figure "HOUSE" will be rotated 50 gon.
                    See also POLSO page 18.

                    The keyboard is set to numerial for PNO,
                    and characters for CODE. You can change this
                    in the USER-file, see page 82.
                    You can also use the SHIFT key on the keyboard.

                    PSION suggests previous pointnumber +1 and the
                    last entered code.
                    If you accept the values within "=" in the
                    display, just press <EXE>.

N=                  Enter Northing.
E=                  Enter Easting.
Z=                  Enter Height coordinate. <EXE> = Z=0.00.

                    You can edit the single characters during input
                    Use <ARROWS> and <DEL>. If you already entered
                    with <EXE>, You can step back to previous record
                    with <SPACE> <EXE> and change.

P=2   PP            In the same jobfile it is not allowed to use
EXIST OK Y/N ?      the point number more than once. If you answer
ERASE P=2 PP        <N> you will be asked whether or not to delete
 OK Y/N ?           the existing point with the same number/name.
```

EXAMPLE:

Pno	Code	Northing	Easting	Elevation
101	TRP	1254.208	2012.292	48.342
102	TRP	1474.381	2037.436	48.455
103	TRP	1549.570	2422.217	58.369
104	TRP	1198.366	2351.108	49.988
105	TRP	1369.334	2226.645	50.560
401	HC	1189.332	2134.935	40.000
402	HC	1300.101	2181.088	40.000
403	HC	1280.870	2227.242	40.000
404	HC	1243.948	2211.858	40.000
405	HC	1224.717	2258.011	40.000
406	HC	1178.563	2238.781	40.000
407	HC	1197.794	2192.627	40.000
408	HC	1170.101	2181.089	40.000
501	HC	1310.101	2351.088	37.000
502	HC	1370.101	2351.088	37.000
503	HC	1370.101	2431.088	37.000
504	HC	1310.101	2431.088	37.000
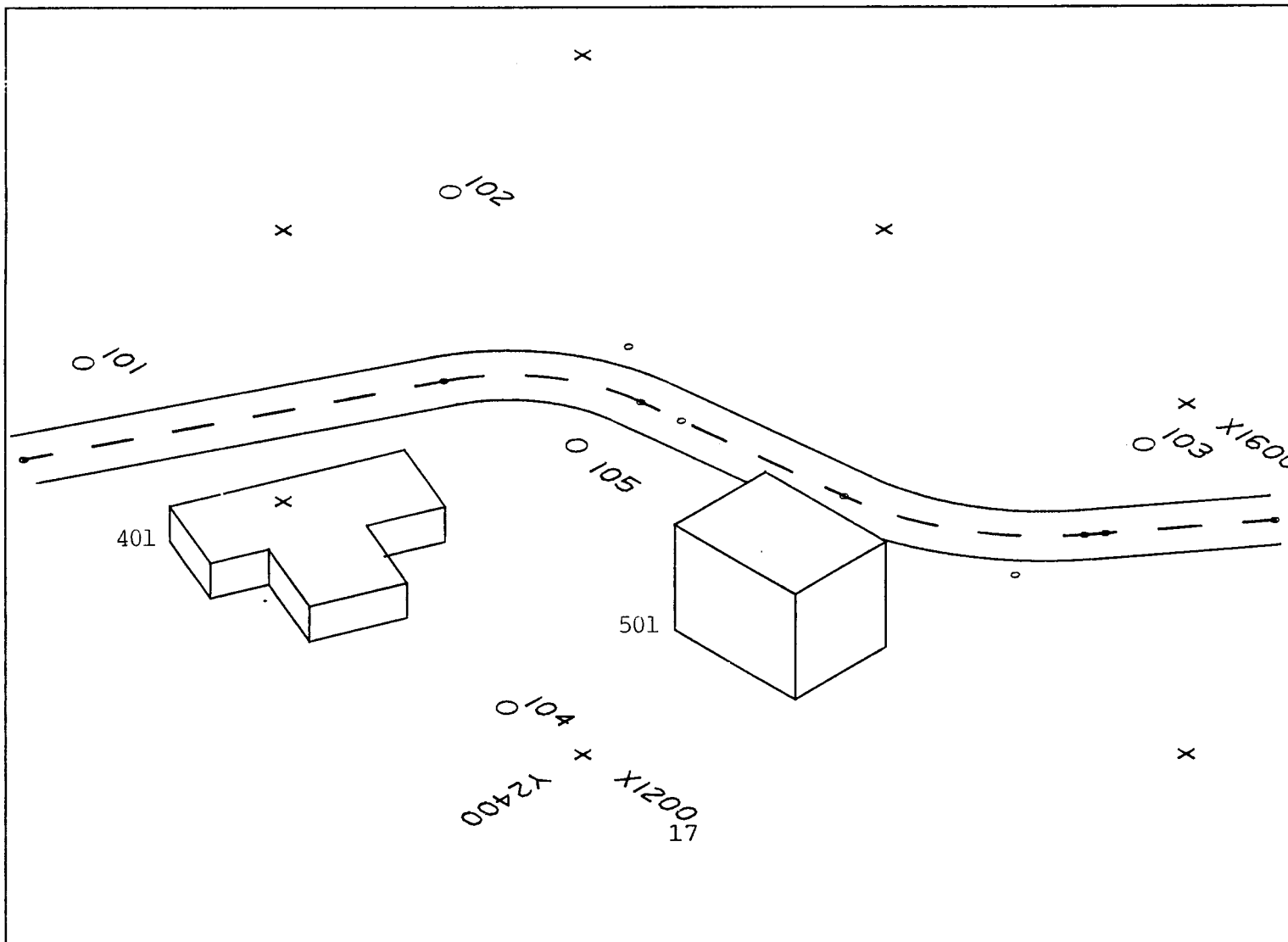
```
* * * G E O D O S * * *        Function

* *   POL  SETOUT   * *         Calculation of polar
                                setting out data in
                                three dimensions.
------------------------------------------------------------------
INSTRUCTIONS
------------------------------------------------------------------
You can enter the setting out point with either POINT NUMBER or
if printer is connected with SEARCH RADIUS and PNO-series or CODE.
Height diff (Dh) and vertical angle (Vv) will be corrected for
earth curvarure and refraction. The distances can be corrected
for UTM-projection.(Optional).
With some total stations, data can be sent to the instrument for
relative setting out data, e.g. count down to zero. You can get
"3D ZERO SETOUT" in PSION by using "CHECK SURV-DATA".
If You have used "REFLIN" just enter A- och B-values relative
reference line instead of point number.
------------------------------------------------------------------
DISPLAY             COMMENTS.
------------------------------------------------------------------
MANUAL              Select total station. <EXE>=manual input.
GEOD-400....

UTM-projection      Enter <Y> if You want to project correct
Y/N ?               distances. (Only if the UTM-flag is set to 1)

STATION             Enter station point. PSION suggests a point
Pno=104=            in the JOB-file. If You accept, just press
                    <EXE>.
Pno=104             PSION answers by showing data for the point.
Cod=PP              You can use the arrow keys to examine the
                    coordinates.
HEIGHT MEAS
Y/N ?               Enter <Y> to calcualte height setting out data
Ih=                 Enter instr.height and target height.
Sh=                 <EXE> = 0.00

REF OBJECT          Enter reference object.
Pno=
Ha=345.9401         Bearing and distance to reference object is
Hd=417.821          displayed.

REF READING         Enter angle reading to reference object.
Ha=345.9401         PSION suggests BEARING. With some total stations
AIM                 data can be sent directly to the instrument
PRESS <EXE>         Than just aim and press <EXE>

DIST SEARCH         Only if printer is connected.
 OK Y/N?            Press <Y> if You want to use "search radius"
 R=                 otherwise <N>.  Enter radius from Station.
ALL PNO CODE        MENU to select points by PNO-series or CODE.
                    within search radius.
OBJECT              Enter PNO for single point to set out.
Pno=406             Press <SPACE> <EXE> to quit.
```

A=0.000= B=0.000= Z=41.345=	If you use "REFLINE", enter A= (along line) and B= (perpendicular to the line.) For previous data press <EXE>. Use brackets "<" and ">" to add or substract value. The suggested Z value is interpolated along the reference line
Cod=/HOUSE/50 FIG HOUSE/50 SELECT PNT 1 2 3 4 5 6	If you have stored figure JOB=C:HOUSE, a MENU will appear that contains the figure points. Select the point to set out. The local coord- inates will be transformed in 3D and setoutdata will be calculated in current coord system.
Ha=288.8907 Hd=114.059 Dh=-11.502 Vd=106.3981 Sd=114.638 N=1178.563 E=2238.781 Z=40.000	The result is displayed two lines at a time. Use the arrow keys to look at the different setting out data. You can control the positions of the emplanted point. Press <C>. You then measure in the set out point. If you choosed "CHECK SURV-DATA" this will take place automatically. Press <T> to change target height. Press <R> to change REFERENCE LINE Press <Q> to quit from REFERENCE LINE
dL=0.023 Sm=0.001 dZ=0.015	Set out check. Distance, offset, and height difference. Press <EXE> for adjustment and another check or <ON> for next point.
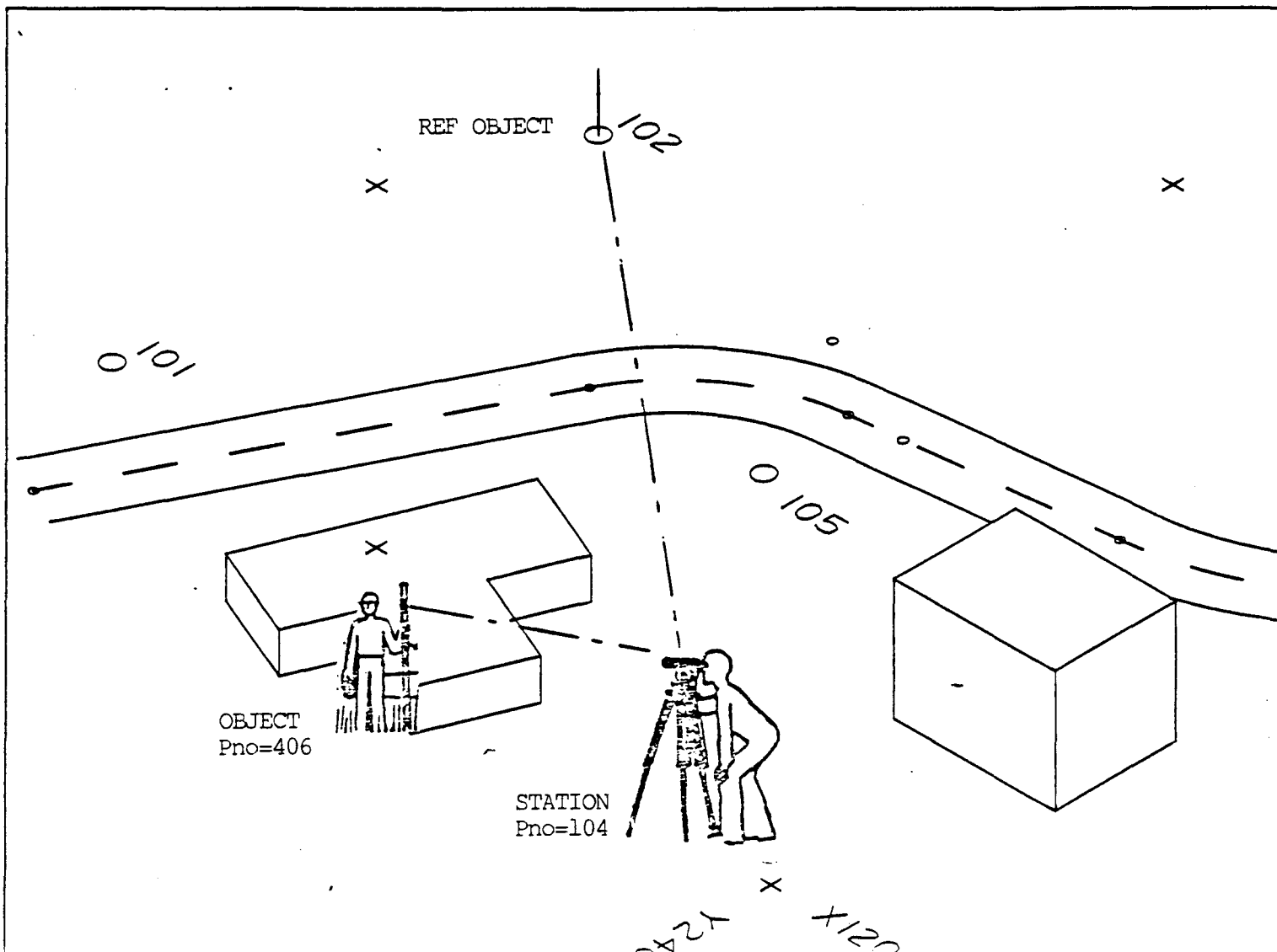
```
* * * G E O D O S * * *        FUNCTION

* *    POLAR MEAS    * *       Polar measurement with
                               coordinate calculation or
                               survey data collection.
                               Se also program REFLIN.
-------------------------------------------------------------------
INSTRUCTION
-------------------------------------------------------------------
Radial surveying in two or three dimensions.
Height measurement is corrected for earth curvature and refraction

You can enter survey data manually or receive directly on line
from different totalstations.
Possibility to make eccentric target calculations.
You can select direct coordinate calculation or just data
collection for later calculation with program "CSDATA"
see page 74.                      .
-------------------------------------------------------------------
DISPLAY           COMMENTS.
-------------------------------------------------------------------
STATION           Previous station establishment is default.
Pno=#101=         Just press <EXE> if you want to keep that.
                  Otherwhise give a new point name.

MANUAL-INPUT      Menu to select totalstation. You can design
GDM-I/O GDM-SER   your own menu.
GEOD-220 GEOD-140 For further information see pages 23,82 and 83.
WILD-TC WILD-TD
SOKKIA SOKSETC
TOPCON NIKON
PTSIII PTS2/110...

CHECK SURV-DATA   Answer <Y> if you during measurement want to
Y/N ?             check or edit survey data.

SLOPE DIST
Y/N ?             Press <Y> for slope dist or <N> for
                  horisontal distance measurement.
HEIGHT MEAS
Y/N?              Press <Y> for height measurements else <N>.

Ih=               Enter instrument height above point.
Th=               Enter target height. <EXE>=0.000

REF OBJECT        Enter reference object point number
Pno=102=102.

Ha=345.9401       Bearing and distance is displayed.
Hd=417.821        (Horizontal angle and horisontal distance)

REF READING       Enter back reading. PSION suggest BEARING..
Ha=345.9401=      With some total stations data can be send
AIM               directly to the instrument. Than just aim.
Press <EXE>       and press <EXE>.
```

```
START ELEM NO      If you use reference ROADLINE you can enter
Elm=1=             start element for fast searching.

Pno=101=406A       Enter POINT NUMBER for survey point.
                   PSION suggests previous number + selected
                   increment.  Press <SPACE><EXE> to QUIT.

Cod=HC             Enter CODE for survey object. Psion suggests
                   same as previous. Use <SHIFT> to change key mode
406A HC  0.00
Ha=342.9500        Enter angle and distance. If You make mistakes
Va=105.8380        use <DEL> resp <SPACE> <EXE> for immediately
Sd=114.540         corrections.
Th=0.000=1.000     Enter target height. <EXE> to accept previous
                   value.
OK Pno=406A Cod=   This is a menu where you may edit the data.
Th=1.000           Data is not yet stored.
Ha=342.9500        You may adjust the data with eccentric target
Va=105.8380        measurement. Press <A> or <B> if required.
Sd=114.540 FHd=    "FHd=" means Fixed Horisontal Distance to a
A=0.000 B=0.000    vertical perpendicular plane.
CPNT EDIT NOTE
                   Enter distances. A=along sight line.
A=0.000=                           B=perpendicular to sight line
B=0.000=           Sign rules: <+>= Add A to the distance
                                B: Object to the right of the
                                   sight line.

                   If You wish to change the target height
                   press <T>.
Th=                Enter target height.

CPNT               If you selected "CPNT" in the "CHECK-menu",
B-102              measure to the inner prism. (point B)
REF-LEVEL          MENU to select Z-value on intersection surface
DIST/B-C           or distance to point C from point B.
Z=0.000=           Enter Z value on reference surface or
Sd=0.000=          Enter slope distance B-C.
                   If you are in survey data collection mode
                   data will be recalculated to point C.

                   You may EDIT already stored data during surveying.
**** GEODOS ***    Press <E> to enter POINT EDIT program.
*    EDIT JOB  *   see page 24. Press <ON/CLEAR> to continue
                   with program. Press <EXE>.

A=                 If You have defined a reference line (REFLIN)
B=                 A and B will be displayed. If you selected
DZ=                height measurement, height difference (DZ),
SA=                slope A-distance and B-distance will also be
LB=                displayed.
                   To change reference line for next point
                   press <R>. Press <Q> to exit routine.
 *** GEODOS ***
**  REF LINE **    See program "REFLIN".
```

EXAMPLE

Stn 104   Ih=1.500

102   Ha= 0.0000

406A   Ha=342.9500   Va=105.8380   Sd=114.540   Th=1.000
        N=1178.562   E=2238.782   Z=40.000
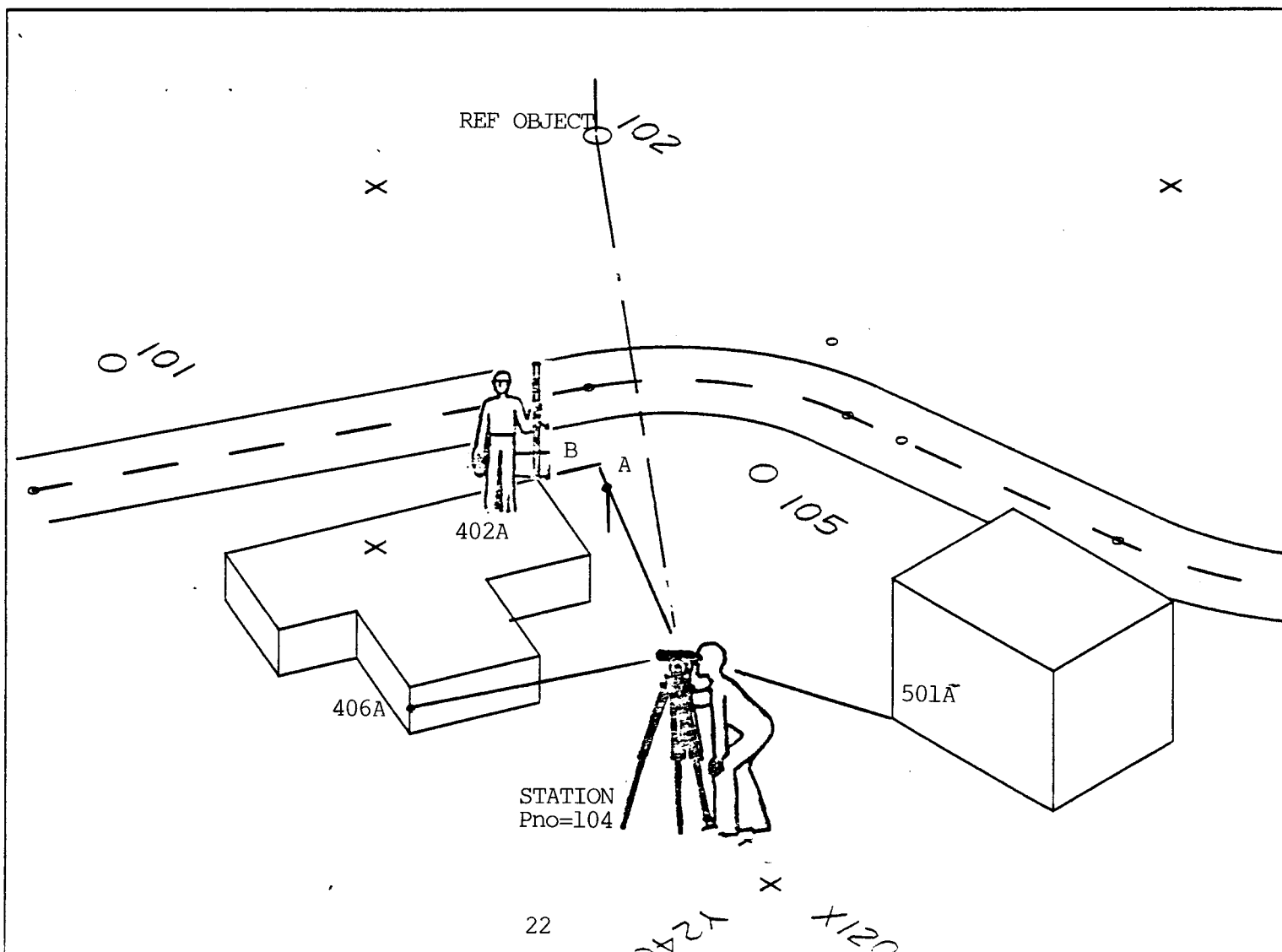
501A   Ha= 54.0485   Va=100.0000   Sd=111.735   Th=1.310
        N=1310.101   E=2351.088   Z=50.179

402A   Ha=398.5900   Va=103.3680   Sd=185.100   Th=1.310
        A=10.49   B=-31.62
        N=1299.929   E=2181.287   Z=40.392

```
* * * G E O D O S * * *        FUNCTION

* *  TOTALSTATION   * *        Measurement with TOTAL STATION
-----------------------------------------------------------------
INSTRUCTIONS
-----------------------------------------------------------------
When you start measurement or set out programs, total stations
can be used. It is important to select the correct instrument
from the MENU and that you are using the correct link and cable.
The TSTN-link is a specially manufactured interface for each
single instrument type. It fits in PSIONs TOP PORT.
The communication parameters will automatically be SETUP for
the different instruments. All instruments except Geodimeter
uses RS232 communication. Details how to connect the different
instruments are delivered together with the TSTN-link interface.
Put in "DMH" value in the "USER"-file if you will automatically
correct the vertical angle when the distance meter is placed
on top of the theodolite, e.g. when aiming with laser beam.
Station establishment is stored and can be used in other JOB:s
-----------------------------------------------------------------
DISPLAY            COMMENTS
-----------------------------------------------------------------
MANUAL-INPUT       MENU for total station selection.
GDM-400 GDM-220    You can use the first letter of the name
GDM-140 GDM-SER    for fast selection.
WILD-TC WILD-TD    You can design your own total station menu.
WILD-T2 SOKKIA..   Press <EXE>.        (See page 80-81.)
xxxx CONNECTED     The total station is now properly connected to
PRESS (EXE)        PSION.
CHECK SURV-DATA    Answer <Y> if you wish to DISPLAY or EDIT
Y/N ?              surveydata before calculation or storing.
                   This is recommended for safe data collecting.
                   If you answer <N>, the data is stored directly
                   for faster measurement.
OK Pno=12 Cod=TP   If you choose CHECK, after each measurement
Th=1.650           you will see the data before it is stored.
Ha=123.4567        You than can EDIT the data in the order you
Va=99.2345         wish. <O>=STORE, <ON>=Cancel current measurement
Sd=145.656         <F>=Fixed horisontal distance to measure at a
FHL=                   perpendicular vertical surface with angles.
                   <A>=Radial dimension along sigth line
A=0.000 B=0.000    <B>=Offset from sight line (-=left)
CPNT EDIT NOTE     <C>=Eccentric meas. with 2 prism. see page 21.
                   <E>=Edit previous data in the JOB file.
                   <N>=Note (Remark)
123 HC      1.50   Current pointnumber, code and target height
AIM press<EXE>     is displayed. If you didn't choose "CHECK"
                   you can change this data by pressing <ON>
                   and then continue measurement with automatically
                   increasing point numbering.
For SETTING OUT some totalstations use internal programs. Data
than will be sent automatically to the instrument.
If you selected "CHECK", automatic set out check will take place
at all intrument types. Instruments with SERVO-motors will aim
automatically
```

```
* * * G E O D O S * * *        FUNCTION

* *   POINT  EDIT   * *        List and edit data in JOB-files.
---------------------------------------------------------------
INSTRUCTIONS
---------------------------------------------------------------
Some keys have special functions for listing and editing work:
       <F>   Go to FIRST point.
       <L>   Go to LAST  point.
       <R>   Step one point BACKWARD.
       <X>   Step one point FORWARD.
       <S>   SEARCH point by name.
       <T>   SEARCH line element by number.
       <H>   LIST Road line profile data.
       <V>   LIST Volume data.
       <DEL> DELETE current point.
       <I>   INSERT new point.
       <P>   Display total number of points in the JOB-file.
       <C>   Copy point from other JOB file.
       <M>   Show MAX and MIN coordinates in the JOB file.
       <N>   Sort points in NUMERICAL ORDER (Only Pno= 0-32568).
       <E>   EDIT current POINT-record. Step to edit position
             with arrow keys. Use <DEL> to delete characters, or
             it is also possible to insert characters directly.
       <A>   List points position along current REFERENCE LINE.
       <D>   Distance, Bearing and height diff between points.
       <ON>  QUIT. Back to GEODOS-menu.
---------------------------------------------------------------
DISPLAY              COMMENTS
---------------------------------------------------------------
Pno=101              Press <F>.First point in JOB-file is displayed
Cod=PP               Use arrow keys to display all data.
Pno=402A             Press <L>.Last point in JOB-file is displayed
Cod=HH               Press <R>. Previous point is displayed.
Pno=501A             Press <X> or <EXE> to move to next point.
Cod=HH               Press <S> or <T>
Pno=    Elm=         Enter point name or element number to search.
Pno=102
Sec=1234.567         Press <A>. Data along REFERENCE LINE if it
Of=-12.345           is defined. See REFLIN.
Cod=PP               Press <DEL>
DELETE P=102         You can regret by pressing <N>
Y/N ?                Press <I>
Pno==                Enter new point number, code and coordinates
                     Press <P>
# POINTS=8           Total number of points in the JOB-file.
                     Press <C>
COPY                 Key in JOB file name from which you wish to
JOB=C:               copy the point, and then the point name.
                     Press <N>
SORT Y/N ?           Answer <Y> if you wish to carry out sort.
                     Press <M>
MIN-MAX              Min and Max coordinates are displayed scrolling
                     Press <E>
                     You can now edit single characters in a record.
```
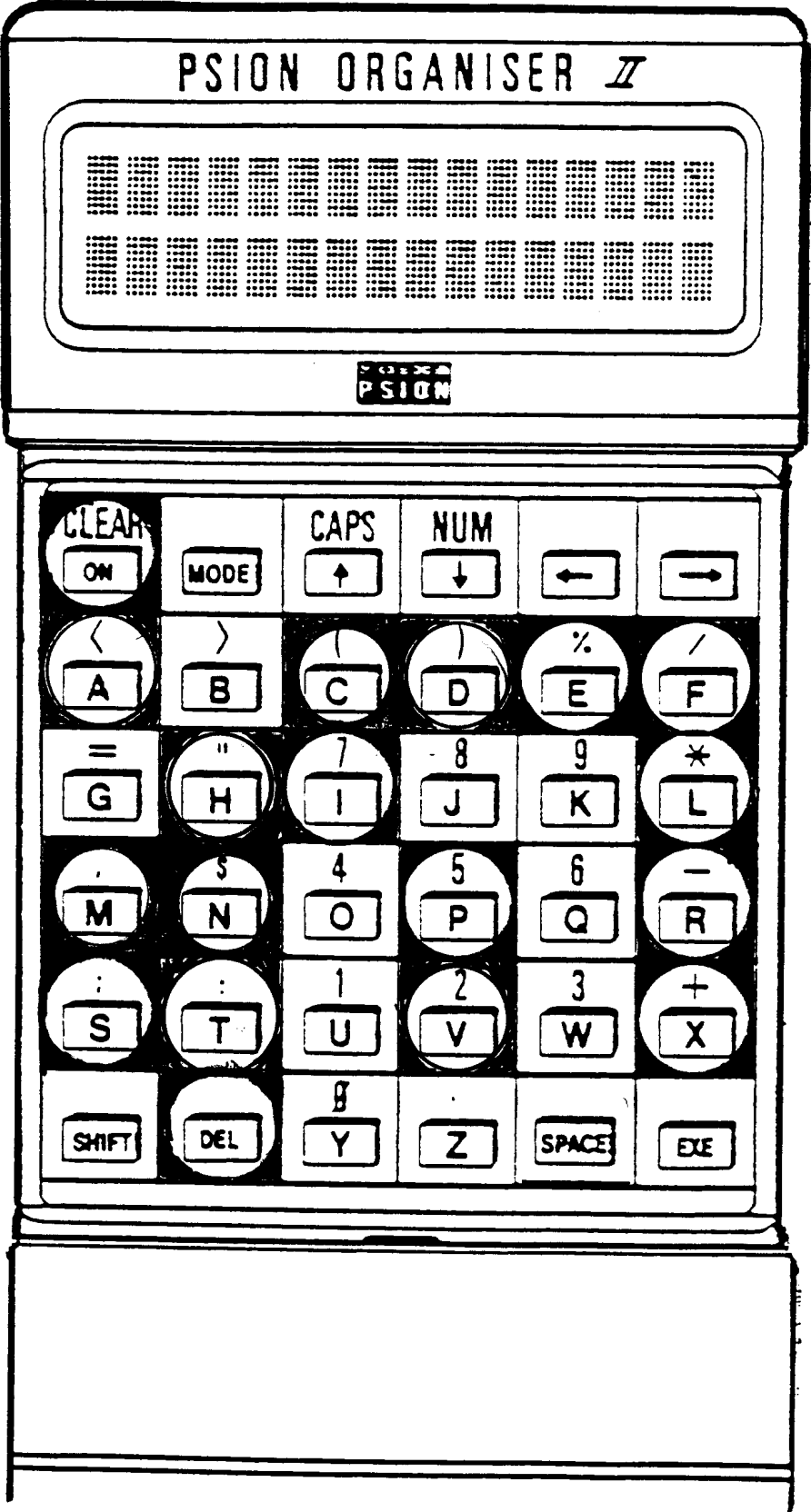
```
*  *  * G E O D O S *  *  *        FUNCTION

*  *    ORT SETOUT    *  *        Rectangular setting out
                                  data calculation in three
                                  dimensions.


------------------------------------------------------------------
INSTRUCTIONS
------------------------------------------------------------------
Selectable horisontal or slope distance along baseline.
Height difference is calculated from baseline vertical to
the "setting out" object.



------------------------------------------------------------------
DISPLAY                 COMMENTS
------------------------------------------------------------------
BASEPOINT               Enter base point no 401
Pno=1=401

Pno=401                 Use arrow keys if you wish to examine coord.
Cod=HH                  Press <EXE>.

TARG-POINT              Enter target point (End point on baseline)
Pno=402=402             If you wish to enter BEARING instead, press
                        <SPACE> <EXE>.
Pno=402
Cod=HH

Ha=25.1333              Bearing and distance are displayed.
Hd=120.000              Press <EXE>.

OBJECT                  Enter setting out object number
Pno=401=405             405

Pno=405                 Press <EXE>.
Kod=HH


A=    80.000            Horizontal distance along baseline.
B=   100.000            Horizontal perpendicular distance
DZ=   13.333            Height difference to the baseline.
SA=   81.104            Slope distance along baseline.
SB=  100.885            Slope perpendicular distance.
```

EXAMPLE

Basepoint

401   HH   N=1189.332   E=2134.934   Z=40.000

Target point

402   HH   N=1300.101   E=2181.088   Z=60.000

       Ha=25.1333   Hd=120.000

Object

405 HH   A=80.001 B=100.000 DZ=13.333 SA=81.104 SB=100.885

27
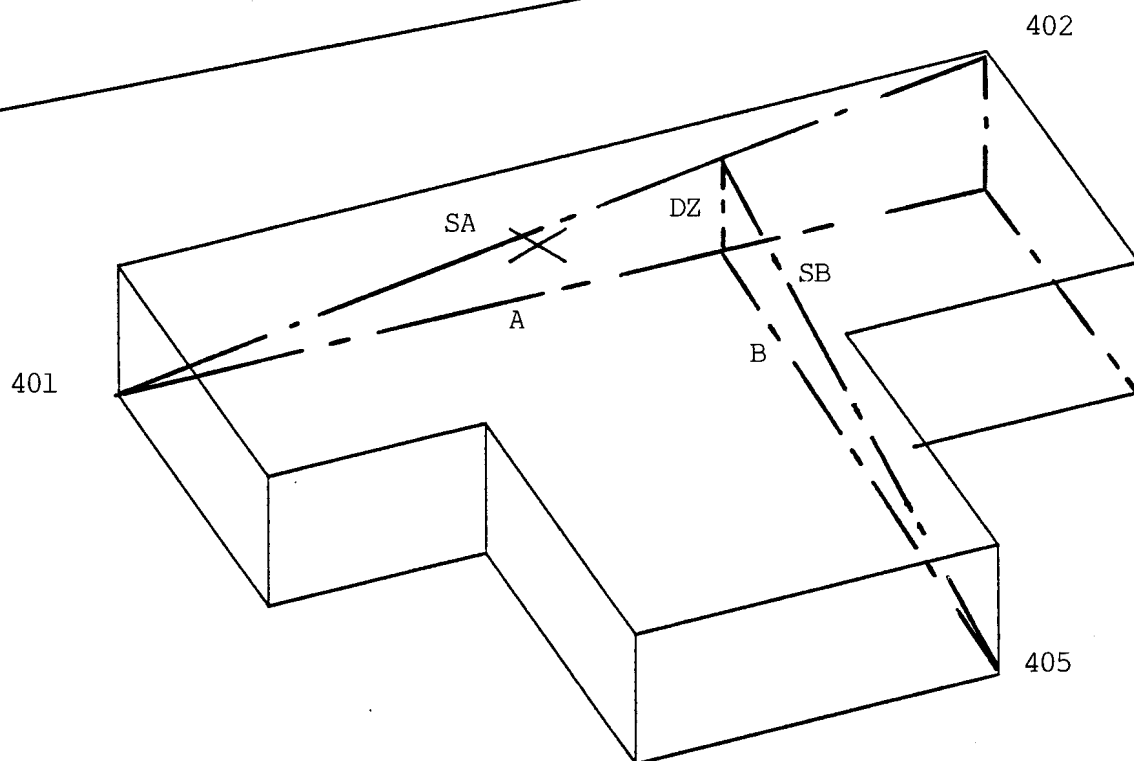
```
* * * G E O D O S * * *        FUNCTION

* *   ORTOG  MEAS   * *        Coordinate calculation (transform)
                               in two or three dimensions
                               from rectangular measurements or
                               drawing dimensions.
-------------------------------------------------------------------
INSTRUCTIONS
-------------------------------------------------------------------
You can enter accumulative distances.

Distance along the baseline (A=) can be slope distance.
Height interpolation along the baseline as default.


-------------------------------------------------------------------
DISPLAY              COMMENTS
-------------------------------------------------------------------
BASEPOINT            Enter base point no 401
Pno=1=401


Pno=401
Cod=PP


TARG-POINT           Enter target point (end point) no 402
Pno=402=402          If You want to enter BEARING, press
                     <SPACE> <EXE>.

Pno=402
Cod=PP


Ha=25.1333           Bearing(Ha), hor distance(Hd), height diff(DZ)
Hd=120.000           vertical angle,(Va) and slope distance (Sd)
DZ=19.999            are displayed.
Va=89.4868
Sd=121.655


HEIGHTS              Press <Y> if you wish to store heights.
Y/N?


SLOPE DIST           Press <Y> if you wish to enter slope distance
Y/N ?                along baseline (A=). You will not get this
                     question if the baseline is horizontal.

Pno==407             Enter point number and code of the point
Cod=HH               to be calculated.
A=0.000=80.00        Enter distances. A=along baseline, B=perp. to
B=0.000=100.00       baseline. Previous values are default.
Z=53.333=            To work with accumulative distances,
                     use ">" resp "<"  to add or sustract distances.
                     The Z value is interpolated along the baseline.
                     <EXE>=accept, or you can enter new Z value.
Pno=407
Cod=HH
N=1224.716           Point record will be displayed and stored.
E=2258.011           Use arrow keys to display coordinates.
Z=53.333.
```

EXAMPLE

Basepoint

401   HH   N=1189.332   E=2134.934   Z=40.000

Target point

402   N=1300.101   E=2181.088   Z=60.000

    Ha=25.1333   Hd=120.000   Dh=19.999   Va=89.4868   Sd=121.655

Measured point

405A
    Slope A=81.102   Horisontal B=100.000

            N=1224.715   E=2258.010   Z=53.333
405B
    Horisontal A=80.000   Horisontal B=100.000

            N=1224.716   E=2258.011   Z=53.333

    Note that Z is interpolated along the baseline

29

```
* * * G E O D O S * * *        FUNCTION
                               Two point resection.
* *     2P RESECT     * *       One or two distances + incl angle
                               Calculation of Northing, Easting
                               and optional height.
-----------------------------------------------------------------
INSTRUCTION
-----------------------------------------------------------------
Calculation of station coordinates in three dimensions.
When you measure two distances, adjustment of the distances
will be done. The ANGLE WILL NOT BE ADJUSTED.
There are no geometric restrictions. It does not matter
if the angle is small or great. The station point can lie
exactly on the straigt line. If you measure only one distance
it must be towards OBJECT 2.
-----------------------------------------------------------------
DISPLAY.          COMMENTS
-----------------------------------------------------------------
MANUAL-INPUT      Select total station.
GDM-400...

SLOPE DIST        Select slope or horizontal distance measurement
Y/N ?
HEIGHT MEAS       Answer <Y> if you wish to calculate height
Y/N ?             of the station point.

Ih=               Enter instrument height. <EXE>=0.00.
                  The instrument axis will then be determined.
Th=               Enter target height. You can also enter this
                  later on during measurement.

OBJECT nr 1       Enter point number for first object.
Pno=101=

Ha=               Enter horizontal angle 1.
Va=               Enter vertical angle
Sd=               Slope distance. Enter "0" if not measured.
Th=0.000=         Target height, enter if applicable.

OBJECT nr 2       Enter point number for object 2.
                  etc.
                  You must measure distance to object 2.
WORKING...        Calculating is now in progress.

dD=-0.005  OK     Distance difference.
dH=-0.003 Y/N ?   Height difference.
                  Press <Y> if You accept.

STORE             Enter point number and code to store the newly.
Pno=105=          calculated point.
Cod=PP=
                  The new point also will be stored as station
Pno=105           establishment that can be used in POLMS, POLUT
Cod=PP...         and ROAD SETOUT.
```

EXAMPLE

Survey data:

Stn 510A   Ih=1.536

101   PP   Ha= 0.0027   Va=107.9431   Sd=391.442   Th=1.502

103   PP   Ha=123.5792   Va=111.4985   Sd=215.318   Th=1.498

Result:

                 dD=-0.006   dH=-0.004

510A   HJP   N=1340.052   E=2391.091   Z=97.009   D=0.007
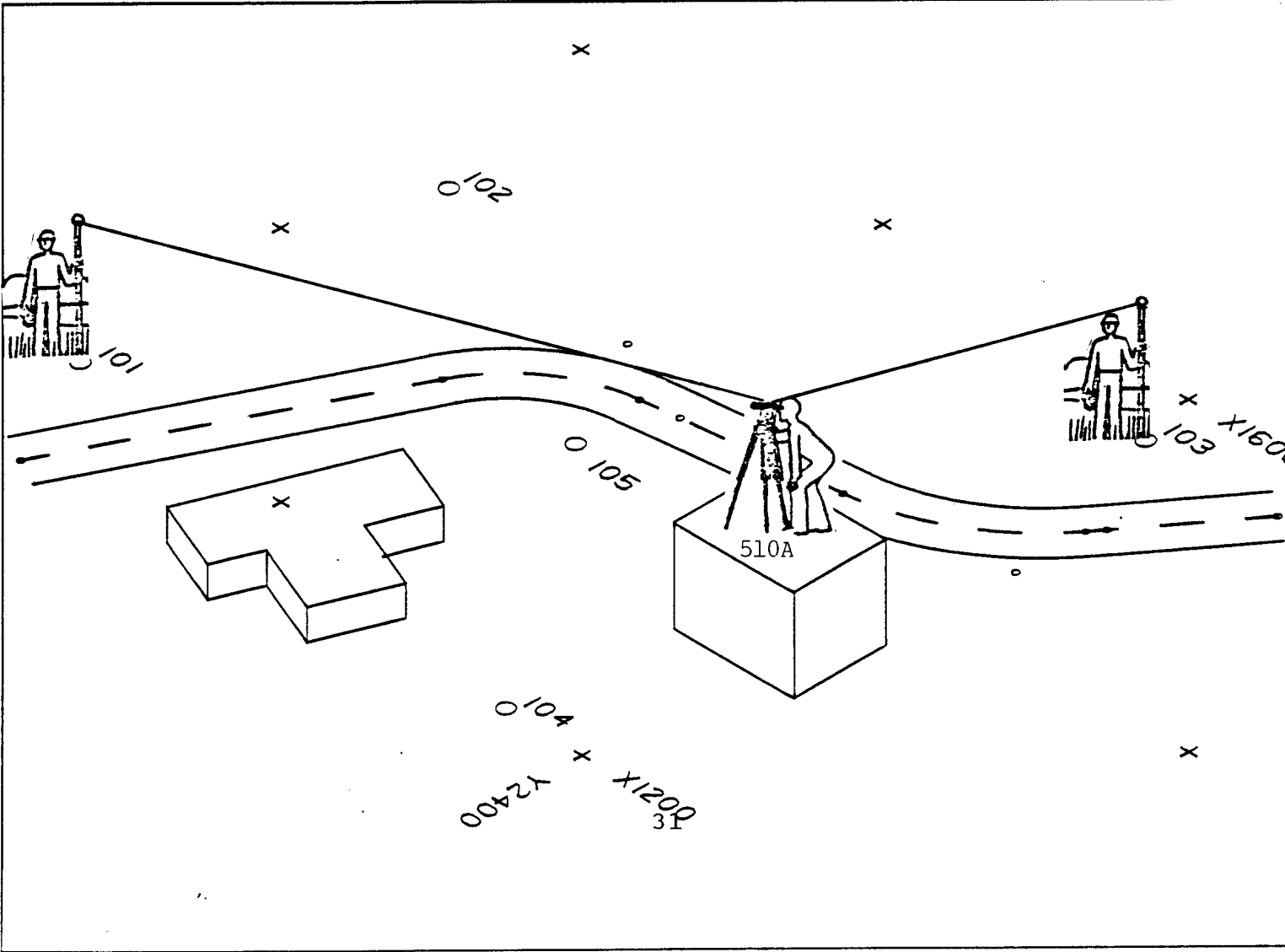
```
* * * G E O D O S * * *        FUNCTION
                               Angle intersection calculation.
* *    ANG RESECT    * *        Measurement to three or four
                               known points. Optional height
                               measurement.
-----------------------------------------------------------------
INSTRUCTION
-----------------------------------------------------------------
Be aware of "the dangerous circle". A bad result will be
achieved if you are standing on the circle through the three
known points. You will get risk factors that shows the expected
accuracy by the different resections. The mean value will be
weighted according to intersection angles.
-----------------------------------------------------------------
DISPLAY            COMMENTS.
-----------------------------------------------------------------
MANUAL-INPUT       Select total station <EXE>=manual input
GEOD-400...

HEIGHT MEAS        Press <Y> för height measurement.
Y/N ?
Ih=                Enter instr.height above point to be determined
                   <EXE> (Ih=0) if You want to determine only
                   the instrument axis.
Th=                Enter target height. You can change it during
                   measurement.
OBJECT 1           Enter point number for the known point.
Pno=101=

Pno=101            The point will be displayed if it exists
Cod=PP             otherwise input code and coordinates as usual.

Ha=                Enter horizontal angle.
Va=                  "    vertical angle.
Th=0.000=            "    target height.

OBJECT 2           As above.
Pno=102=

                   For each resection, the angle and expected
INT 1 Ha=64        accuracy are displayed. The value shows what
Risk=10mm/100m     will happen by an angle deviation of 0.001 gon.

1 N=1369.336...    Coordinates for the different resections are
2 N=1369.335...    displayed. Also the weight that is used for the
3 N=1369.320...    mean value calculation.

N=0.012 E=0.014..Standard deviation will be displayed scrolling.
Diff OK Y/N ?      dz and dr (3D radial). You can stop and view
                   the data with the arrow keys.

STORE              Enter point name and code to store the new
Pno=105=           point in the JOB-file.
Cod=PP=
Pno=105...         The point will be stored as station establishment
```

EXAMPLE

Survey data

Stn 105   Ih=1.585

101   PP   Ha= 0.0056   Va=100.6064   Th=1.501

102   PP   Ha= 63.6420   Va=100.6491   Th=1.495

103   PP   Ha=183.9739   Va= 98.1553   Th=1.498

104   PP   Ha=291.3167   Va=100.2031   Th=1.510

Result:

        N=0.012   E=0.014   Z=0.008   dR=0.020

105   PP   N=1369.326 E=2226.656 Z=50.573 D=0.020
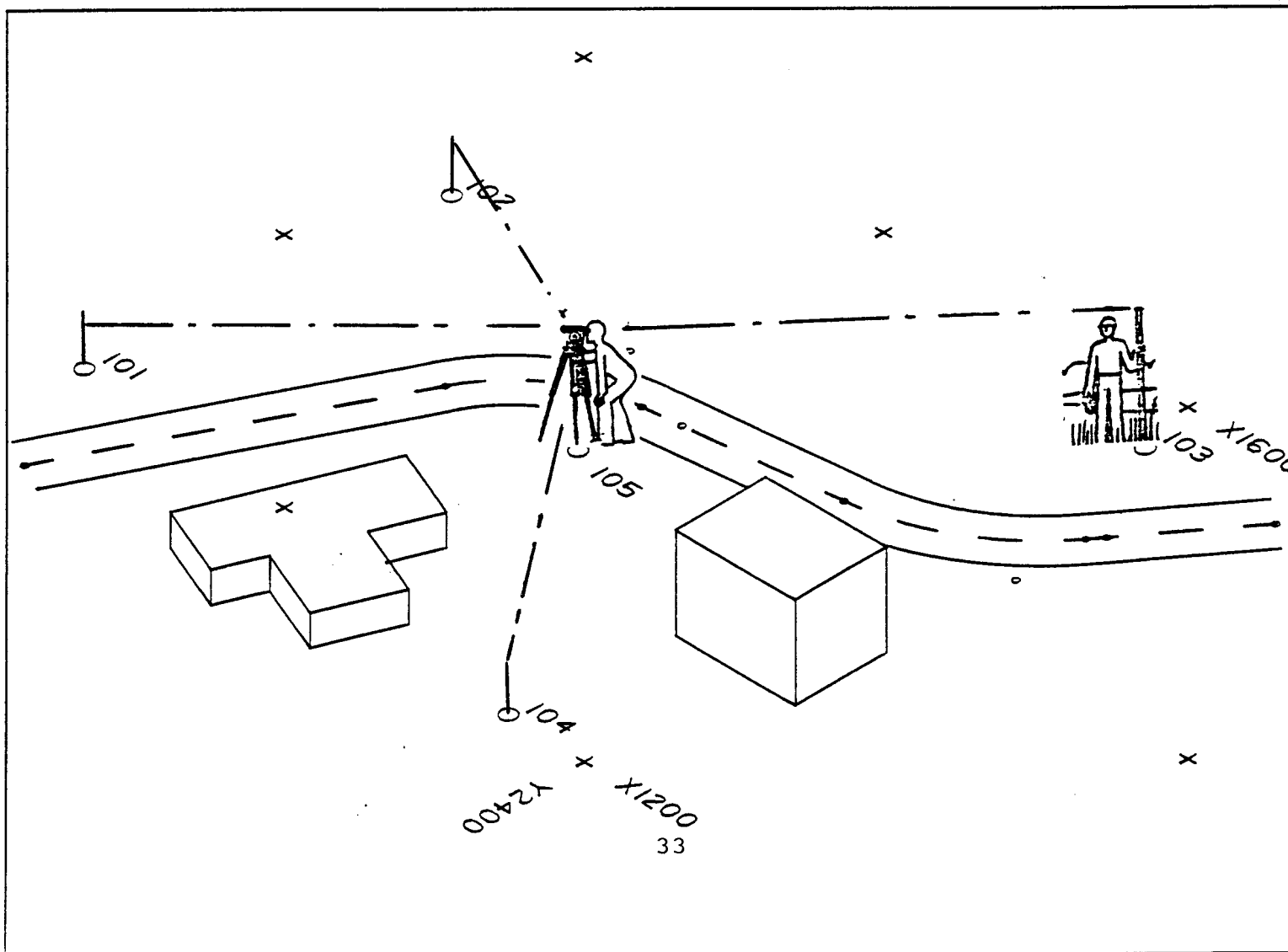
```
* * * G E O D O S * * *        FUNCTION
                               Free station calculation in
* *     FREE  STN    * *        two or three dimensions.
                               Angle and distance measurement
                               to two or several known objects.
------------------------------------------------------------------
INSTRUCTIONS.
------------------------------------------------------------------
Coordinate calculation by HELMERT TRANSFORMATION.
You can EDIT the measurements and recalculate during execution.
Height adjustments by average calculation.
------------------------------------------------------------------
DISPLAY              COMMENTS.
------------------------------------------------------------------
MANUAL               Select total station <EXE>=manual .
GEOD-400...
SLOPE DIST           Press <Y> for slope distance measurement.
Y/N ?
HEIGHT MEAS          Press <Y> for height measurement.
Y/N ?
Ih=                  Enter instr.height above point.<EXE>=instr.axis
Th=                  Enter target height. You can change it during
                     measurement.
OBJECT nr 1          Enter point number for resp. objects.
Pno=101=             Press <SPACE><EXE> to QUIT.

Ha=                  Enter horizontal angle.
Va=                  Enter vertical angle.
Sd=                  Enter slope distance.
Pno=102=             As above.
WORKING...           Calculation in progress.
4 KNOWN POINTS       Your known points are displayed scrolling.
101 102 103 104..Press <EXE>.
DEVIATION
P=101 D=0.014..      Deviations for each point are displayed
N-0.013 E0.005..     scrolling.
Z-0.002              Press <EXE> for each point.
                     At the end of the calculation the point with
                     the biggest deviation is displayed again.
DIST.ERROR/100m      Errors shown contain scale factor with relation
                     to metre unit per 100m. When measuring from
                     free station position the factor can be used to
                     carry out precise distance measurement. Note
                     that the +- sign is the ERROR. Correction is
                     carried out using the opposite sign.

STORE QUIT                    MENU for selection as follows:
DELETE ADD                    STORE   Point OK, store in JOB-file.
                              QUIT    Quit without storing.
                              DELETE  Delete measurement to certain
                                      point and recalculate.
                              ADD     Add measurement to another point
                                      and recalculate.
STORE                Enter point number and code to store the point
Pno=105=             that also will be stored as station eastablishment
```

```
STORE
Pno=105=    -      Enter point number and code for station-
Cod=TRP=    "      point to store.


EXAMPLE

Input data:
Stn 105           Ih=1.585
101      TRP      Ha=  0.0056    Va=100.6064    Sd=243.320   Th=1.501
102      TRP      Ha= 63.6420    Va=100.6491    Sd=216.420   Th=1.507
103      TRP      Ha=183.9739    Va= 98.1553    Sd=266.071   Th=1.498
104      TRP      Ha=291.3167    Va=100.2031    Sd=211.475   Th=1.498

Result deviations.
101      N-0.013   E 0.005   Z-0.002   R 0.014
102      N 0.011   E-0.001   Z 0.007   R 0.013
103      N-0.001   E 0.001   Z-0.005   R 0.005
104      N 0.002   E-0.005   Z-0.001   R 0.005
             Coordinates
105      N=1369.330   E=2226.645   Z=50.573   D=0.014
```


35
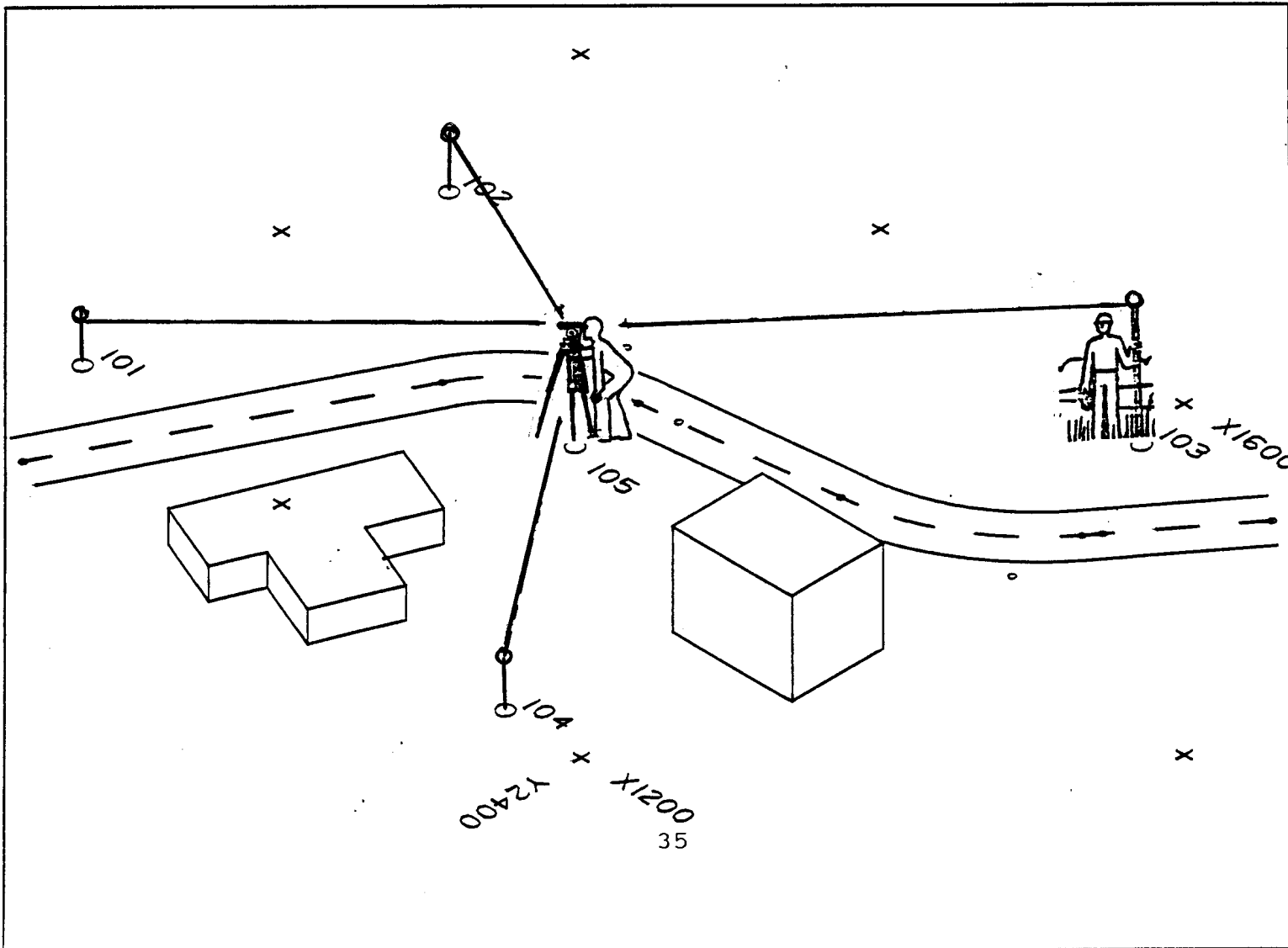
```
* * * G E O D O S * * *        FUNCTION

* *    TRAVERSE    * *         Calculation and adjustment
                               of traverse in three
                               dimensions.
----------------------------------------------------------------
INSTRUCTIONS
----------------------------------------------------------------
Start in a JOB-file that contains your known points.
Survey data will be stored in a special JOB-file during
measurement. You can edit survey data and recalculate.
Coordinate calculation is done at the same time.
When you measure vertical angle and distance to back object
the deviation will be displayed. You can then select correction
of the station coordinates immediately. This allows you to use
the "hanging" traverse points for e.g. setting out work.
The point codes will be automatic set to PP(fly) and PP(adj)
respectively for the new points.
The start and close points must be stored previously in the JOB
file before you start the adjustment. Use program "PREG".


----------------------------------------------------------------
DISPLAY              COMMENTS
----------------------------------------------------------------
SURV DATA            Enter JOB name for storage survey data.
JOB=C:

new JOB Y/N?         Press <Y> to start a new traverse. If you
                     continue an existing traverse PSION remembers
                     the previous station point number and displays
                     it when you continue with the next station.
MEASURE ADJUST       MENU. When You have finished the measurement or
PRINT                changed survey data, you can select adjustment
                     or print out.
MANUAL-INPUT         Select total station <EXE>=manual
GDM-400...

SLOPE DIST Y/N? Press <Y> if you enter slope distances.
HEIGHT MEAS Y/N?  "    <Y> for height measurement.

BACK OBJ             Enter point number for reference station.
Pno=101=              (102 in the example)

STATION              Enter point number for start point. (Station)
Pno=102=              (101 in the example)

STN-P=101            You have now established the traverse start. For
BACK-P=102           each new station, PSION displays the station-
                     point and backsight point.

Ih=1.493             Enter instrument height (only if You selected
                     height measurement)
```

```
Ha=7.2389                Bearing, distance and height difference to back-
Hd=221.604               object are displayed.
Dh=-1.383                Press <EXE>.
Va=100.3974
Sd=221.608


BACK-P=102               Enter horizontal angle to back station.
Ha=0.0132
Va=0                     Enter vertical angle. "0" if no measurement.
Sd=0                     Enter distance. "0" if no measurement.

Th=0.000=                Enter target height.

FORWARD                  Enter point number of forward station.
Pno==105C                If it exists in the JOB-file you will be asked to
Ha=61.3980               connect.
Va=99.4150               Enter measurement to forward station.
Sd=243.325
Th=0.000=1.500

Pno=105C                 Coordinates will be calculated and stored
Cod=PP(fly)              Now you can move to next station. If you don't
N=1369.331              switch off PSION, it will be automatically
E=2226.648              switched off after a few minutes.
Z=50.575                When you switch ON again it is ready for the
                        next station.
                        If you switch off by pressing <O> from the head
                        menu, you must enter the JOB-file again when
                        you switch on.
Stn-P=105C              PSION remembers the previous point numbers
Back-P=101              for station and backsight stations.
Ih=1.585                Enter instrument height.
Ha=                     Bearing etc to backsight station is displayed.
  .
  .
Ha=0.0056               Enter survey data to backsight station.
Va=100.6064
Sd=243.320

dD=0.006                Deviation for distance and height.
dH=-0.003 Y/N?          Press <N> if you want to remeasure.
CORR P=105C             Press <Y> if you want to adjust station coord.
Y/N?                    and survey data (average).
..........
FORWARD                 Measurement to KNOWN forward station.
Pno==103
P=103 EXIST             Press <Y> to connect. Then make the normal
CONNECT Y/N ?           measurements to the known closing point.

N=0.011 E=-0.010.. Coordiante deviations are displayed.
DIFF OK Y/N?       Press <Y> if it is OK.
  .                If you don't want to make angle connection, you
  .                can stop here.
  .                In this example go now to the MENU and select
```

```
                        ADJUST. To carry out an angle adjusted traverse
   .                    continue to the known point and complete the
                        closing angle measurement.
ANGLEDIFF
WORKING...

ANGLEDIFF               Angle diff is displayed. Press <Y> to continue
0.0052 Y/N ?            adjustment.
COORDDIFF
WORKING...              Adjustment is in progress.

N=0.006 E=-0.003...
DIFF OK Y/N?            Press <Y> if you are satisfied with the closure.

ADJUST                  If you answer <Y> all "hanging" points PP(fly)
Y/N ?                   will become adjusted points = PP(adj).

                        If you want to change known closing point
                        coordinates, use program "EDIT" in your JOB file
                        Then go to program "TRVRS" and select "ADJUST"
                        from the MENU.

                        If you want to change SDATA, go to the main
                        menu, enter GEODOS, JOB=your survey data file
                        and select EDIT.
                        Return thereafter to JOB-file and re-adjust.
```

EXAMPLE

```
Stn 101          Ih=1.493
-----------------------
102     Ha=   0.0132

105C    Ha=  61.3980       Va= 99.4150      Sd=243.325       Th=1.500

Stn 105C         Ih=1.585
-----------------------
101     Ha=   0.0056       Va=100.6064      Sd=243.320       Th=1.501

103     Ha=183.9739        Va= 98.1553      Sd=266.071       Th=1.498

Stn 103          Ih=1.530
-----------------------
105C    Ha=   0.0025       Va=101.9900      Sd=266.090       Th=1.010

102     Ha=  35.1201

Adiff=   0.0052

dN= 0.006        dE=-0.003        dZ=-0.012         dR=0.013

Pno=105C  Cod=TRP(adj)  N=1369.327  E=2226.648  Z=50.574  D=0.013
```

SURVEYDATA

PNO	COD	HA	HD	VD	DIFF
102	str				
101	stp	61.3848	243.312	2.2385	0.006
105C	new	183.9683	265.959	7.8005	0.006
103	slp	35.1176	0.000	0.0000	0.000

RESULT

PNO	COD	N	E	Z	D
102	TP	1474.381	2037.436	48.455	
101	TP	1254.208	2012.292	48.342	
105C	TRP(adj)	1369.327	2226.648	50.274	0.009
103	TP	1549.570	2422.217	58.369	
102	TP	1474.381	2037.436	48.455	

| Ha=0.0052 | COOR-DEV | 0.006 | −0.003 | −0.012 | 0.018 |
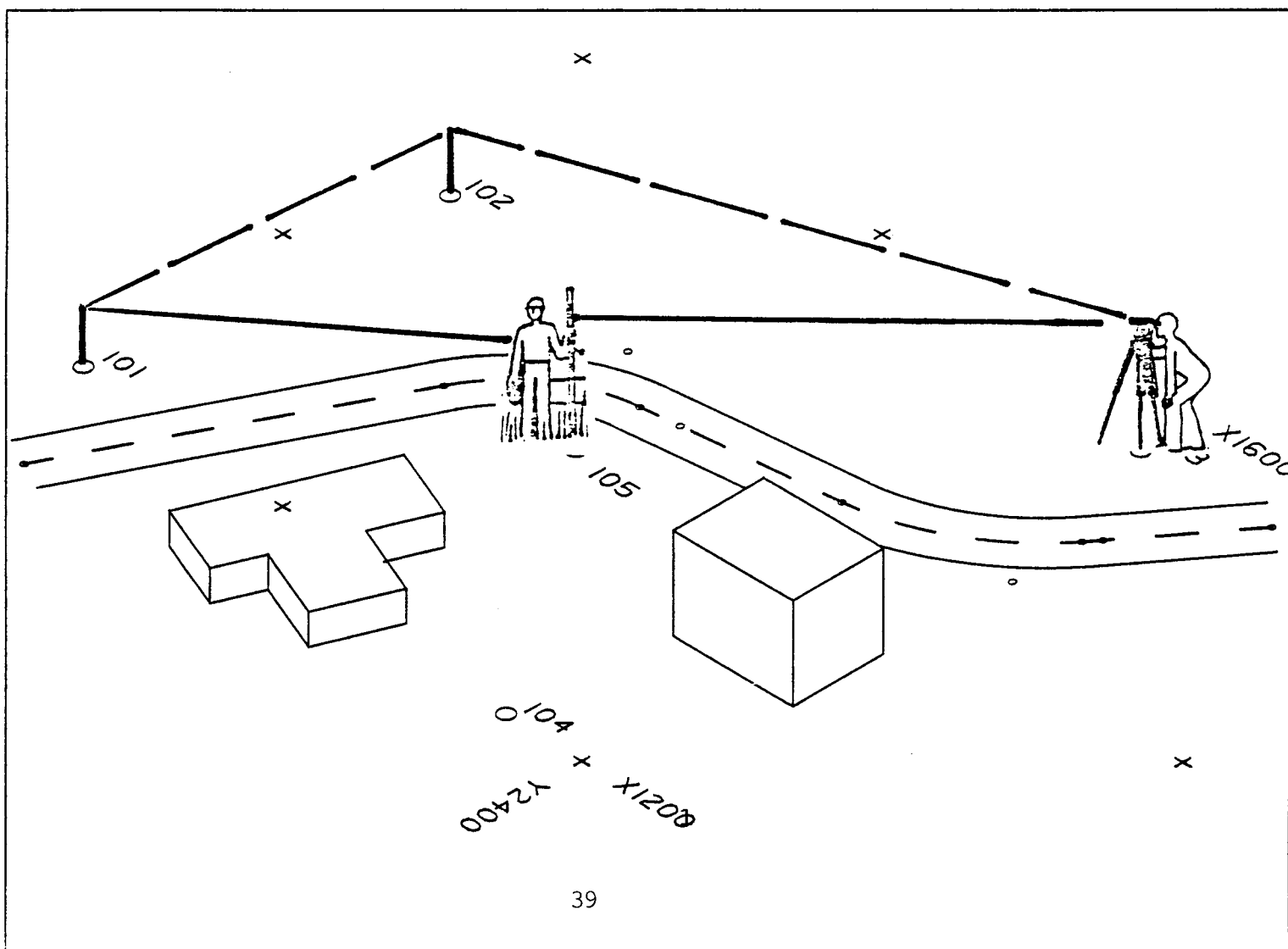
```
* * * G E O D O S * * *          FUNCTION

* *    ANG INTERS    * *          Angle intersection from
                                  two or three station
                                  points in two or three
                                  dimensions.
----------------------------------------------------------------
INSTRUCTIONS
----------------------------------------------------------------
Measurement can be made "ON LINE" (RMS) or by survey data
collection in two separat JOB-files (see POLMS). By height
measurement mean value will be calculated and deviations will
be displayed. Weighted mean value calculation.
----------------------------------------------------------------
DISPLAY            COMMENTS.
----------------------------------------------------------------
"RMS" MEASUREMENT.
------------------
MANUAL-INPUT       Select total station (EXE>=manual input.
GDM-400...
HEIGHT MEAS        Press <Y> for height measurement.
Y/N ?

3 STN-POINTS       Press <Y> if you wish to measure from three
Y/N ?              stations.

STATION 1          Enter point number for station 1.
Pno=101=
Ih=                Enter instrument height above point.
                   0.00 if Z is equal to instument height.

BACK OBJ 1         Enter reference object for station 1.
BACK READ          Enter reference reading (horisontal angle)
Ha=

STATION 2          As above.

After station establishment, enter survey data as follows:

Pno=101=           Enter point number for the survey object.
Cod=HC=              "    code         "    "    "     "

FROM STN 1
Ha=                Enter horizontal angle from station 1.
Va=                  "    vertical angle   "         "
Th=0.000=            "    target height

FROM STN 2         Etc...
Ha=
WORKING...         Calculation will take maximum c:a 20 seconds..
N=0.005 E=0.004    Standard deviation is displayed scrolling
DIFF OK Y/N ?      Use the arrow keys to stop and back scroll.
                   Press <Y> if OK.
Pno=101
Cod=HC             Coordinates will be stored in current JOB-file.
```

SURVEYDATA CALCULATION

```
SDTA STN 1          Enter JOB-name for surveydata.
JOB=C:              Data from the different stations must be stored
SDTA STN 2          in two separate JOB:s with different names.
JOB=C:              Do not mix this type of surveydata with other
                    types. Coordinates for station points must
                    be stored in the JOB you entered for calculation


STN P=1 P=2         Station point names will be displayed.
 OK Y/N ?           Press <Y> to continue.

                    Press <Y> if you want to calculate all measured
AUTOMAT             points. Coordinates will be stored in current
 OK Y/N ?           JOB. Press <N> to select separate points.
                    If printer is connected, the result will be
                    printed out as in the example below.
                    The angles are displayed for each calculated
350.011  99.123     point. The calculation takes a while, so before
45.454  101.322     you start a large computation with printer
                    connected, put in fresh batteries or connect a
                    power adapter.
```

```
============================================== GEODOS = version 5.45


==============================================
VIKER DATA AB
============================================== 05 APR 1990 09:20:30 =

==============================================

ARB-NAMN : EXEMPEL    ARB-NR : 12.3456    OPER: SOA

AVSKARNING                                                    Z          D
JOB : C:XMP                            X          Y
                                                          50.560
PNO              KOD
STN 1 MATDATA JOB : S105            1369.334   2226.645   48.342
105           Stn                   1254.208   2012.292
101           Bobj

STN 2 MATDATA JOB : S510A                      2391.091   97.009
510A          Stn                   1340.052   2226.645   50.560
105           Bobj                  1369.334

MATTA PUNKTER                                             59.975      0.
                                    1280.873   2227.243
403A          HH
```

41
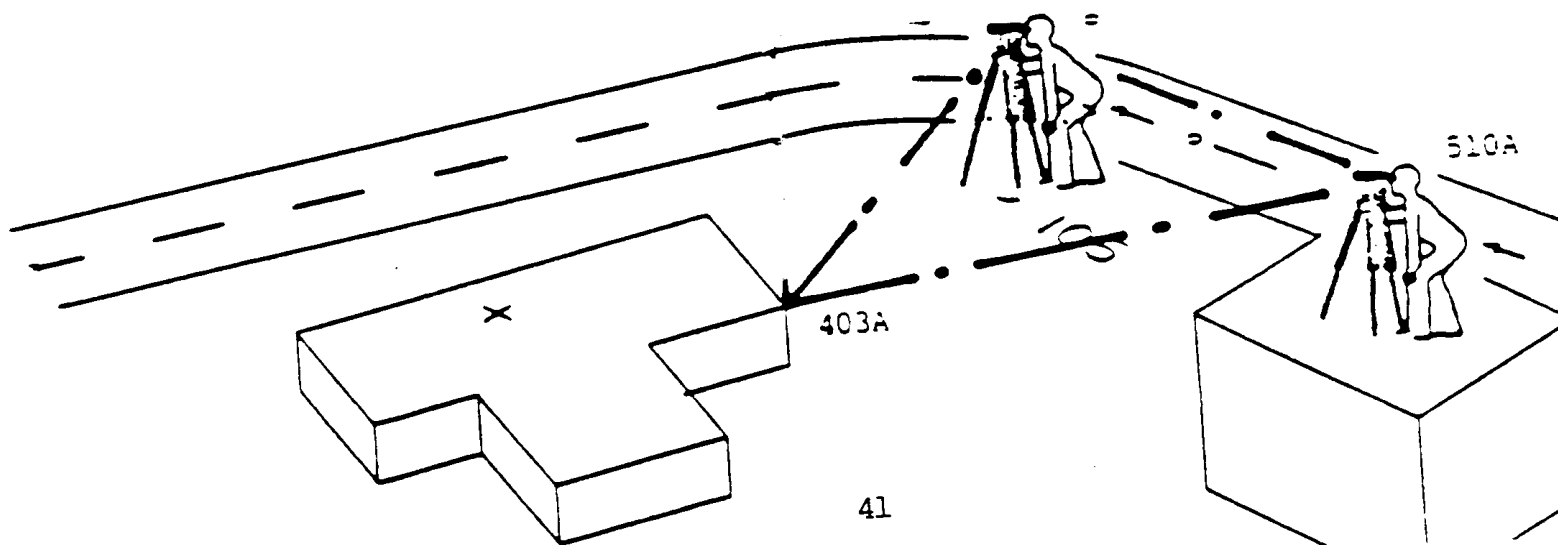
```
* * * G E O D O S * * *        FUNCTION
                               Distance intersection.
* *    DIST INTER    * *        Measurement from two known
                               objects.
```

INSTRUCTIONS

Calculation of plane coordinates.(Northing, Easting)

Clockwise calculation. Seen from the intersected point, the
first object must be on the left.

DISPLAY   COMMENTS.

OBJECT 1   Enter point number for object 1..
Pno=101=102   (102 in the example)

Pno=102   Point number and code will be displayed.
Cod=PP   Use arrow keys to view the coordinates.

OBJECT 2   Enter point number for object 2.
Pno=103=   (103 in the example)
                     etc...

Pno=105=401A   Enter point number and code for the inter-
Kod=TP=HOUSE   sected point. (401A in the example)

Hd-1=   Enter horisontal distance to object 1 and
Hd-2=   object 2.

Pno=401A   Coordinates will be calculated and stored in
Cod=HC   current JOB-file.

ERROR IN SDATA   If the sum av the distances is less than
                     the distance between the two known points
                     coordinates can not be calculated.

DISTANCES:

502A – 102   330.533

502A – 103   193.050

RESULT:

PNO	CODE	N	E
502A	HC	1370.101	2351.089
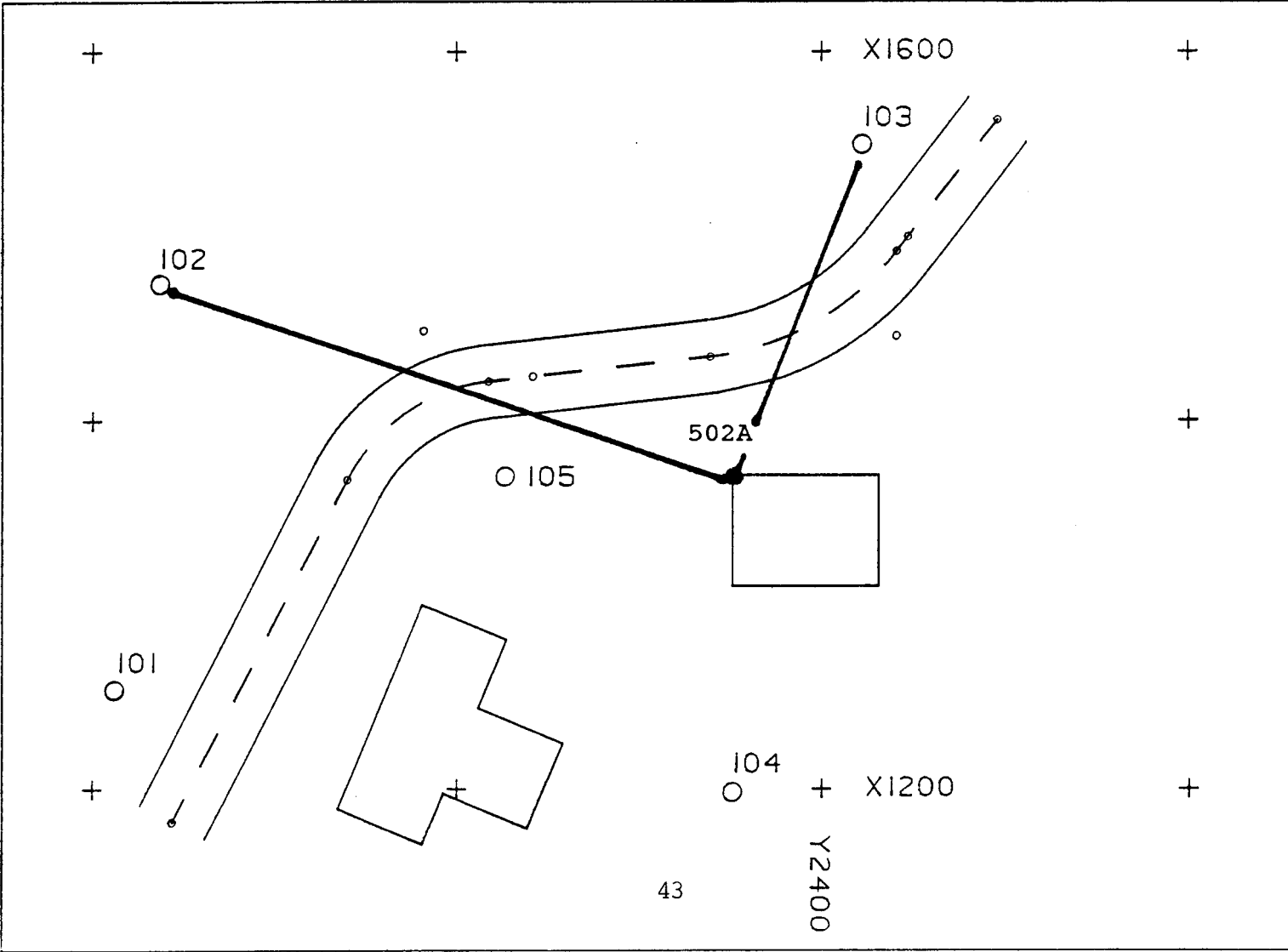
```
* * * G E O D O S * * *        FUNCTION

* *   HELM TRANS    * *         Helmert coordinate transformation
                                with scale adjustment and rotation
                                of coordinate system.
```

INSTRUCTION

Common points must be stored in DIFFERENT JOBs with
SAME POINT NUMBERS.
The known points, ("TO-system") must be stored in the
current JOB-file.
PSION asks for JOB-name where the "measured points" in
("FROM-system") are stored.
The program finds all points with common names in the two JOB-
files, and makes a transformation formula.
All "NEW POINTS" in the "FROM-system" can then automatically
be transformed and stored in current JOB-file.
Heights can be transformed to a mean value of the Z deviations

---

DISPLAY	COMMENTS.

HEIGHTS Y/N?	Press <Y> if you also want to transform Z coord
MEAS POINTS JOB=C:	Enter JOB-name in which the measured points in ("FROM-system") are stored.
WORKING...	It may take some seconds to find all common points if the JOB-files contain many points.
4 KNOWN POINTS 101 102 103 104	The common points are displayed in scrolling display. Press <EXE> if they are OK, otherwise <ON/Clear> and use program "EDIT" to adjust the point numbers so that they match.
DEVIATION P=101 D=0.004.. N=0.004 E=0.000.. Z=0.000...	Deviations for the common points are displayed. scrolling. Press <EXE> to continue. If you want to edit or delete data, use program "EDIT".
SCALE=0.99999292 Y/N ?	Scale factor relationship between systems is displayed. Press <Y> to continue.
AUT TRANS ALL POINTS Y/N? P=105 TRANS Y/N?	If you answer <Y>, all points in "FROM-file" will be transformed and stored in current JOB- file. If you answer <N> you can choose any point in "FROM-file" to transform. Use keys <F>, <L>, <R> or <X> as in "EDIT" to choose. Confirm with <Y>. Use <ON> to quit.
8 TRANSF PNT	Total number of transformed and stored points is displayed.

44

```
================================================= GEODOS = version 4.93 ===
VIKER DATA AB
S-433 49  PARTILLE  Sweden
================================================= 03 OCT 1988 11:00:41 ===

HEADER : HOUSE 4+5   ID-NO : 12.345   OPER: SOA

HELM TRANS
JOB : C:LONDON

KNOWN POINTS
101        TP                5012.720      6361.840
102        TP                5225.620      6300.370
103        TP                5443.020      6626.630
104        TP                5091.480      6696.070

DEVIATION:
P=101  D=   0.004  N=   0.004  E=  -0.000  Z=   0.000
P=102  D=   0.003  N=  -0.003  E=   0.001  Z=   0.000
P=103  D=   0.002  N=   0.001  E=  -0.001  Z=   0.000
P=104  D=   0.003  N=  -0.003  E=   0.000  Z=   0.000

  N=   3081.041 +  0.92307242 * a - -0.38461146 * b
  E=   4986.732 +  0.92307242 * b + -0.38461146 * a

TRANSF POINTS
105        TP                5201.429      6515.425      50.560
401        HC                5000.001      6500.001      40.000
402        HC                5120.000      6500.000      60.000
403        HC                5119.999      6550.000      40.000
404        HC                5080.001      6550.000
```


45
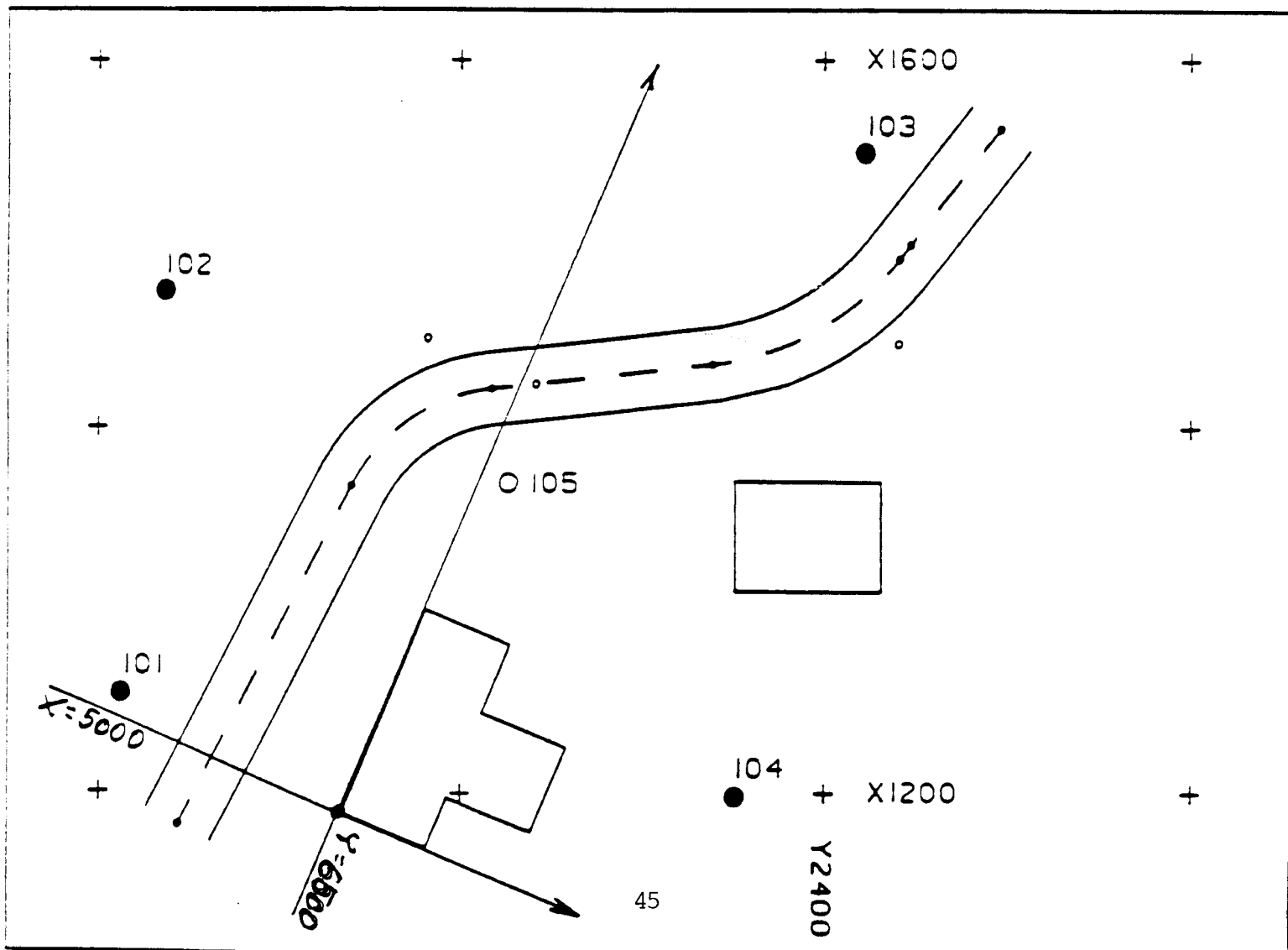
```
* * * G E O D O S * * *          FUNCTION

* *      AREA CALC     * *        Calculation of AREA
                                  distances and bearings
                                  in closed polygon.
                                  ARCs may be included.
```

INSTRUCTIONS

Area will be calculated within a polygon described by
point numbers. If a point is missing in current JOB-file,
you will be asked to key in coordinates and the calculation
will continue.
Distances and bearings will be printed out if printer is
connected.
You can enter series of point numbers short e.g 101-104.

DISPLAY   COMMENTS.

PNO-SERIES   Enter series of point numbers delimited by
101 102 103...   <SPACE>.
alternatively   If point serie is in cosecutive order, you can
101-104   enter first and last point delimited by "-".
                   Previous series remains, and you can edit
                   single point numbers and recalculate.
                   Quit by <CLEAR> <EXE>.

101 102 (500)...   Enter arc radius between two points within
                   brackets. Arc may not be entered at the first
                   two positions. Minus (-) gives negative area in
                   that segment.

P=101 102 103...   Point numbers is displayed scrolling on first
A=102896.1 m2   line. Area is displayed on second display line.
                   If printer is connected a print out of
                   distances and bearings will be given.

                   The point number string is limited to maximum
                   255 characters.

```
================================================= GEODOS = version 4.93 =
VIKER DATA AB
S-433 49   PARTILLE   Sweden
================================================= 02 OCT 1988 18:32:09 ==

HEADER : AREA NO 124-ABC    ID-NO : 12.3456    OPER: SOA

AREA CALC
JOB : C:SDTA

PNO                COD              N              E        DIST      BEARING

101                TP           1254.208      2012.292
102                TP           1474.381      2037.436    221.604       7.239
103                TP           1549.570      2422.217    392.058      87.715
104                TP           1198.366      2351.108    358.330     212.718
                                1254.208      2012.292    343.387     310.399

AREA=102896.1 m2
```
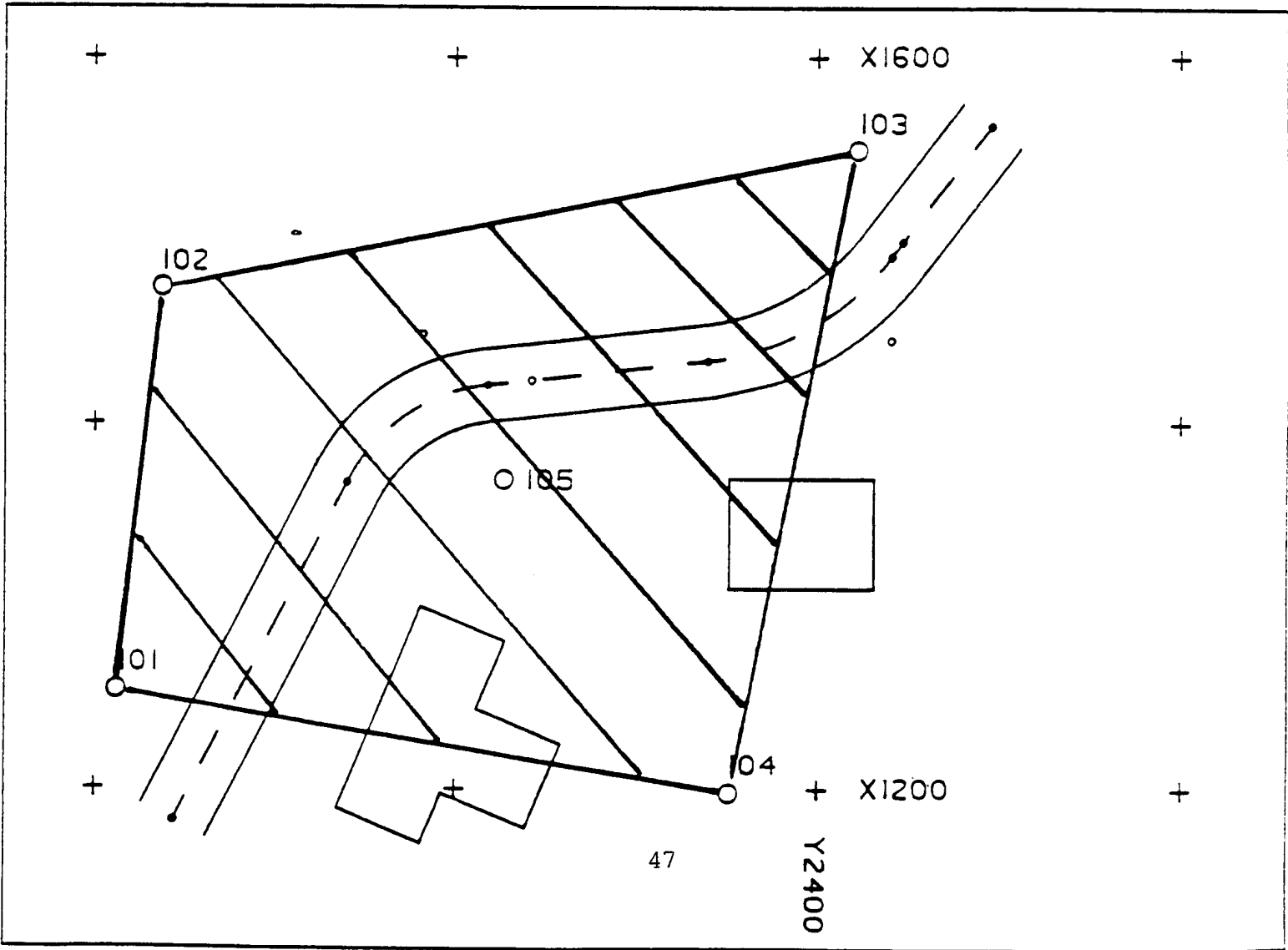
```
* * * G E O D O S * * *        FUNCTION

* *    POINT CHCK    * *        Comparsion of coordinates.
                               Deviation print out after
                               control measurement.
```

INSTRUCTION

Printing of coordinates and differences by comparsion of
two JOB-files. Points with the same number will be compared.
Differences (D,N,E and Z) will be calculated and printed out
if printer is connected.

DISPLAY   COMMENTS.

```
** POINT CHCK **  Enter JOB-name of the file to be compared
JOB=C:            with current JOB-file.

DEVIATION         Differences in three dimensions displayed
P=401 D=0.006..   scrolling.
N=0.002 E=-0.004  Press <EXE> for next point.
Z=-0.005          If printer is connected, the result will be
                  automatically printed out for all points
                  with common point numbers in both JOB-files.
```

```
=========================================== GEODOS = version 4.93 =
VIKER DATA AB
S-433 49  PARTILLE  Sweden
=========================================== 02 OCT 1988 18:40:56 ==

HEADER : HOUSE 105A    ID-NO : 12.3456    OPER: SOA

POINT CHCK
JOB : C:SAMPLE

KNOWN POINTS
```

PNO	COD	N	E	Z	D
401	CC	1189.330	2134.930	40.005	
		0.002	0.005	-0.005	0.007
402	CC	1300.100	2181.090	40.056	
		0.001	-0.002	19.944	19.944
403	CC	1280.875	2227.240	40.003	
		-0.005	0.002	-0.003	0.006
404	CC	1243.950	2211.859	39.988	
		-0.002	-0.001	-39.988	39.988
405	CC	1224.712	2258.006	40.003	
		0.005	0.005	-0.003	0.008
406	CC	1178.560	2238.775	39.999	
		0.003	0.006	0.001	0.007
407	CC	1197.791	2192.629	39.995	
		0.003	-0.002	0.005	0.006
408	CC	1170.100	2181.095	39.997	
		0.001	-0.006	0.003	0.007

```
* * * G E O D O S * * *         FUNCTION

* *    P R I N T   * *          Print out coordinate list
                                of survey site data.
```

INSTRUCTIONS

You can use any serial or paralell printer.
Connection via COMMS-link or RS232 interface.
If your printer has paralell Centronic interface, you will also
need a converter (serial-paralell)
STANDARD SET UP paramteres:

```
                Baud      9600
                Parity    NONE
                Bits         8
                Stop         1
                Hand       XON
```

If you want to keep other set up parameters for your printer, use
SETUP from COMMS-menu to set parameters and then select "SPECIAL"
in print menu to retain the new parameters. "SPECIAL" sends the
characters one by one and is therefore slower, mainly to support
printers without buffers.

DISPLAY   COMMENTS.

STANDARD SPECIAL MENU. Select setup parameters.
PARALELL

HEADER   Enter header line.
ID-NO   Enter identification number
OPER   Enter operator name

ALL PNO CODE   MENU to select print out content.
                   ALL= All points in the JOB-file will be printed
                   PNO= Select point number series to be printed.
                        e.g. 401-410.
                        DO not enter areas containing to many
                        points. Searching and sorting will take
                        some time.
                   CODE= Select a certain code to be printed.

                   The printer starts directly. Form feed with new
                   header after 60 lines (default). This can be
                   changed in the USER definable parameter file.

NO CONNECTION   The printer is not connected or off line.

NOTE. Be careful when you connect unknown printers.
If the current from the printer is too high, in some cases
you can damage data stored in the RAM-pack,
First make a test with unimportant data in your RAM-pack.

HEADER : HOUSES/ROADS   ID-NO : 12.3456   OPER: SOA

POINT LIST
JOB : C:SDTA

PNO	COD	N	E	Z	D
101	TP	1254.208	2012.292	48.342	
102	TP	1474.381	2037.436	48.455	
103	TP	1549.570	2422.217	58.369	
104	TP	1198.366	2351.108	49.988	
105	TP	1369.334	2226.645	50.560	
401	HC	1189.332	2134.935	40.000	
402	HC	1300.101	2181.088	60.000	
403	HC	1280.870	2227.242	40.000	
404	HC	1243.948	2211.858		
405	HC	1224.717	2258.011	40.000	
406	HC	1178.563	2238.781	40.000	
407	HC	1197.794	2192.627	40.000	
408	HC	1170.101	2181.089	40.000	
501	HC	1310.101	2351.088	37.000	
502	HC	1370.101	2351.088	37.000	
503	HC	1370.101	2431.088	37.000	
504	HC	1310.101	2431.088	37.000	
201	GP	1205.225	1999.645		
202	GP	1471.609	2137.629		
205	GP	1383.892	2246.399		
206	GP	1406.754	2451.076		
207	GP	1526.037	2543.459		
300	INT	1415.006	2164.619		
302	TP	1367.551	2140.038		
303	TP	1420.393	2217.732		
303A	CP	1321.557	2228.833		
301	TP	1182.228	2044.042		
304	TP	1434.489	2339.045		
105C	PP(adj)	1369.328	2226.649	50.572	0.009

```
* * * G E O D O S * * *        FUNCTION

* *    SEND DATA     * *        Transmit JOB-files to other
                                computers or devices.
```

INSTRUCTIONS.

Data can be transmitted in different ways:
  1. To MSDOS computer via program "CL" on the COMMS diskett.
  2. To optional device by direct output on the serial port
  3. To WILD REC module or GRE3/4 field data collector
  4. To GEODAT or GEODIMETER internal memory
  5. To SOKKIA CARD (option)
In case 1 and 2 data can be transfered in two different formats:
  ODB - "Organiser Data Base". It is the PSION internal compact
        format. Delimeter between the fields is Ascii(9) (HT)
  XYZ - The same logical content and order as "ODB" but data
        in fixed positions with SPACE in between.
For translation to other formats, "GEODOS-PC" is recommended.
It also includes sophisticated DXF file conversion.

Check that the communication parameters are properly set.
As default PSION is set as follows.
```
                  BAUD        9600
                  PARITY      NONE
                  BITS           8
                  STOP           1
                  HAND         XON
                  PROTOCOL    NONE
```
Changes can be made with program "COMMS" "SETUP" or via program
"CLSET" that exists on the GEODOS pack. "CLSET" resets the
parameters to the above values and switch to PROTOCOL PSION.

DISPLAY   COMMENTS.

GDOSODB GDOSXYZ Select format/communication from the menu.
WILD-REC GDM400
SOCARD

CL-MSDOS SPECIAL Select communication protocol. If you select
ACKNAK   "CL-MSDOS", execute "CL" on the host computer.

PC-FILE: By "CL-MSDOS", give the file name on PSION.
XMP.ODB   Default is the JOB name with extention .ODB
Sending...

                 The entire JOB-file will be transmitted to the
                 receiving system in desired format as an
                 ASCII file.

```
TOTALSTN GIF10        At WILD communication you can select direct
GRE3/4                communication via TOTAL STATION, via "GIF10"
                      or GRE3/4 via "GIF2".

SET MODE 76 RUN       When using WILD REC via totalstation, check
(Rep,Modul) RUN       SETUP at the WILD totalstation.
OK? Press<EXE>

AREA JOB              MENU to select FILE TYPE on GEODAT.
AREA= (JOB=)          Enter AREA or JOB name.
                      The keyboard is switched to numeric input
```

SETUP for GEODAT-400 (P51 Set protocol 0)

1.Baud=1200	2.Parity=2	3.Char len=7	4.Stop bits=2
5.Time out=10	6.Hardw.Hs=0	7.Softw.Hs=1	8.XON=17
9.XOFF=19	10.NAK=0	11.ACK=0	12.ENQ=0
13.STX=0	14.ETX=2.131	15.Nul=0	16.EOT=3.26131

Example on GEODOS.XYZ-format:

```
** GEODOS ** SUN 13 SEP 1987 17:40:44
101          PP          1254.208    2012.292    48.342
102          PP          1474.381    2037.436    48.455
103          PP          1549.570    2422.217    58.369
104          PP          1198.366    2351.108    49.988
```

```
                      PSION transmits two END OF FILE characters at
                      the end of transmission (ASCII 26 = ctrl Z)
```

```
* * * G E O D O S * * *        FUNCTION

* *   RECEIVING     * *         Receiving JOB-files
                                from other computers,
                                GEODAT 400, WILD-REC
                                or SOKKISHA CARD


-----------------------------------------------------------------
INSTRUCTIONS
-----------------------------------------------------------------
Reception of data works best using "ODB format".
Free format with any number of SPACES between the data fields
is also accaptable but take longer time. The order of the data
is important: PNO COD NORTH EAST (HEIGHT QUALITY REMARK). Data
within brackets are optional.
You can use the software "GEODOS-PC" to translate data from
other formats (e.g DXF).
WILD-REC, GEODAT and SOCARD is are special formats.


-----------------------------------------------------------------
DISPLAY            COMMENTS.
-----------------------------------------------------------------
CL-MSDOS SPECIAL Select communication protocol
WILD-REC GDT400
I-MEM SOCARD       (SOCARD is an option)

PC-FILE:           When using "CL-MSDOS", enter the file name
XMP.ODB            to receive. Default is the JOB name+".ODB"
                   The file format must be "ODB format". Use the
                   software "GEODOS-PC" to convert from other
                   formats.

START              This message appears if you selected "SPECIAL".
                   PSION than waits for data. The file format
                   must be "XYZ format".
                   At WILD-REC or SOCARD the transmission starts
                   directly after MENU selection.

AREA JOB           At GEODAT-400, select AREA or JOB in the menu.
AREA= (JOB=)       Enter AREA or JOB name. The keyboard is
                   switched to numeric input.
4=PP 5=123...      Only coordinates is accepteed. Other data
37=1234.567        is ignored by GEODOS.
38=2345.678
```

DATA FORMAT in PSION / GEODOS 5 och 6

The GEODOS database consists of a matrix with 7 columns of "Point
data". The first two columns are alphanumerical. Next four are
numerical. The last is an alphanumerical "remark field".
A "Point" may contain maximum 255 characters including delimiters
In the two first alphanumerical fields the two first positions is
a prefix that describes the data typ. The prefixes are hidden to
the GEODOS user at printing, diplaying etc.
There is space for maximum 12 characters in each column, prefixes
excluded.
The numerical data and the remark field has no prefix.
The "ODB-format" is a free format with delimeter ASCII 9, (HT)
Horisontal TAB.
End Of Line is <CR><LF> at transmission. (Standard)
End Of File is ASCII 26 "   "   "

The following is valid for de most common data types.

POINTS.

Exaple:
Coordinates:
   Pno   Cod   N   E   Z   Q   Rem
P=123ABC ^ C=123ABC ^ 12345.678 ^ 12345.678 ^ 12345.678 ^ 0 ^ REM

Survey data:
   Pno   Cod   Ha(Ih)   Va   Sd   Th   Rem
P=123ABC ^ C=Stn   1.50
P=123ABC ^ C=Bobj
P=123ABC ^ C=123ABC ^ 123.4567 ^ 123.4567 ^ 123.456 ^ 1.234   REM

Line element data

Example:
Element no Type   N   E   Chn
E=1   ^   C=STR ^ 12345.678 ^ 12345.678 ^ 123.456 ^ 0
                                                          Radius
E=2   ^   C=CIR ^ 12345.678 ^ 12345.678 ^ 12334.678 ^ -12345.678
                                                          A-param
E=3   ^   C=TRN ^ 12345.678 ^ 12345.678 ^ 12345.678 ^ -1000

```
* * * G E O D O S * * *        FUNCTION

* *   DIRECTORY     * *        Listing of JOB directory



---------------------------------------------------------------
INSTRUCTION
---------------------------------------------------------------
PSION displays all JOBs that exists in the external memory (C:)

It also displays the total number of points in each JOB-file
and also the type of data.

If printer is connected, a print out will be provided.

---------------------------------------------------------------
DISPLAY          COMMENTS.
---------------------------------------------------------------


C:XMP(48)        Job name, total number of points and
COORD+LINES      type of data is displayed. Press <EXE> to
                 see information about next job.
                 If question mark (?) appears the file contains
                 information that not belongs to GEODOS.


If printer is connected a list will be printed out as follows:


======================================== GEODOS = version 5.96 =
VIKER DATA AB
433 43 PARTILLE
======================================== 12 DEC 1991 20:27:40 ==

JOB NAME :    JOB-No :     OPER:

 JOBLIST
JOB :

        NAME          TYPE              POINTS

        C:XMP         COORD               46
        C:ABC         COORD               24
        C:BERGF       COORD              560
        C:PBANK       COORD               45
        C:OA          KOORD+LINE          36
        C:AA          TYPSECT             11
        C:KALLE       ?                    6
        C:MMM         SURV-DATA          956
        C:OAP         SECTION+LINE       145
```

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```
* * * G E O D O S * * *        FUNCTION

* *    ERASE JOB      * *       Deleting JOB-files or
                                part of JOB-files.

------------------------------------------------------------------
INSTRUCTION
------------------------------------------------------------------

You can delete the entire JOB, part of a JOB by PNO series or
all points with certain CODE.

By keying in the Psion command "RAMFORM" to the question JOB
you can CLEAR ALL DATA stored in the RAM pack.

------------------------------------------------------------------
DISPLAY             COMMENTS
------------------------------------------------------------------
ALL PNO CODE        Menu to select what to erase
                    ALL  = all data in the JOB
                    PNO  = a serie of points by point number
                    CODE = points with certain code
At "ALL":
ERASE               Enter JOB name to be deleted.
JOB=C:              If you enter "X" you will be given a JOB-menu
                    where you can select JOBs to be deleted with
                    the arrow keys.
                    Key in RAMFORM if you want to CLEAR ALL DATA.
JOB=C:ABC           Press <N> to regret or <Y> to continue.
SURE Y/N ?
                    Press <EXE> to return to GEODOS menu.

ERASE
JOB=C:RAMFORM       Key in RAMFORM to format the RAM pack.

RAM FORMAT          Answer <Y> to continue.
Y/N ?               ALL DATA WILL BE ERASED

SURE                You are given one more chance to change
Y/N ?               your mind.

At "PNO":
PNO-SERIES          Enter PNO series to erase.
ex.10-99=
ERASE 10-99
 OK Y/N?            Confirm with <Y>.

At "CODE":
Code=HH=            Enter CODE to delete.
ERASE HH
 OK J/N?            Confirm with <Y>.
```

```
* * * G E O D O S * * *        FUNCTION

* *   TRIG DIST    * *        Calculation of horisontal and
                              vertical distance from angle
                              and distance measurement to
                              two objects.
                              (Cosine theorem)

-----------------------------------------------------------------
INSTRUCTION
-----------------------------------------------------------------
You can enter survey data manually or automatically
from total station.
Height difference will be corrected for refraction and
earth curvature.


-----------------------------------------------------------------
DISPLAY            COMMENTS
-----------------------------------------------------------------
MANUAL             Select from menu type of total station.
GEODIM-400
GEODIM-Serial...
Sokkisha Kern
Topcon Pentax
Zeiss  Nikon

SLOPE DIST         Press <Y> for slope distance measurement.
Y/N ?              or <N> for horisontal.

HEIGHT MEAS        Press <Y> for height measurement.
Y/N ?              Otherwise <N>.

Ih=                Press <EXE>
Th=                Enter target height

OBJECT 1           Enter angles and distances or follow
Ha=                the instructions for the total station.
Va=
Sd=
Th=0.000=
OBJECT 2
Ha=
Va=
Sd=
Th=0.000=

Hd=                Result : Horisontal distance
DZ=                         Vertical distance.
```
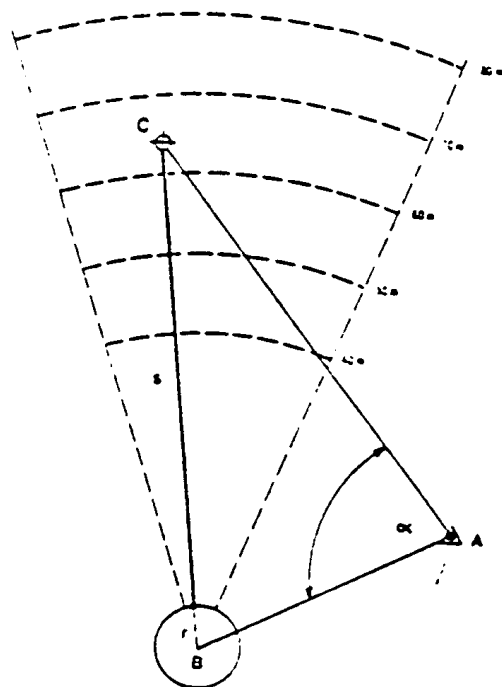
Mätning av kastgren

$$S-BC-r=$$
$$\sqrt{(AB^2+AC^2-2\ AB\quad AG\quad \cos\alpha)}-r$$

```
* * * G E O D O S * * *        FUNCTION

* *    ROAD DESGN    * *       Calculation of line intersection
                               With arcs, calculation of tangent-
                               points and centerpoint.
------------------------------------------------------------------
INSTRUCTIONS
------------------------------------------------------------------
You define the center line with offset dimensions to known lines.
Whith arcs you give the radius to calculate tangent points and
centerpoint.


------------------------------------------------------------------
DISPLAY              COMMENTS
------------------------------------------------------------------
LINE 1 PNT 1 :       Enter point 1 on the first line.
Pno=101=201          (Pno 201 in the example.)

LINE 1 PNT 2 :       Enter point 2 on the first line
Pno=202=             (Pno 202 in the example.)

OF=0.000=            Enter offset distance  <->=left of known line
                     PSION suggest previous distance.
LINE 2 etc....       (+50.00 in the example.)

INTERSECTION         Press <Y> to calculate intersection point.
Y/N ?

Pno=203=3021         Key in point number and code for intersection
Cod=INT=             point. Default code is "INT".

TANGENT              Press <Y> to calculate tangent points.
Y/N ?

RADIUS=              Enter arc radius. <->= left <+>= right curve.
                     (+100 in the example)
TP 1                 Enter number and code for first tangent point.
Pno=302              (Pno 302 in the example Default code=TP.
Cod=TP=

Pno=302              Use the arrow keys to view the coordinates.
Cod=TP

TP 2                 Enter number and code for second tangent point.
Pno=303=             As above.

CENTERPOINT          Press <Y> to calculate centre point.
Y/N ?

Pno=3021             Enter number and code for centre point.
Cod=CP=              Default code="CP".

                     All calculated points will be stored in your
                     JOB file.
```

```
ROAD DESGN
JOB : C:XMP

PNO             COD                N                E              Z
LINE 1
201             PRC              1205.225         1999.645
202             PRC              1471.609         2137.629
LINE 2              OF=50.000
205             PRC              1383.892         2246.399
206             PRC              1406.754         2451.076
                    OF=-40.000
3021            INT              1415.006         2164.619
                  RADIUS=100.000
302             TP               1367.551         2140.038
303             TP               1420.939         2217.732
3022            CP               1321.557         2228.833


LINE 1
205             PRC              1383.892         2246.399
206             PRC              1406.754         2451.076
LINE 2              OF=-40.000
206             PRC              1406.754         2451.076
207             PRC              1526.037         2543.459
                    OF=-60.000
3041            INT              1441.535         2402.123
                  RADIUS=-150.000
304             TP               1434.489         2339.046
305             TP               1491.715         2440.986
3042            CP               1583.562         2322.394
```
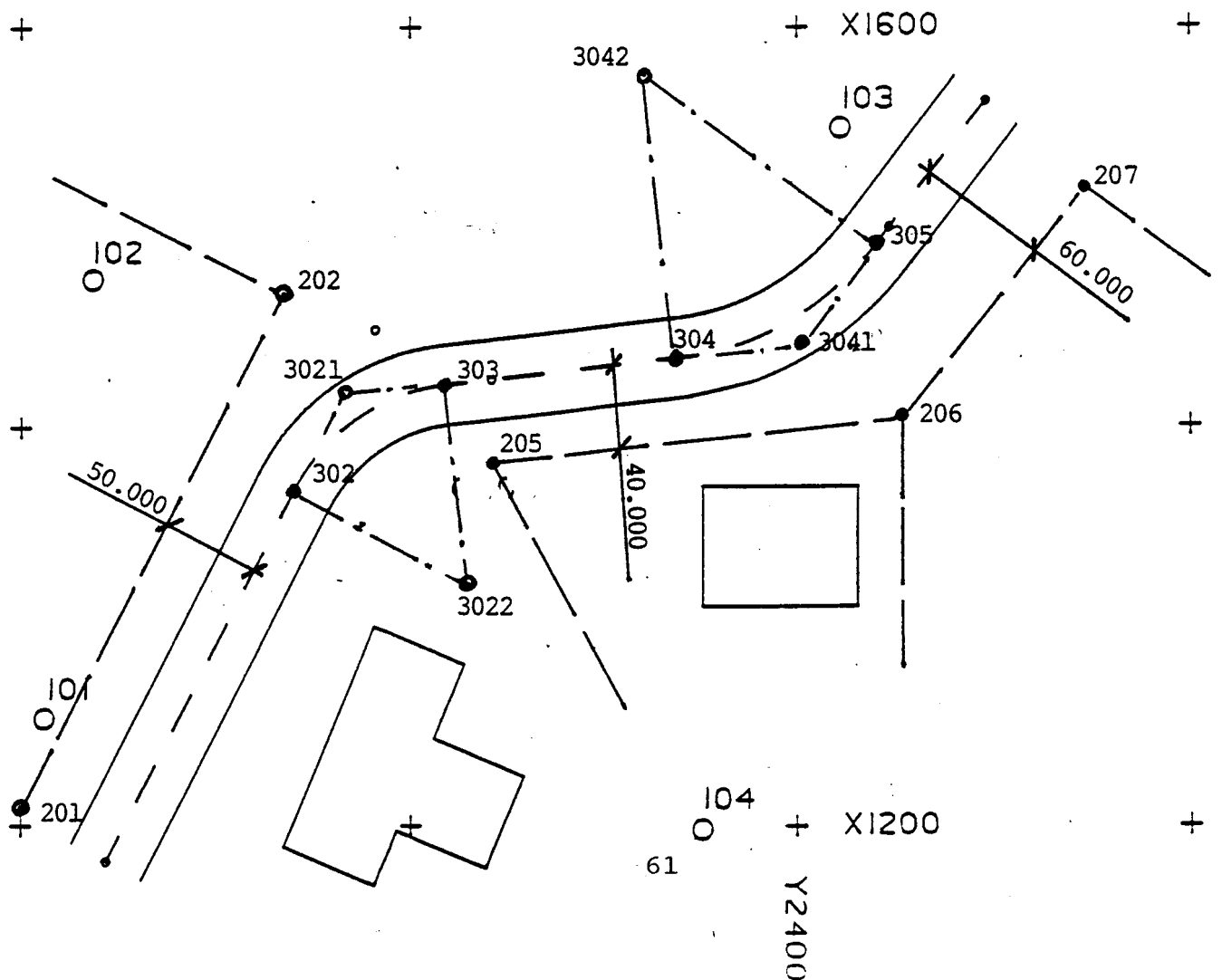
```
* * * G E O D O S * * *          FUNCTION

* *   ROAD REGIS    * *          Road line registration
                                 designed PLANE, PROFILE
                                 and SECTION data.
------------------------------------------------------------------
INSTRUCTIONS
------------------------------------------------------------------
PLANE and PROFILE are stored together with other data in current
JOB-file. SECTIONS are stored in separate JOBs for each section.
"GENERAL" is general and can be used for all types of terraces
and tunnel sections. You can define a section in two planes:
Plan-T (top) and plan-G (ground). Automatic interpolation occur
along the headline to get slope and slant transitions.
"SLOPE" and "TUNNEL" are simplified section types.

The data base has the following appearance:
    PLANE: (Plane data, compulsory)
        Elm=   ; Element sequence number beginning with 1.
        Typ=   ; STRaight ARC or TRaNsiton curve.
        N=     ; Northing for start point of element.
        E=     ; Easting    "    "    "    "       "
        S=     ; Section (chainage)    "    "       "
        R=(A=) ; Radius or transition parameter.
   PROFILE: (Longitudinal profile, optional)
        Sec=   ; Section,(chainage) simular to PLANE-element
        Typ=   ; Section name=JOB-file for designed section.
        Ht=    ; Design height in current section.
        Sl=    ; Slope, decimal value e.g. -.01= -10 promille.
        Rv=    ; Radius for vertical curve in metres.
        Wt     ; Width to be used if no section is designed.

    SECTION:   (Cross section, optional)
    GENERAL       (General cross section)
        Pno=   ; Consecutive point numbers from the left.
        Cod=   ; "PLAN-T" or "PLAN-G"
        OF=    ; Offset from headline
        Ht     ; Height from headline
        R=     ; Radius to next point (0=straight line)
    SLOPE         (Simplified road section)
        Sct=   ; Section file name
        Typ=   ;"SLOPE"
        Cmb=   ; Camber value at straight line in PERCENT(%).
        Slp=   ; Cross slope at arc in PERCENT(%).
        Bnk=   ; Slope of embankment in PERCENT(%).
    TUNNEL:       (Simplified tunnel section)
        Sct=   ; Section file name
        Typ=   ; "TUNNEL"
        Wt=    ; Tunnel width.
        Ht=    ; Height to valt (skew back).
        R=     ; Valt radius.
        D=     ; Valt center point (automatic calcultated)
```

```
-------------------------------------------------------------------
DISPLAY             COMMENTS.
-------------------------------------------------------------------
PLANE PROF SECT     Select Plane,Profile or Section.
CHECK PRINT         "Check" = Check of existing road alignment.
                    "Print" = List of alignment on printer

PLANE
------
ELEM NO=1           PSION takes care of the numbering of elements.
Pno=101=301         Enter point number for tangent point.
Cod=Hp              (301 in the example)
Ch=0.00=            Enter chainage for element start point.


STRAIGHT ARC        Select element type by using the arrow keys.
TRANSITION          (STR in the example).

ELEM NO=2           Enter point number for next tangent point
Pno=202=302         (302 in the example)
Ch=208.71=          PSION automatically calculates distance from
                    previous point and suggests chainage, except
                    at transition curve. Press <EXE>.

STRAIGHT ARC        Select element type (ARC in the example)
TRANSITION
RADIUS=             Enter radius (100 in the example) minus=left
                    curve.
ELEM NO=3           Next element etc.......
Pno=303=
```

You cannot have more than one alignment in the same job. It may
consist of a great number of elements. For fast searching
it is recommended not to exceed 20 elements in one JOB.
Conclude the last element as a "blind element", i.e. a straight
line element with same start and end point.

```
PROFILE
-------
Ch=                 Key in chanage of section t.p. Chainage must
                    be in the same system as PLANE design.
                    <SPACE><EXE>=terminate.

Typ=                Key in NAME of section TYPE (standard). If
                    such a section has been stored, (see below).
                    It is not necessary to work with standard type
                    sections. In such cases points are interpolated
                    along the section line.

Ht=                 Height in vertical tangent point.
Sl=                 Slant or slope at vertical tangent point in
                    forward direction. Key in as a decimal .e.g.
                    -2.5 = 2.5 percent slope = fall of 2.5 m over
                    next 100 meter.
Rv=                 Radius of vertical curve +=convex, -=concave.
Wt=                 You must enter WIDTH if you work with SLOPE sect
                    or EMBANKMENT. Width is the total road width to
                    top of road embankment.
```

TYPSECT

```
--------
```

TYPSECT JOB=C:	Key in JOB file name for storing a standard type section.
new JOB Y/N?	You can create a new section or edit an existing one. You can have only ONE section per file.
GENERAL SLOPE TUNNEL	Select type of cross section. General (offset+ height), simplified cross slope or tunnel.

GENERAL (Of/Ht)

```
----------------
```

Pno=1 Plan-T	
Of=	Key in offset for first point on top plane.
Ht=	Key in height difference from center line.
R=0=	Key in radius to next point. 0=straight line.
....etc.	Press <SPACE><EXE> after last point.
Pno=6 Plan-G	Key in offset for first point on ground plane
Of=	etc. Press <SPACE><EXE> after last point, or directly if you do not give a ground plane.

Note that the points in the standard type sections must be given
FROM THE LEFT to the right in each plane.
The following example shows the state when the standard type
section forms a complex tunnel section. The example also shows
the values you get from program POLMS with road line as REFLINE.

OF = Offset distance from center line.
TdZ = Height differense to the top plane.
GdZ = Height difference to the ground plane.
dR = Radius difference to the valt.

64
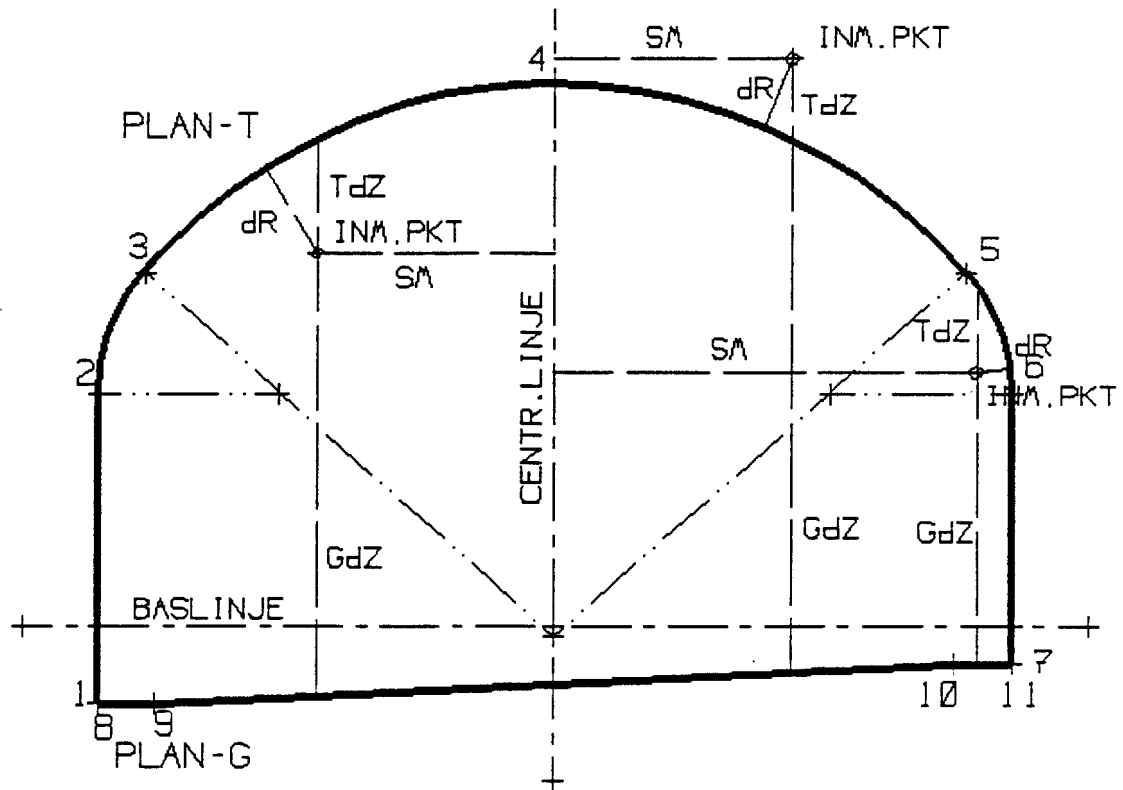
SLOPE.

CAMBER Str%	Key in camber value for straight lines in
Cmb=	percent. Ex: 2.5
SLOPE Arc%	Key in cross slope value for arcs in percent.
Slp=	Ex: 3.0
CARR. WIDTHm	Key in width of carriage way.
Wt=	
TRANS.DIST	Key in distance for slope transition.
Hd=	Thumb rule: 5-10 times the road width.
	Ex: 60

SLOPE
at Arc

Transition
DISTANCE

WIDTH of
carriage

CAMBER
at straight
line
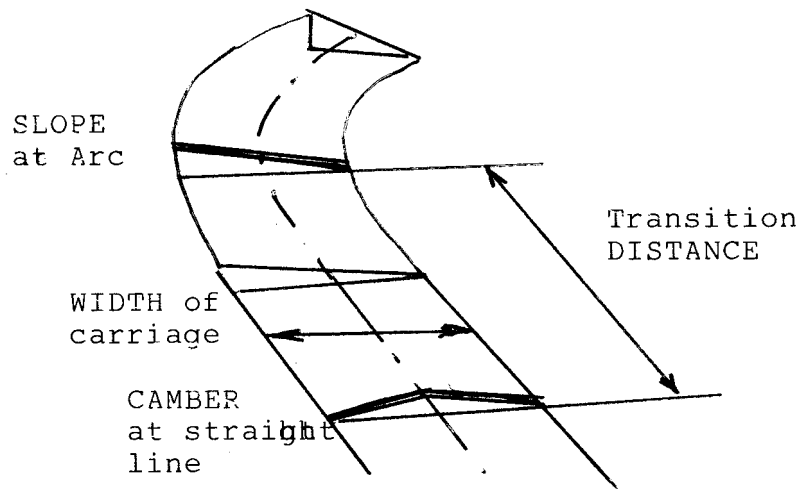
TUNNEL.

TUNNEL WIDTH m	Key in tunnel width
Wt=	Ex: 8.00
VALT HEIGHT m	Key in height from the baseline to the valt
Ht=	(skew back). Ex: 2.50
VALT RADIUS m	Key in the valt radius.
R=	Ex: 6.00
	The valt centerpoint will be calculated and
	stored together with the other data.

CENTER
LINE

RADIUS

HEIGHT

WIDTH
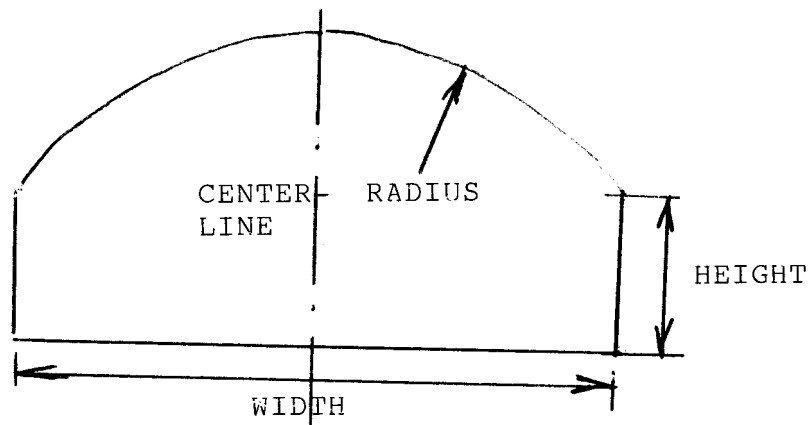
```
* * * G E O D O S * * *        FUNCTION

* *    ROAD SETOUT   * *        Calculation of 3 dimensional
                                radial setting out data
-----------------------------------------------------------------
INSTRUCTION
-----------------------------------------------------------------
Line data and station points can be stored in the same JOB file.
To store line data see program RLREG.(page 62)
You specify chainage and distance offset along the ROADLINE
ROADLINE consist of a series af straight lines, arcs and
transition curves, see program "RLREG"
Chainage interval can be set to automatic updating.
Height setting out with vertical angle and slope distance.
In the case of stored profiles and sections, heights will be
automatically interpolated. Optional setting out of slope top.
-----------------------------------------------------------------
DISPLAY             COMMENTS.
-----------------------------------------------------------------
SLOPE SETOUT        Press <Y> if you want TOP OF SLOPE setting out.
Y/N?
STATION             Enter station point number.
Pno=101=105

HEIGHT MEAS         Press <Y> if you want HEIGHT setting out.
Y/N ?
Ih=                 Enter instrument height.
Th=                 Enter target height.
BACK OBJ            Enter reference object.
Pno=102=            Bearing and distance to reference object.
                    is displayed.
BACK READ           Enter angle reading to reference object.
Ha=332.2651=        Default is bearing.
INTERVAL=           Enter chainage interval for automatic updating.
                    Especially advantage when printer is connected.

Ch=0.000=200        Enter chainage of point to set out.
                    You can enter a series e.g. 200-250.
OF=0=-10            Enter offset distance (minus=left)
Z=0.000=50.00       Enter height. Only if you selected height meas
                    If you entered PROFIL and SECTION in "RLREG"
                    PSION automatically interpolates heights.
Ch=200>300          You may key in a series of chainage for
                    automatic printout or storing of calculated
                    coordinates.

PROFIL,TYPSECT      PSION finds profile and section data. The name
TYP=A               of the design section is displayed for a short
                    time.
 Z=46.500           If you choose SLOPE SETOUT, key in slope value
Sl=10:1             e.g (1:3). Default is 10:1. Press <EXE>.
MEASURE             By slope setout you have to measure a point to
Ha=54.85            get a height value in the terrain. The program
Va=100.232          interpolates all data according to the point
Sd=210.34           you measured and shows the differences related
Th=1.500=           to the the chainage and offset you entered
Ch=250 Of=-10
```

```
A=-0.53 B=0.11      A=longitudinal diff, B=offset diff.
dZ=-0.41 Sd=0.41    dZ=height diff to intersection with embankment
                    Sd=slope distance to embankment (bore depth).

                    If you did not select slope setout, you will
                    get ordinary polar setting out data.
PLAN Sec=200        PSION displays element type for current point.
Elm=1, STR          Calculating...
WORKING...
Ha=296.8588         Radial setting out data is displayed or printed.
Hd=99.614           Use arrow keys to view height setting out
Vd=-0.824           data and coordinates.
Va=100.5264
Sd=99.618
N=1364.417
E=2127.152
Z=50.000

Ch=220.00           Key in next chainage to set out etc...
```
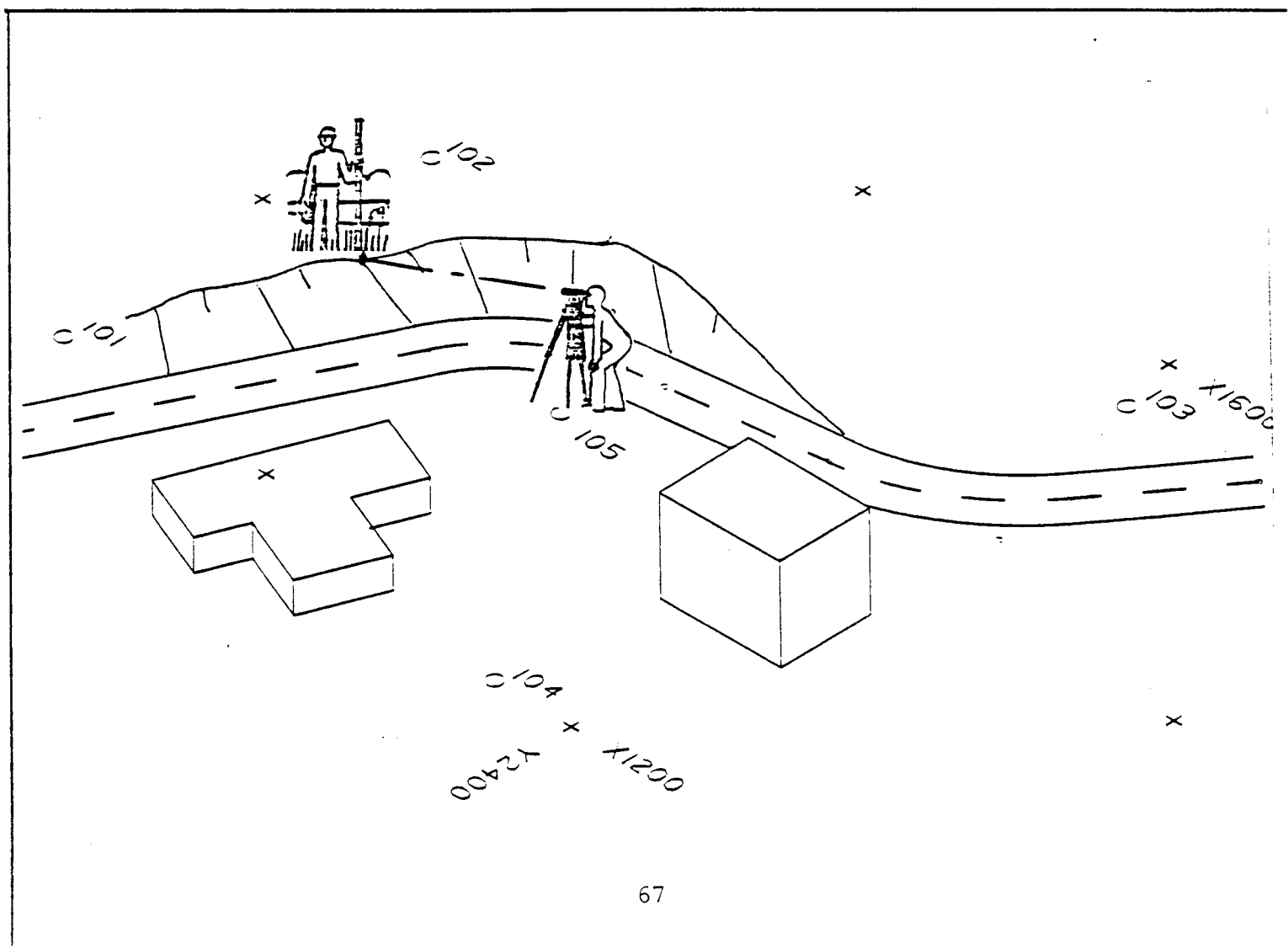
```
* * * G E O D O S * * *        FUNCTION

* *    DIGITIZE    * *          Registration of points
                               by digitizing from maps
                               and drawings.
                               Optional height registration
```

INSTRUCTIONS

Implemented digitizers: XPLAN 360i, PLANIX 5000, DIGICOORD.
Connect PSION to digitizer via COMMS-link RS232.

Valid communication set up parameters:.

```
XPLAN: 1200 BAUD      PLANIX: 1200 BAUD    DIGICOORD: 9600 BAUD
       8 BITS                 7 BITS                  8 BITS
       NO PARITY              NO PARITY               NO PARITY
       2 STOP BITS            2 STOP BITS             1 STOP BIT
```

Device setting up:
XPLAN: Use default values.

```
PLANIX:        1  2  3  4               (Switch no)
               U  U  U  D               (U=up, D=down)
               Note that you have to switch pin 2/3 and 4/5 in
               the connector.

DIGICOORD:     1  2  3  4  5  6  7       (Switch no)
               U  D  D  D  D  D  D       (U=up, D=down)
```

Use set up functions on resp. digitizer for scale, origin etc.
Read the manual for applicable digitizer.
Some tips:

    XPLAN:
    1.   Hold down CLEAR-key when you start XPLAN in order to
         reset all parameters.
    2   Put XPLAN in "COMPUTER" "NO PRINT" mode.
    3.   Calibrate or select drawing scale.
    4.   Switch to "PRINT"-mode.

    PLANIX:
    1.   Connect COMMS-link and PLANIX RS232 interface.
    2.   Check the DIP-switches in PLANIX interface (all ON)
    3.   Press ON at PLANIX.
    4.   Press ON at the INTERFACE.
    5.   Press ON at PSION.

Now you are ready to digitize and store in GEODOS.

You can increase the accuracy if you digitize several known
points and afterwards make a coordinate transformation with
program "HTRAN" in GEODOS. (page 44)

DISPLAY	COMMENTS.
XPLAN PLANIX DIGICOORD	MENU. Use arrow keys to select digitizer.
	You can select input of heights (Z).
HEIGHTS Y/N ?	
	Enter point number.
Pno=1=	Enter code.
Cod==	Enter Z value for the point to be digitized.
Z=0.000=	Only if you select height measurement.
	Press the button for pointwise digitizing.
	Point number will increment with 1 and the
Pno=2 Cod=HC	code and Z will remain as previos for next
DIG	point to digitize.
	Press <ON> to change Pno and/or Code and Z.
	The coordinates will be stores in current JOB
N=123.456	
E=234.567	
Z=12.345	
	Error in data transmission. Try again.
ERROR I SDATA	

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```
* * * G E O D O S * * *        FUNCTION

* *    PLOTTING      * *        Automatic plotting of a JOB.
------------------------------------------------------------
INSTRUCTION
------------------------------------------------------------
Grafic language: HPGL.
Selectable scale, format (height/width) and plotting window.
Different lines, symbols and text can be related to different
codes by means of the CODE TABLE. It is also possible to
automatic get lines between points with sequence numbers.
Automatic plotting of grid with text and header. PSION suggests
origin and size when you select the scale.
It is important to make a proper setup for your plotter. If you
use a plotter without buffer, it is particular important to use
a good handshake facility. Use "HAND ALL" if possible.
Also be aware of the SCALE FACTOR on your plotter. To check,
plot a grid with SCX=1 SCY=1 (default) and measure with a good
graduated rule. Then calculate scalefactors to insert in your
USER file. See page 84.
Example of a good setup for HP7475:
                                S2 S1 Y   US A3 B4 B3 B2 B1
              Baud     2400     --------------------------
              Parity   EVEN     x              x  x
              Bits     7           x  x  x           x  x  x
              Stop     1        --------------------------
              Hand     ALL
------------------------------------------------------------
DISPLAY              COMMENTS.
------------------------------------------------------------
A3/A4-PLOTTER       MENU to select plotter size. At A0/A1-PLOTTER
A0/A1-PLOTTER       PSION reads the inserted sheet size.
SCALE=1:            Enter PLOT scale
WORKING...          PSION calculates the extents in the JOB file.
CODE TABLE          Press <EXE> to plot WITHOUT code table, else
JOB=C:              enter the name of the code table.
                    Without code table you answer <Y> or <N> on
HEIGHTS             the following questions:
Y/N ?               Heights will plotted with the decimalpoint
                    at the measured point.
ZZ DR TDZ GDZ       If you have used 3D REFLINE and stored coord-
                    inates (sto%=1), you can select height diff.
POINT-NAME          Point name will be plotted in the lower
Y/N ?               left position.
COD                 Code will be plotted in the lower right
Y/N ?               position
LINES               Lines will be plotted between points with
Y/N ?               numbers in sequence order independent of
                    measurement order. Points will be automatic
                    sorted when plotting.
PLOT  1:1000...     This is a MENU with default values calculated
N=1000 E=2000       based on your scale, selected plotter, paper
Ht=240(230)mm       size and the values in your JOB file. The values
Wt=340(320)mm       within brackets is the size you need to get all
ROTATE=0 PLTMAN=    data on the same sheet. You may change any data
PLH%=2              in any order. When using ROTATE, check that your
                    plotter also is in ROTATE MODE.
```

EXEMPEL:

GEODOS | VIKER DATA AB
JOB=C: XMP | BOX 181 433 23 PARTILLE
19 JUN 1991 | SKALA 1: 2000

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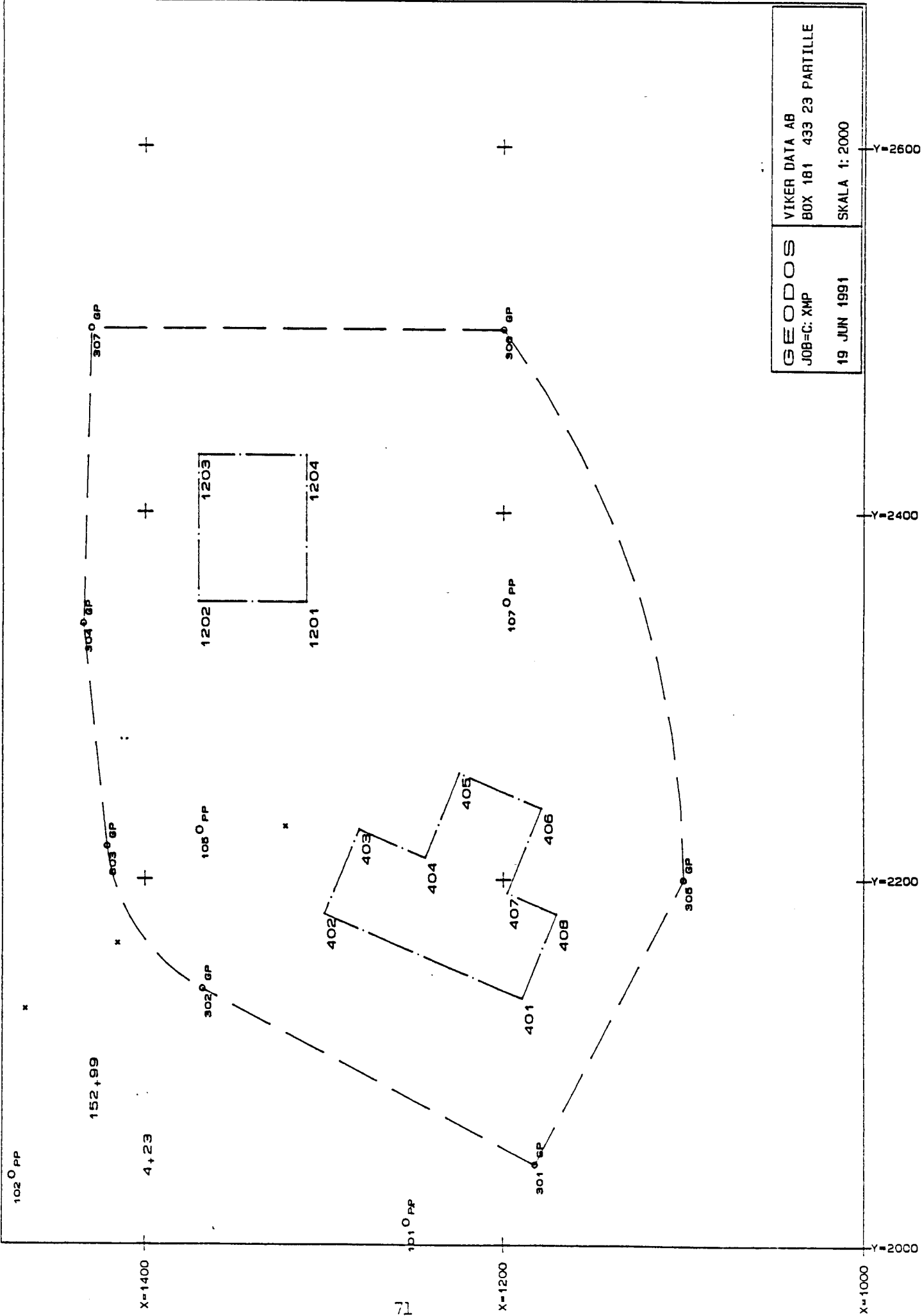
```
* * * G E O D O S * * *        FUNCTION

* *   CODE TABLE    * *        Edit codetable for JOB-file
                               plotting.

-----------------------------------------------------------------
INSTRUCTION
-----------------------------------------------------------------
CODE TABLE is a table to define your drawing. You can define
how to plot SYMBOLS, TEXT, LINES and ARCS.
The code table will be stored as a normal JOB-file with
optional name. You may have several different CODE TABLES.
You can edit a code table with program EDIT on page 24.
-----------------------------------------------------------------
DISPLAY            COMMENTS.
-----------------------------------------------------------------
CODE TABLE
JOB=C:             Enter "JOB name" for the code table.

GEODOS             Key in the code that you have used in the
Cod=               Job you will plot.

SYMBOL             You can select four types of symbols. Press
Typ=(xo+.)         one of this keys : <x>,<o>,<+> or <.>
HEIGHT mm=         Enter height of the symbol in mm.

TEXTHEIGHT         Enter text heights in mm,
Pno=mm=            for point number (lower left position)
Cod=mm=            for code/text (lower right position)
  Z=mm=            for Z values (upper center position)
                   Key in 0 mm to omit text.

LINE               Enter line font number according to the manual
Typ=(0-7)=         for your plotter. Default is type 7 (solid).
Pen=(1-8)=         Key in pen number.

PNO-SERIE          Enter PNO series to define how to connect the
Pno=               points. You can use the following special
                   characters:
                   *  All points with sequence numbers are sorted
                      and automatic connected with straight lines
                   +  Line to next point in the list
                   ,  Space to next point in the list
                   () Arc to next point. Give radius within the
                      brackets. ex:...+302(100)303+...

                   Code table is stored as in following example:

                   Cod=GP              Feature code.
                   Smb=o1.0            Symbol circle 1.0 mm
                   Lin=4.3             Line font 4 pen 3
                   Pno=1.5             Point number hgt 1.5 mm
                   Cod=1.5             Code height 1.5 mm
                     Z=0.0             No Z value will be plotted
                   Pno=301+302(100)303.. Line definition.
                   Pno=*,401+408,1201+..    "         "
```

72

CODE TABLE USED FOR THE EXAMPLE ON PAGE 71.

| CODE | SYMBOLS | TEXTHEIGHTS | | | LINES |
		Pno	Kod	Z values	
PP	o2.0	1.5	1.5	0.0	0.0
HP	+1.5	0.0	0.0	2.0	0.0
GP	o1.5	1.5	1.5	0.0	3.2
	301+302(100)303+304,301+305(-500)306+307+304				
HH	.0.0	1.2	0.0	0.0	4.2
	*,401+408,1201+1204				

```
* * * G E O D O S * * *        FUNCTION

* *   SDTA CALC      * *        Coordinate calculation of
                                radial surveydata stored
                                with program "POLMS".


------------------------------------------------------------------
INSTRUCTIONS.
------------------------------------------------------------------
Known points must be stored in current JOB or in JOB "PBANK".
If a station point is missing, the calculation will stop and
you can key in the station coordinates.


------------------------------------------------------------------
DISPLAY            COMMENTS.
------------------------------------------------------------------
SURVEYDATA         Enter survey data JOB name.
JOB=C:


P=101              Coordinates will be stored in current JOB-file.
P=102......        Survey data does not change.
                   The points appear in the display during
                   calculation.
                   You can edit survey data and/or your known
                   station points and thereafter recalculate.


NO SURVEYDATA      Error message. The file is not a survey data
                   file. You can not mix coordinates and
                   raw survey data.
```

```
* * * G E O D O S * * *        FUNCTION
                               Calculation of height of station
                               point by angle and distance meas-
* *    STN HEIGHT      * *      urement. You can measure to one or
                               several known height points.
```

INSTRUCTIONS:

If the plane coordinates are stored in the JOB file, you can
measure just the vertical angle. Otherwise you must measure also
the distance. You can use an unlimitad number of known points.
Mean value and deviation is displayed and stored.

DISPLAY   COMMENTS.

MANUELL   Select totalstation <EXE>=manual.
GDM-I/O....

STATION   Enter station point number.
Pno=105=

SLOPE DIST   Press <Y> för slope distance measurement.
Y/N ?
HEIGHT MEAS   Press <Y>.
Y/N ?

                     Enter instr. height <EXE>=0.00 (instr.axis)
Ih=   Enter target height. You can change during.
Th=   measurement.
                     Enter point name for each known object.
OBJECT nr 1   Press <SPACE><EXE> to quit.
Pno=101=

                     Enter "0".
Ha=   Enter vertical angle.
Va=   Enter "0" or measured distance.
Sd=   Enter target height.
Th=0.000=

Pno=102=   Etc...Etc...

                     After last measurement mean value and mean-
M Z=50.573   deviation is displayed. You can use the arrow
dH=0.006   keys to look at the separate resulys.
1 Z=50.573   Press <EXE>.
2 Z=50.574
etc...
P=105 Z=50.573.. Press <Y> if you accept the measurement.
  OK J/N ?
    ...Z=0.003..   If there is a previous height on the point
DIFF OK J/N ?   the difference is displayed.
KEEP CHANGE   Select if you will keep the old height, change
MEAN   to the new or store a mean value.
```

```
* * * G E O D O S * * *        FUNCTION

* *   REFER LINE    * *         Definition of a 3D REFERENCE LINE.
                                You can combine this program with
                                RADIAL MEASUREMENT and SETOUT.
                                (POLMS and POLSO). This program
                                can be used for e.g. direct house
                                set out, tunnel control, profile
                                set out etc.
---------------------------------------------------------------------
INSTRUCTIONS
---------------------------------------------------------------------
Reference line may consist of STRAIGHT LINE, ARC, ROADLINE or
POINT with BEARING.
When using ROADLINE in combination with "POLMS" the result will
refer to the complete 3D designed line. (PLANE,PROFILE and
SECTION, see page 62). Automatic surface interpolation.
Setting out of the roadline is carried out with the program
"RLSO" (see page 66).
You can change or quit the reference line during measurement
by pressing <R> or <Q> after the result is displayed.
---------------------------------------------------------------------
DISPLAY          COMMENTS.
---------------------------------------------------------------------
STRGHT ARC RDLIN  MENU to select reference line type. Straight
TAN SLP POL QUIT  line, Arc, Roadline, Tangent to roadl. arc
                  Slope line, Polar sphere from centerpoint.

BASEPOINT         Enter start point for reference line.
Pno=1=

TARG-POINT        Enter end point for reference line.
Pno=2=            Press <SPACE><EXE> if you want to enter
                  BEARING instead of point number.

Ha=               Key in BEARING in current angle unit.
Sl=ex 1:10=       Key in slant. (ex 1:10 = 1m per 10 metres up-
                  wards). This question appears only if "SLANT"
                  is choosen in yhe menu above.

RADIUS=           Enter curve RADIUS. <+>=right, <->=left.

REFER LINE STR
Ha=   225.1322    Bearing and distance on reference line
Hd=    50.000     is displayed..
Sl=1:1.32(3.12%)  Slope value on reference line.
SECTION Diff      Anser <Y> if you want to store the values
STORE Y/N ?       from POLMS (A,B and height diff)

LINE MISSING      If you choose to work with roadline and no
                  line data has been previously registered.
                  Use program "RLREG" to store roadline.

By result from    Press <R> to change to another line or
POLSO or POLMS.   press <Q> to return to "normal" measurement.
```

```
SAMPLE

BASE POINT
405     N=1224.717      E=2258.011      X=40.000

END POINT
406     N=1178.563      E=2238.781      Z=40.000
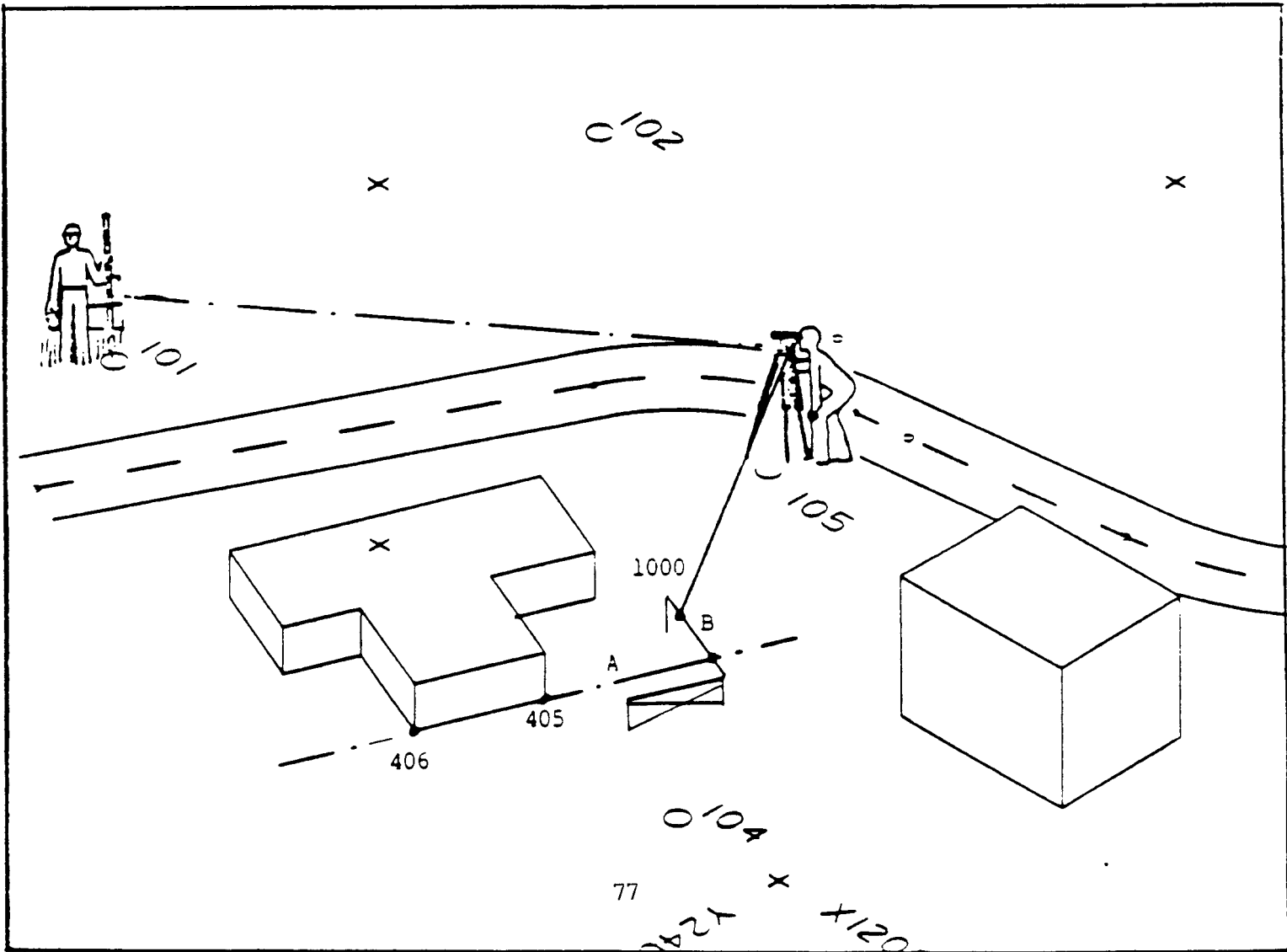
STN 105         Ih=1.550

101     Ha=268.6226

1000    Ha=175.2309     Va=108.8450     Sd=87.410     Th=0.000

        N=1289.236      E=2259.483      Z=40.005

        A= -60.123      B= 23.456       Dh= 0.005
```

```
* * * G E O D O S * * *          Function

* *      PROFILE      * *         PROFILE is the MAIN routine
                                  for a number of program that
                                  handles ROAD LINE PROFILES,
                                  and SECTIONS.
------------------------------------------------------------------
INSTRUCTIONS
------------------------------------------------------------------
The base for profile and sections is the file "PROFILE" that is
stored in the C: pack. It is automatic created with the program
"CREATE" and will contain profile and section data.
It may also be directly created with the program "LEVEL".
REFERENCE LINE to profile data can consist of single lines or
arcs or a complete roadline with lines,arcs and transition curves
------------------------------------------------------------------
DISPLAY                  COMMENTS
------------------------------------------------------------------
** GEODOS **             If you earlier did not give any reference
* REFLINE **             line, you automatically enter this
                         program. Press <EXE>.
STRGHT ARC RDLIN         Choose type of reference line. (see page 74)
TANG SLANT QUIT

CREATE PRINT               Select program:
EDIT SECTPLT               CREATE = Create JOB and calculate.
PROFPLT LEVEL              PRINT  = Print out profile data
                           EDIT   = Edit profile data
                           SECTPLT= Plot cross sections
                           PROFPLT= Plot profile
                           LEVEL  = Levelling of profile data

CREATE :
--------
                         Key in corridor WIDTH along the reference
                         line = centerline. See page 79

PRINT :                  Print out of section data in the same way
-------                  as described on page 50.

SECTPLT :                Plotting of sections on HPGL compatible
--------                 plotter. Optional scale in height and plane
                         Selectable number of sections per sheet.
                         Detailed description on page 80.
PROFPLT :                Plotting of profile along reference line
---------                with optional scale in height and length
                         in the same way as described on page 70.

EDIT :                   List, search, edit etc in the same way as
------                   described on page 24.

Note that with ROADLINE reference the calculation will go faster
if the measured point are stored in order along the alignment.
```

```
* * * G E O D O S * * *          Function

* *     CREATE       * *          Create PROFILE data as a base
                                  for listing, and plotting of
                                  profile and cross sections.
------------------------------------------------------------------
INSTRUCTIONS
------------------------------------------------------------------
The program calculates chainage and offset along the reference
line and store the data in a JOB file. The data will be
sorted in chainage order. Points will be renumbered from 1.
The original point number will be added to the code.
The profile data are stored as follows:
PNO    CODE    CHAIN    OFFSET    HEIGHT   DR   TDZ   GDZ.
Points with Z=0 will not be calculated.
If the reference line is a roadline, the alignment must cover
the area to calculate.
Check that there is space enough in your datapack before you
start the calculation.


------------------------------------------------------------------
DISPLAY                     COMMENTS
------------------------------------------------------------------
** GEODOS **                If you earlier did not give any reference
* REFLINE **                line, you automatically enter this
                            program. Press <EXE>.
STRGHT ARC RDLIN            Choose type of line. (see page 74)
TANG SLANT QUIT            At ROADLINE, the line must cover all
                            points. No automatic extension.
SECTION
JOB=C:PROFIL=               Enter JOB NAME for profile data. Default
                            name = PROFIL
START resp END              Enter START resp END chainage for profile
Chn=                        to create.

CORRIDOR                    Enter corridor width from reference line
Wdt=                        All points with Z value within the
                            corridor will be calculated in relation
                            to the reference line.
SORT                        If you answer <Y>, data will be sorted
  OK Y/N?                   on chainage . Answer <N> if you want to
                            keep the measurement order e.g. for
                            tunnel profiles.

P=101                       You can follow the calculation in display
P=102...                    Along a roadline the calculation will run
                            faster if the points are stored in order
S=1                         along the line. At the end a sorting will
S=2...                      take place.
```

```
* * * G E O D O S * * *        Function

* *    SECTPLT      * *         Plotting of cross sections
```

INSTRUCTIONS

Plotting of cross sections take place with "PROFIL DATA" as
base. See page 79. You can choose to plot design section at the
same plot as the ground section.
Optional number of sections per plot sheet.

DISPLAY   COMMENTS

DISPLAY	COMMENTS
SECTION JOB=C:PROFIL=	Enter name of the job where profile data is stored. See page 79.
A3/A4-PLOTTER A0/A1-PLOTTER	Select type of plotter. When using A0/A1 PSION automatic reads the paper size from the plotter.
SECTION SCALE DIST 1: HEIGTH 1:	Enter scale factor for length scale Enter scale factor for height scale
SECTION INTERVAL: CORRIDOR:	Enter interval for cross sections to plot Enter corridor width (tolerance) perpend- icular to the reference line within the points belong to the current section. There will be no interpolating in this program. See "VOLUME" on page 82 for interpolating of cross sections.
SECTION START: END :	Enter chainage for the first section " " " " last "
# SECTIONS/SHEET ROWS: COLUMNS:	Enter number of sections in rows " " " " " columns
REFLINE JOB=C:	Enter name of JOB file where designed roadline is stored. Press just <EXE> if you don't wish to plot designed sections.
SECT=20...	The plotter starts and plot selected number of cross sections on each sheet.
CHANGE SHEET	You may continue on next sheet directly after changing.

EXEMPEL: ▶
▶
== GEODOS = version 5.89 ==
VIKER DATA AB
433 43 PARTILLE
== 19 JUL 1991 10:46:30 ===

ARB-NAMN : MANUAL   ARB-NR : 12.345   OPER: SOA

SKTIONERNG
JOB : C:OAP

REFLINJE

ELEM	TYP	X	Y	SEKT	R/A
1	RAK	59585.501	87300.852	26082.694	
2	KLT	59369.938	87044.099	26417.939	775.468
3	CIR	59182.875	86809.658	26717.939	2004.500
4	KLT	58819.080	85407.220	28200.345	775.468
5	RAK	58868.598	85111.410	28500.344	
6	RAK	59397.444	82373.293	31289.065	

PNO/KOD	SEKT/A	SIDM/B	Z	DR	TDZ	GDZ
101/B	28023.701	7.993	39.220	-0.007	******	2.191
102/B	28023.275	8.244	40.821	0.367	-0.294	3.791
103/B	28023.647	7.884	42.024	0.437	1.275	4.995
104/B	28023.227	6.788	43.545	0.458	0.662	6.515
105/B	28023.310	5.309	44.318	0.422	0.455	7.288
106/B	28023.006	4.018	44.497	0.211	0.217	7.466
107/B	28022.821	2.600	44.745	0.271	0.271	7.713
108/B	28022.889	2.116	44.754	0.274	0.274	7.723
109/B	28022.594	0.762	44.321	-0.019	-0.020	7.289
110/B	28023.296	-0.243	44.300	0.213	0.224	7.270
111/B	28023.000	-1.233	44.383	0.646	0.713	7.352
112/B	28023.189	-1.844	43.763	0.370	0.429	6.732
113/B	28023.878	-2.651	42.901	0.292	0.490	5.872
114/B	28023.195	-3.357	41.628	0.247	0.769	4.597
115/B	28023.009	-3.732	40.765	0.342	-0.309	3.734
116/B	28023.116	-4.000	40.127	0.507	-1.717	3.096

28025.00

+47.00

+37.03

GEODOS | VIKER DATA AB
JOB=C:OA | 433 43 PARTILLE
21 MAR 1988 | SKALA 1:50

```
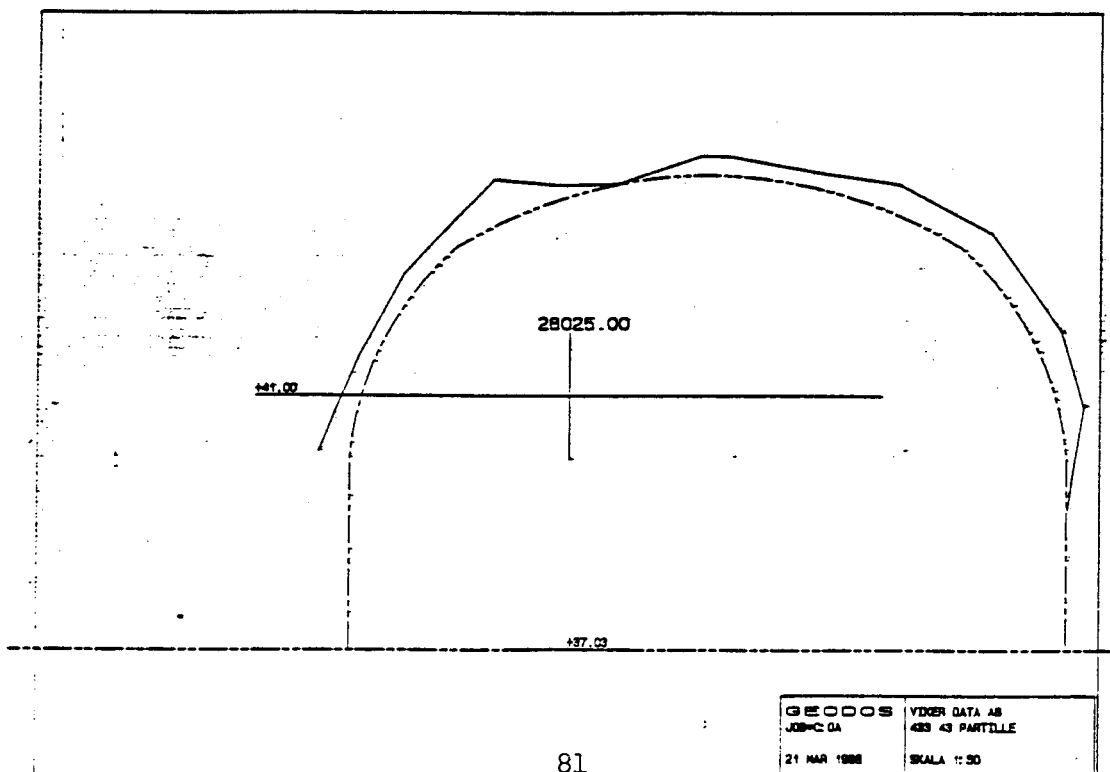* * * G E O D O S * * *        Function

* *     VOLUME        * *      Calculation av average VOLUME
                               from the point base.
                               Interpolation of cross sections.
----------------------------------------------------------------
INSTRUCTIONS
----------------------------------------------------------------
The program interpolates cross sections and calculates section
AREAS and VOLUMES along a straight reference line. You can select
a FIXED or VARIABLE reference level. The variable level is the
ground level on the measured outlines. You can also give a SLOPE
when using fixed reference level. The interpolation is made along
measured lines. The lines are defined with consecutive point
numbers on the measured points in the same way as described in
program "PLOT" on page 70. Use e.g. program POLMS or DIGI for
data collection. You can store the sections for further plotting.
----------------------------------------------------------------
DISPLAY                  COMMENTS
----------------------------------------------------------------
STORE PROFILE            Press <Y> if you want to store section
Y/N?                     data in JOB=PROFIL for e.g. plotting.
BASEPONT                 Key in the START point = first cross sect
Pno=1A=                  NOTE ! If the baseline has consecutive
                         number, that line will also be contained
                         in the interpolation and volume calc.

REFERPOINT
Pno=1B=                  Key in the END point = last cross section.
                         The reference line must be within the
END OF FILE              area for the measured point. Otherwise
                         you will get an error message during
                         the interpolation.

REF LEVEL
 Z=                      Key in the reference level if desired.
                         Press just <EXE> if you want to use the
                         outlines as variable level.

Sl=ex 1:10=              If you entered ref level above you can
                         also give slope along the baseline.
                         Press just <EXE> for horisontal level.

INTERVAL=                Key in the interval for cross sections to
SORTING...               interpolate. PSION sorts the points, and
                         creates lines for the interpolation

Z=40.00 Int=20           In the display you will see how many
#Sct=15 #LIN=5           cross sections that will be interpolated
5 min OK Y/N?            and the number of lines. You can also see
                         the time it will take to calculate.
-----------------        Press <Y> to continue or <N> to quit.
> (Sct=  0) ^            You can follow the interpolation in the
-60.15    42.37          display. Offset and height is displayed
-----------------        for each point. If a printer is connected
                         you will get a printout. Press <ON> if
                         you want to interupt.
Sct=852 m2               For each cross section the AREA and VOLUME
Vol=17032 m3             from previous sections is displayed.

Vol=282531 m3            TOTAL VOLUME is displayed. You can store
STORE OK Y/N?            the result in the current JOB file.
```

```
VOLUME
JOB: C:VOL

REFLINE
PNO              COD                 N                    E
1A               BL             1063.250            2118.360
1B               BL             1306.100            2240.000

REFERENCE LEVEL   Z=40.000 Sl=0

SECT              OFFS               HEIGHT
------------------------------------------------
60.00
                 -56.73              52.27
                 - 1.07              52.23
                  57.45              52.34
                 168.26              42.73
                 168.26              40.00
                 -56.73              40.00
   ARER      2235.7  m2
   VOLUM     38088 m3
------------------------------------------------
etc etc.....
------------------------------------------------
271.61
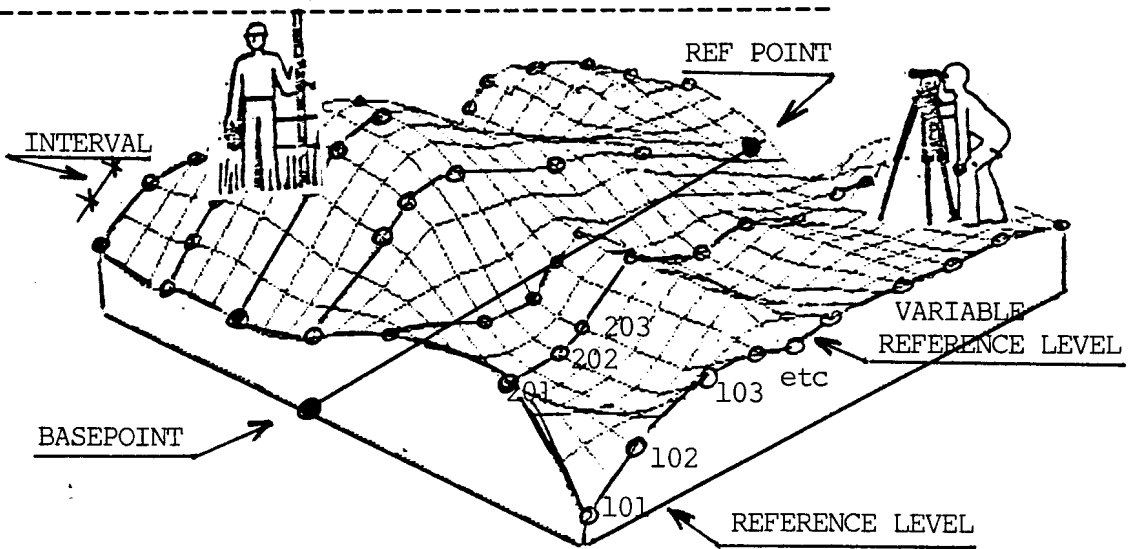                  68.71              53.23
                 127.51              43.88
                 127.51              40.00
                  68.71              40.00
   AREA       503.1  m2
   VOLUM     13683 m3
------------------------------------------------

        VOLUME        102497 m3
------------------------------------------------
```

USER - The user parameter file.

"USER" is a OPL PROCEDURE FILE where you can change GEODOS
default parameters. You can define your own parameters with help
of the variables seen below. Store the USER file in C: (RAM
pack). These values (new parameter settings) will override the
values (default values) in the system parameter file. You need
only define the parameters you wish to change.

NAME	DEFAULT VALUE	REMARK
DC%	3	Number of decimals in printout and result display.
U%	0	Angle unit. 0 = gon 1 = grades + decimals 2 = grades min sec. 3 = radians
RAD%	60	# Lines per page for print out.
TID%	0	Point name at measurement replaced with TIME if 1. Format: HH.MM.SS
PN	1	Incremental value for automatic point mumbering
PRINIT$	CHR$(27)+CHR$(64)+ CHR$(27)+"5"+CHR$(0)+ CHR$(27)+"1"+CHR$(6) for DICONIX-150	Character string for initiation of printer, e.g. setting of left margin, font etc. Refer to printer manual.
KSTAT%	1	Setting of keyboard function for POINT CODE. 1= uppercase letters. 3= figures.
UTM%	0	With UTM%=1 set to 1, it is possible to compensate for scale factor in POLMS, POLSO e.g
DMAX	0.1	Tolerance for standard deviation in programs where mean value is calculated.
LMAX	100	Max offset distance at measurement related to roadline reference line.
JR	6375	Earth radius in km.
JK	0.14	Coefficient of refraction.
SCX	1	Plotter scale factor (easting)
SCY	1	" " " (northing)
PLH%	2	0= no grid or frame, 1= grid 2= grid and frame
NAM$	" "	Name and adress of print out of
ADR$	" "	headers etc.
DMH=	0.000	Length measurement intr. height above theodolite axis.
TM$	"010203040506070809010"	STRING for MENU of total stations. Definition see table on next page. Each code must contain 2 char.

EXAMPLE:

If you want to set your own NAME and ADRESS on print outs.

1. Start "PROG" from the main menu.

2. Select "NEW" in the next menu or "EDIT" if it is
   not the first time.
   Display shows "NEW A:" Change to "C:" with <MODE>.

3. Key in "USER", Press <EXE>.

4. Display now shows "USER:" , Press <EXE>.

5. Key in e.g. NAM$="GEOTRONICS LTD", Press <EXE>

6. Key in e.g. ADR$="Box 64 18211 DANDERYD, Sweden"

7. Press <MODE>. Display shows TRAN SAVE QUIT.
   Press <EXE>

8. Display shows SAVE C:USER. Press <EXE>

   Now it is ready.

You can any time enter the USER file and append or change these
parameters. However it does only work if it is carried out
correctly. You will always be given an OK if everything is keyed
in correctly, and when you enter GEODOS. A BEEP and YOUR NAME
can be seen in the DISPLAY.
Some tips:
If you are using several RAM packs at the same time, mark them
with different names (NAM$) in the user file. You will than be
given a reminder each and every time you enter GEODOS.

Table over TOTALSTATION CODES:

        01 = MANUAL INPUT   Manual input of angles and dist
        02 = LEICA   TD,TC,TC1,TC2,TC5,TM3,NA2/3
        03 = GDM-I/O   Geodimeter 130-140,220,410-440 I/O
        04 = GDM-SER   Geodimeter Serial
        05 = SOKKIA   Sokkia SET3/4/5,SETC,SET5A
        06 = TOPCON   Topcon GTS3/4/6,RS1-A,GTS300,CTS1/2
        07 = PENTAX   Pentax PTSIII,PTS10
        08 = NIKON   DTM-A/D, OLD
        09 = ZEISS   Zeiss Elta3
        10 = KERN   Kern DM500,RD20,DM

COPYING JOB-files..

You can in a very simple way copy JOB-files between different
devices. Use "COPY" in the MAIN MENU.

Some samples:

1.   Your friend wants to use your JOB "KALLE" that you have
        stored in your RAM-pack in slot C:.
        - Remove your RAM-pack in slot C:
        - Change it with the GEODOS-pack in your friends PSION.
        - Select "COPY" from the main menu.
        - PSION displayes "FROM"
        - Type "B:KALLE" and press <EXE>.
        - PSION answers "TO"
        - Type "C:" och press <EXE>.

        It takes a few seconds to copy 100 points.
        The JOB-file will be named "KALLE" also at your friends
        PSION. You can change name if you want.

2.   You want to make a temporary copy of JOB "KALLE" from
        the RAM-pack (C:) to the internal memory (A:) to be safe
        when you connect to an unknown computer.
        - Select "COPY" from the main menu.
        - PSION displayes "FROM"
        - Type "C:KALLE", Press <EXE>
        - PSION displyes "TO".
        - Type "A:BACK" and press <EXE>.

        The JOB in the internal memory will be called "BACK" and
        is an exact copy of "KALLE"

        NOTE. If JOB "KALLE" already exists, the new points will
        APPEND to the old JOB.

Learn how to handle "COPY" in a safe way. It is very useful. And
first of all, train to make BACKUP copies of important data.

When you use DATA-packs of EPROM-type, use battery elimimator

TAKE CARE OF YOUR DATA !

Some rules for safe handling av data in RAM-packs
- -

-       When you connect power adapter to the COMMS-link
        you have to be careful. Do it in the following steps:

                1. Power off.
                2. Connect COMMS-link WITHOUT POWER ADAPTER.
                3. Press <ON>
                4. Connect power adapter to COMMS-link.

-       When the computer is working, do not disconnect or
        remove any devices or power sources.

-       Avoid magnetic fields close to RAM-packs.

-       Do backup or print out important data before you remove
        a RAM-pack. The battery in the RAM-pack have a life of
        approximatly 3 years.

USER PROGRAMMING.

You can add your own software to the GEODOS system.
The program language is called OPL. Refer to PSION manual.
There is one access routine:

        APROG:

Your programs will be very powerful because of access to "GPL",
Geodos Procedure Library.

It will not be described in this manual. Here only is an idea
as to how the system works by showing the following example:
The object code for the program listed below also exists in the
GEODOS program pack.
```
---------------------------------------------------------------
PROGRAM LISTING                 COMMENTS
---------------------------------------------------------------
                                Program: DIST
                                Display distances, bearings
                                height differences etc. when
                                you ask for pointnumbers from
                                the data base.


DIST:                           : Procedure name
LOCAL i%                        : Declaration coord array index
PR¤(31)=" DISTANCE"             : Header text
LGO:                            : Display header
DO                              : Start loop
  CLS                           : Clear display
  STR¤="ENTER POINT"            : Header for procedure "FIN"
  i%=i%+1                       : Index for coord array
  IF FIN:(i%)=0 :RETURN :ENDIF  : Find coord in database X(),Y()
  IF i%=2                       : After first time......
    PLU:(1)                     : calculate radial data
    i%=1                        : Update array index
    X(1)=X(2)                   : Change coordinates for
    Y(1)=Y(2)                   : next calculation
  ENDIF                         : That's all.
UNTIL 0
```

This procedure can not run outside GEODOS due to the use of
GEODOS common arrays.
You must therefore write the following procedure:

```
APROG:                          :Program name in GEODOS menu.
DIST:                           :Call up your own procedure.
```

You can store your procedure in A: or C: memory. The GEODOS-pack
(B:) is write protected.
To run the program, enter GEODOS and select "APROG" from the
GEODOS menu.

GEODOS Database

General

"Raw" data in PSION is stored in "ODB"-format.
"ODB" is short of "Organiser Data Base"

It is a compact ASCII-format with delimeter between the
different data fields. The delimeter character is ASCII 9
(Horisontal TAB).
It is possible to convert the delimeter while sending or
receiving. In "COMMS" "SETUP" you can change the parameter
"TTRN". Default is "no conversion".

The GEODOS database is a matrix with 7 columns in each record.

The two first fields has a PREFIX to handle different data types
The prefix is a letter followed by an equalsign (=).
In the second field there are also important information for
the data base as described in the following:

In general the following is valid:

Column			
Column 1	A/N with prefix	Max 14 char. incl. prefix
" 2	A/N with prefix	Max 14 char. incl. prefix
" 3	Numerical	Max 12 char. (+ - 0-9)
" 4	Numerical	" " " "
" 5	Numerical	" " " "
" 6	Numerical	" " " "
" 7	A/N without prefix	Max approx. 200 char.

One RECORD as above is MAXIMUM 255 characters. There is usually
not more than 60 characters in a record.
Column 7 is mostly used as a REMARK field.
The first two columns is mainly used for POINT NUMBER and
FEATURE CODE with prefix "P=" resp. "C="

Different data types may appear in the same FILE in any
order. However it is NOT ALLOWED to mix polar survey data
with rectangular coordinates.

In the GEODOS-software you can reformat data while sending or
receiving, but it is an advantage if you use the ODB-format
for communications.

The following is a list that describes the different data types.

1.   COORDINATES

       Column 1:   Point number   Prefix: P=
          "   2:   Feature code   Prefix: C=
          "   3:   X-coordinate
          "   4:   Y-coordinate
          "   5:   Z-coordinate
          "   6:   Quality value
          "   7:   Remark

2.   LINES

       Column 1:   Elementnumber   E=1,E=2,E=3 etc.
              2:            Elementtype   C=RAK,C=CIR,C=KLT
              3:            X-coordinate startpoint
              4:            Y-coordinate startpoint
              5:            Chainage (Section)
              6:            Radius or clothoidparameter with sign
                            (minus is left hand curve).
              7:            Not used.

       Remark:
       Note that an element record is not complete by itself,
       but must always be followed by another element, that
       defines the end point. The last element in a road line
       must be stored twice.
       The first and the last element must not be a clothoid.
       Two clothoides may be stored after each other in the
       inflexsion point with different signs. (right/left) in
       column 6.

3.   HEIGHT PROFILES

       Column 1:   Chainage (Section) Prefix: H=
          "   2:   Name of TEMPLATE   Prefix: C=
          "   3:   Height in chainage acc. to col 1
          "   4:   Slope in percent (minus is down)
          "   5:   Radius on vertical curve (minus=concave)
          "   6:   Not used
          "   7:   Nor used.

       Remark:
       Note that the slope must appear in every record.
       "Slope" means slope in the starting point.

4.   REFERENCE VALUES: (Local coordinate systems)

       Column 1:   Order number   Prefix: A=+
          "   2:   Pointno/Code   Prefix: C=
          "   3:   Chainage alt Abscissa (A)
          "   4:   Offset   Ordinata (B)
          "   5:   Diff (Radial dist to type sect, dR)
          "   6:   Height diff to "T-plane" (TdZ)
          "   7:   Height diff to "G-plane" (Gdz)

       Remark:
       Reference values may be stored by eg. POLAR measurement
       with 3D road line as reference line.

5.   TYPE SECTIONS (Templates)

There are three different ways to store type sections.

5.1 Offset/Heigh (General type section)

```
Column 1:            Order number     Pfx: T= eller G=
   "    2:            "C=PLAN-T" or "C=PLAN-G"
   "    3:            Offset according to head line
   "    4:            Height according to head line
   "    5:            Radius to next point ("0"=straight linje)
   "    6-7:          Not used.
```

Remark:
Two plane may be stored in the same file: Plane "T" and
plane "G".
I each plane data is stored from left to right offset.
At first plan "T" is stored. The numbering is sequensial
from "1".
The height in origin must exist (at offset=0.00).
This type of template is connected to the height
profile. Interpolation between templates take place
automatically along the headline.

5.2 Camber

```
Column 1:            File name       Pfx: B=  ex: B=AA
   "    2:            "C=Skevning%"    Fixed data..
   "    3:            Camber on straight line (%)
   "    4:            Camber in curve (%)
   "    5:            Carriage widht
   "    6:            Transition distance
   "    7:            Not used.
```

Remark:
This template is connected to PLANE data and automatically
take care of the camber slope according to the plane
curvature.

5.3 Valt (Simple tunnel roof)

```
Column 1:            Filname         Pfx: U=  ex: U=BB
   "    2:            "C=TUNNEL"       Fixed data
   "    3:            Tunnel width
   "    4:            Height to valt center
   "    5:            Valt Radius
   "    6-7:          Not used.
```

6. POLAR SURVEYDATA

The first line is a "HEADER" with some user definable data.

Header:

Column	1:	"P=MDTA"	Mandatory
"	2:	A/N info	Pfx: "C="
"	3-6:	Numerical info	
"	7:	A/N info	

Surveydata:

Column	1:	Point number	Pfx: "P="
"	2:	Feature code	Pfx: "C="
"	3:	Hor.angle or Ih. If "C=Stn" Ih is valid.	
"	4:	Vert. angle	
"	5:	Slope distance	
"	6:	Target height	
"	7:	Remark	

Remark:
At station point : Col 2 = "C=Stn"
At ref. target   : Col 2 = "C=Bobj"