GETTING STARTED

SOKKIA™

SOKKIA™

SDR33
GETTING STARTED GUIDE

Software Version V04–03

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Distributed by

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Preface

Read This First!

The first section of this SDR33 **Getting Started Guide** is addressed to those people who normally do **not** read manuals. If you wish to get started immediately using the SDR33 (in doing so, it is unlikely that you will be able to make the best use of the SDR33's powerful facilities), this section is a concise introduction to using the SDR33. If you intend to read this **Guide** and follow the series of tutorial lessons, we suggest you turn to the Introduction (page 3).

The SDR33 has been designed so that it is easy and intuitive to use. Follow the simple instructions in this section to set up your equipment and perform simple surveys immediately:

1. Enter the name of a **job**. Data is stored in this job.

2. Make sure the SDR33 is set up correctly for the type of total–station/surveying instrument you intend to use (see the ***"Instrument"*** entry of the ***"FUNC"*** or ***"Functions"*** menu). In particular, be sure you have set up the total station's prism constant appropriately. The SDR33 should apply a prism constant correction only if the total station does not. You should also check the instrument's PPM settings. Chapter 3 of the **SDR33 Reference Manual** supplies more details about available instruments and settings.

3. Make sure the configuration parameter ***"Topo view stored"*** (in the ***"CNFG"*** or configuration menu) is set appropriately for your purposes. In general, store observations as position **(POS)** records or as raw observation **(OBS)** records, the default being **POS**. Chapter 5 of the **SDR33 Reference Manual** explains the **"VIEW"** system in detail.

4. Check (under the ***"Units"*** entry in the ***"FUNC"*** menu) that the distance, angle, temperature, and pressure units are set appropriately. These settings should have been configured for your region by the distributor.

5. Press the **<READ>** key (bottom right–hand corner with instrument icon).

6. Enter the name of your station and backsight points and you're ready to take topographic observations.

Once your total station has sent an observation to the SDR33, save the observation in the SDR33's database using the **<OK>** key. Alternatively, the observation is automatically saved when you press the **<READ>** key and initiate another reading.

*To make best use of the SDR33, follow through the tutorial lessons in this **Guide**, or refer to the appropriate chapters of the **SDR33 Reference Manual**.*

P1.1 Quick summary

The following list is a brief guide to SDR33 use:

- To turn off, press gold **<FUNC>** and **<CLEAR>** (or gold **<O>**).
- Screen contrast adjustment is gold **<FUNC>** ⇐ or gold **<FUNC>** ⇒.
- Page up/page down is gold **<FUNC>** ⇑ or gold **<FUNC>** ⇓.
- Backlight turns on for one minute by pressing gold **<FUNC> <L>**.
- Booting is done with the SDR in the "OFF" condition:

  –for warm boot (***resets units, autopoint number, other parameters***), hold down gold **<FUNC> <L>**, and press and release **<CLEAR>**.

  –for cold boot (**WARNING–*clears data!***), hold down **<F1> <F4> <READ>**, and press and release **<CLEAR>**.
- If you experience problems and cannot turn off SDR33, hold down **<CLEAR>** for 16 seconds; this will force it off. ***Do not turn back on!***

  – Do a boot, preferably cold boot (read warning above) instead.
- To review data press **<VIEW>** key, use ⇒ to zoom in on details.
- To write a note anytime press **<NOTE>** key. If done while reviewing data, the note is entered prior to highlighted record.
- + – × ÷ are entered by pressing gold **<FUNC>** and the key desired.

In this Guide, < > denotes a keystroke of named key (e.g., **<Enter>**).

<READ> refers to large key at lower right corner of keyboard with theodolite icon. Generally used to initiate readings.

P1.2 Introduction

Congratulations on your purchase of the SDR33 Electronic Field Book. If you are familiar with data collectors, but have never used an Electronic Field Book, you are about to discover how quickly your surveying field work can be completed.

The SDR33's large screen allows menus and survey data to display concurrently, as well as directions and messages on courses of action. The ease of using SDR33 use should not mask the underlying power of the survey calculations it completes and records in the field.

P1.3 Making the best use of this Guide

This **Guide** is set up in a tutorial style; the information it contains is the minimum required to have a good working knowledge of the SDR33 system. As it is only a starting point for learning data collection and calculation methodology in the field, you may wish to read more detailed sections of the **SDR33 Reference Manual**.

How you use this **Guide** and the **Reference Manual** depends on your previous SDR Electronic Field Book experience.

P1.3.1 Existing SDR users: how to get started

If you have previously used an SDR Electronic Field Book, read Appendix A of the **SDR33 Reference Manual**, which discusses the differences between the SDR20 Series and the SDR33. Then work through the lessons in the **SDR33 Getting Started Guide**.

P1.3.2 New SDR users: how to get started

If you have never used an SDR Electronic Field Book, work your way steadily through this **Guide**. This will give you confidence to attempt some

simple surveys. After gaining some experience, read the **SDR33 Reference Manual** to develop a better understanding of the overall SDR33 system.

P1.4 Utilizing the available SDR files

Accompanying this manual are diskettes with files representing the data that should be in your SDR33 at the completion of seven of the lessons in this **Guide**. These diskettes have copies of the data resulting from the lessons covered in this **SDR33 Getting Started Guide**. There are 7 SDR files in total that contain the SDR33 data at the completion of the Traversing, Topography, Intersections, Areas, Resection, Point Setting Out, and Road Setout lessons. These SDR files are named TRAVERSE.SDR, TOPO.SDR, INTSECT.SDR, AREAS.SDR, RESECTN.SDR, PTSETOUT.SDR and RDSETOUT.SDR respectively. The SDR files are in ***"Comms output"*** format.

If you wish to cover a specific lesson without carrying out all the previous lessons, you can download the SDR file for the lesson preceding the lesson you wish work on. In order to upload one or more of these SDR files to your SDR33, you will need a software package that is capable of outputting the data over a serial RS232 interface to the SDR33. The Sokkia Software MAP or LINK modules will allow you to do this. The SDR files may be read into the Sokkia MAP or LINK program using the ***"Import data file"*** option in the ***"Receive data from SDR"*** menu selection. Send the SDR file to the SDR33 using the ***"Send current SDR file"*** option.

Note that there may be minor differences in any calculations carried out using data from these uploaded files. This is due to differences in the internal accuracy of coordinates stored in the SDR33 database and the accuracy of coordinates as read from the SDR files. The SDR files contain coordinate values rounded to a limited number of decimal places. These file differences are unavoidable and do not have a significant effect on the lessons covered.

You should make sure that the auto point number is set up appropriately for continuing a lesson after uploading an SDR file if you wish to use the same point numbering as in the examples. Set the auto point number using the

appropriate option in the ***"Configuration"*** menu (access with the **<CNFG>** softkey) or from the menu item in the **<Func>** menu.

P1.5 Using this Guide

Typefaces and icons are used in this manual as follows:

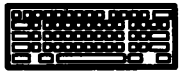
Main Menu Indicates field identifiers, menu options, unit names, variables, and functions.

Prompt Represents screen prompts and other information displayed on the screen.

<KEY> Indicates a keyboard key that causes an immediate action. Examples: **<1>**, **<F1>**, **<ESC>**, **<Y>**, **<N>**, **<↵>**.

TEXT Represents user–typed text, numeric or special character input (always followed by one of the action keys above).

Print Represents reports or output to a printer.

 Indicates that adjoining text is to be typed by the user.

 Indicates that adjoining information is displayed on the computer screen.

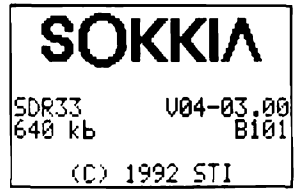
 Indicates that adjoining text is either a printed report or text from a disk file.

 Indicates that adjoining text explains previous text.

Indicates important information, or warning information concerning adjoining text.

 Indicates that adjoining text is to be typed by the user on the SDR33's keyboard.

Screen snaps of the SDR33 screen are shown to provide a reference as to what should be on your screen at any given moment during a tutorial lesson. They will look like the following:



A copy of the printed output of the tutorial is included at the end of this **Guide**. In addition, a partial printout appears at the end of most tutorial lessons summarizing the state of the database at the completion of those lessons.

P1.6 How to get more information

For more information regarding your Sokkia product, please contact the Sokkia organization for your country or region.

Europe
Sokkia B.V.
Damsluisweg 1, 1332 EA Almere
P.O. Box 1292, 1300 BG Almere
The Netherlands
Phone 31–36–5322–880
Fax 31–36–5326–241

USA
Sokkia Corporation
9111 Barton, Box 2934
Overland Park, KS 66201
Phone (913) 492–4900
Fax (913) 492–0188

Canada
Sokkia Inc.
820 Denison Street, Unit 1
Markham, Ontario
L3R 3K5
Phone (416) 475–1450
Fax (416) 475–1453

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Electra Way
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Crewe, Cheshire, CW1 1ZT
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Oceania
Sokkia Pty. Ltd.
107 Leicester Street, Carlton
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#06–01 Haw Par Technocentre
Singapore 0314
Phone 65–479–3966
Fax 65–479–4966

P1.7 About the tutorials

This **Getting Started Guide** uses an example job, outlined below, to illustrate the various features of the SDR33 that can help you collect survey information. The **Guide** is designed to give you a consistent, procedural approach to your surveys.

P1.7.1 Sample survey

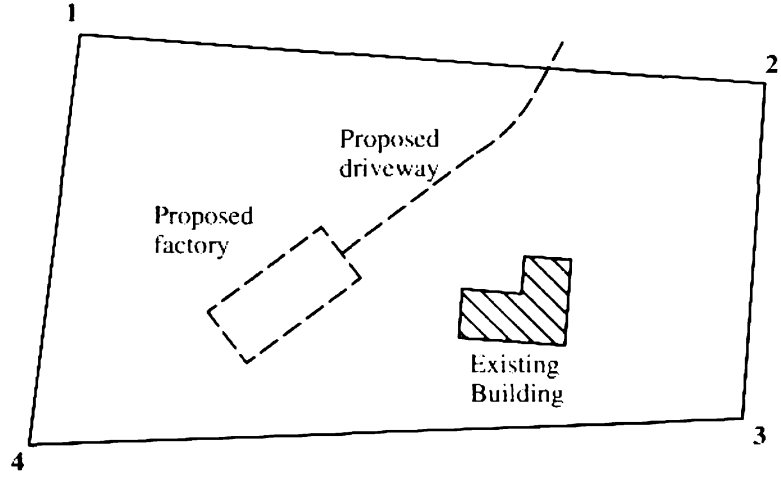
The following is an outline of a survey to be carried out for Mrs. Smith. She requires:

a. A cadastral plan of her property,

b. A contour plan, including setting out of a building, including cut and fill values as detailed in the engineer's specifications, and

c. A road design of a driveway, to be followed by a staking of cross sections.

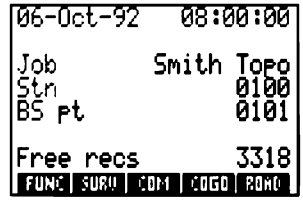
Engineer's Plan



P1.7.2 Starting the tutorials

The following tutorials should be completed in order as each tutorial makes use of the experience (and data) acquired in previous tutorials. The tutorials assume that your SDR33 contains no survey jobs initially (which will be the case when you purchase it or whenever you perform a **"cold boot"**).

To begin, get your SDR33 to display the ***"Start up screen,"*** which looks like the following:



This is the first screen that displays when you initially turn the SDR33 on. Get to this screen by pressing the **<CLEAR>** key several times. If you are unable to locate this screen in the SDR33's menu hierarchy, perform a **"cold boot"** (see Chapter 2 of the **SDR33 Reference Manual**). This is guaranteed to get you to the ***"Start up screen"*** (but it will also clear the SDR33's memory of any data that may have previously been entered).

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Lesson 1 Starting a job

All surveying field data must be associated with a ***"job."*** A job (which must have a name) records such details as the atmospheric conditions applied when the field work was performed. The job is the basic group of data that the SDR33 manipulates. Creating a job, is one of your first tasks.

In this lesson you will:

Create a job file
Enter a note
Set units, instrument selection, date, and time
Check configuration parameters.

1.1 Quick summary

Brief steps for setting up jobs and tips for SDR33 use are listed below. Details for executing these steps are provided in this lesson.

- SDR33 operation is shown by a sequence of keystrokes or menu selections to complete the named operation. For example, **<FUNC>** "Hardware" is used to check battery status. Press **<FUNC>** softkey, then use cursor keys to select "Hardware" from the menu options (or press "H" to highlight hardware). Then press **<ENTER>** or **<OK>**.
- To select an existing job (file), press **<FUNC>** softkey ***"Job."*** Then use the arrow keys to position the highlight cursor over the job name. Finally, press **<OK>** or **<ENTER>**.
- To create a new job (file), press **<FUNC>** softkey ***"Job,"*** **<ENTER>**. Then type in a new name, check the settings on the job screen before you press **<OK>**. Once a job file is set up, the settings cannot be changed.
- The following settings must be correctly selected on the job screen at time of job file creation:
  - Scale factor
  - Record elev
  - C&R Corr
  - Point Id format
  - Atmos corr
  - Sea level corr

- Press the gold **<FUNC>** key followed by the **<1/0>** key to turn the SDR33 off at any time; pressing the **<1/0>** key again turns the SDR33 back on.

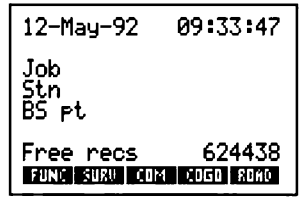
- Pressing gold **<FUNC>** and then **<L>** turns the screen backlight on—it will be turned off automatically if the SDR33 is switched off or if 60 seconds elapse without a key being pressed. Pressing gold **<FUNC>** **<⇐>** and gold **<FUNC>** **<⇒>** decreases and increases the screen's contrast, respectively.

- **Before starting you may also want to check:**

Setting	Accessed by:	
Starting autopoint number	<FUNC>	"Configure reading"
Combine F1/F2	<FUNC>	"Configure reading
Tracking	<FUNC>	"Configure reading
Battery	<FUNC>	"Hardware"
Code list on/off	<FUNC>	"Configure reading
Instrument	<FUNC>	"Instrument"
Prism constant	<FUNC>	"Instrument"
Time/date set, time stamping	<FUNC>	"Time+date"
Topo view stored format	<FUNC>	"Configure reading
Units	<FUNC>	"Units"
Tolerances	<FUNC>	"Tolerances"
Code fields	<FUNC>	"Configure reading
Info blocks	<FUNC>	"Configure reading

1.2 Job creation

If the SDR33 is turned ***"off"*** (i.e., the screen is blank), press the **<1/0 CLEAR>** key to turn it back on. Make sure that the SDR33 is displaying the ***"Start up screen."*** Before you begin the task of job creation, there is some brief background information you need.



1.2.1 Background

Softkeys

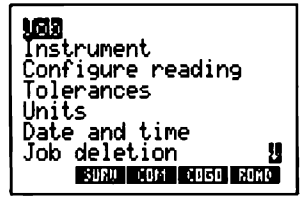
The bottom line of the ***"Start up screen"*** contains five "softkey" labels; each softkey is the name of a "menu" of possible actions. The first of these (called **<FUNC>**) is the ***"Functions"*** menu; this menu contains various functions that will not be performed often (e.g., only at the beginning or end of a surveying task).

Highlighted and selecting menu entries

In an SDR33 menu, you can move the highlighting bar from entry to entry using the <⇑> UP and <⇓> DOWN arrow keys. You can then press the **<ENTER>** or **<OK>** key to actually select the currently–highlighted menu entry. The task associated with the entry is performed when you press **<ENTER>** or **<OK>**. Pressing the **<CLEAR>** key exits the menu and returns you to the next highest level in the SDR33's menu structure.

Follow these steps to create a job:

1. Press the **<F1>** key (which corresponds to the **<FUNC>** softkey) to enter the ***"Functions"*** menu.

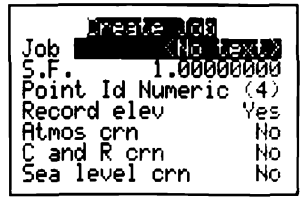


The first entry of this menu, entitled ***"Job,"*** should be highlighted.

2. Press **<ENTER>** if ***"Job"*** is highlighted. Otherwise highlight ***"Job"*** before pressing **<ENTER>**.

Note: If the SDR33 already contains a job, (which is unlikely since you have just begun the first tutorial exercise), a screen like the following will appear:

In this case, press the **<F1>** key (corresponding to the ***"New"*** softkey) in order to create a new job. Once you have pressed the **<F1>** key, the SDR33, the following ***"Job creation"*** screen appears.

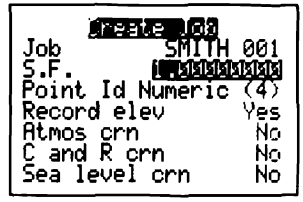


3. With the cursor on the ***"Job"*** field (the highlighted line beginning with the word *Job*), type the following characters:

SMITH 001

4. Press the **<ENTER>** key. You have now named the new job **"SMITH 001."**

Note: You can press the **<SHIFT>** key to toggle between upper– and lower–case letters.



The highlighted cursor is now on ***"Scale,"*** the second line of the screen. This denotes the scale–factor to use for the job **"SMITH 001."** It should be left as **1.00000000**.

5. Move to the third line of the screen by pressing the <⇓> arrow key.

   The ***"Point Id"*** field determines whether the point names in the **"SMITH 001"** job are to be 4–digit numeric, or 14–digit alphanumeric (i.e., a mixture of letters, digits, and punctuation characters).

   This field is a ***"selector field,"*** which means it accepts one of a fixed number of values (in this case, two). View the possible values of a selector field using the <⇐> and <⇒> arrow keys. Press the <⇒> arrow key, and the value under the cursor should change from ***"Numeric (4)"*** to ***"Alpha (14)."*** Press the <⇒> arrow key again, and the highlighted value reverts to ***"Numeric (4)."*** We want this job to have numeric point names so leave the ***"Point Id"*** field with the value ***"Numeric (4)."***

Warning

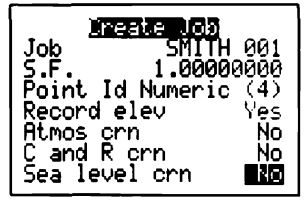
Note: If you use SOKKIA Software (Version 4.00 or earlier) in conjunction with the SDR33, you **must** use Point Id's of type ***"Numeric (4)."*** If you are using another brand check to see what its requirements are.

6. Continue to the next line on the screen by pressing the <⇓> arrow key.

   The field entitled ***"Record Elev"*** asks whether or not you are interested in elevations for the new job. For Mrs. Smith's job we are required to produce a contour map, so leave this field with a ***"Yes"*** value.

7. We are not interested in any sort of atmospheric or sea–level corrections so leave the following three fields with a ***"No"*** value.

   The Job Creation screen should look like this:

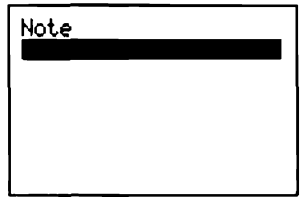


If the display of your SDR33 looks different from this screen, use the <⇑> and <⇓> arrows to move to any field and correct the value of that field so it matches the illustrated display.

8. Press the **<OK>** key when you are satisfied with the contents of the job creation screen. This tells the SDR33 to create the new job called **"SMITH 001"** with the indicated options and to make this the current SDR33 job.

Note: The SDR33 can contain many jobs at once, but at any time only one job is **"active;"** this is referred to as the ***"current job."***

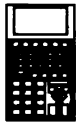
After you press the **<OK>** key, the SDR33 beeps and displays the message **"Input accepted."** This message indicates that the SDR33 has stored the details for the Job **"SMITH 001"** in its database and accepted it as the current job. Then the following screen displays:



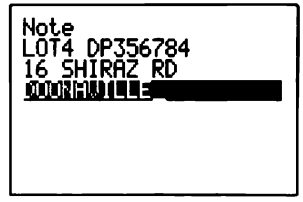
You may type in one or more ***"notes"*** containing information about the newly–created job in this screen.

Follow these steps to enter a note:

1. Type the following three lines to enter a note about the lot and address of the current survey:



LOT4 DP356784 <⇓>
16 SHIRAZ RD <⇓>
DOONAVILLE <OK>



The SDR33 beeps and briefly displays the ***"Input accepted"*** message before giving you the opportunity to enter another note.

2. Since we will not be entering additional notes, press **<OK>** to continue.

When you have typed as many notes as you require, press the **<ENTER>** or **<OK>** key on an empty note to continue.

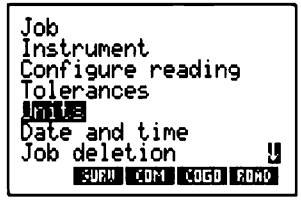
The SDR33 returns to the ***"Functions"*** menu; you have now created a job file for the survey.

1.3 Checking units

Before starting to collect data, you should set the units, instrument type, date, and time. Once defined, you should not change these parameters during the course of the job (although some of them may have to be changed if the job takes place over a long period of time, etc.).

Follow these steps to set the units:

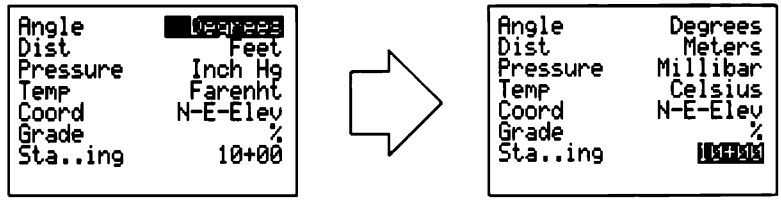
1. From the ***"Functions"*** menu, move the highlighted cursor (using the <⇑> or <⇓> arrow keys) until the ***"Units"*** entry of the menu is highlighted. Your screen should like like this:



2. Press the **<ENTER>** or **<OK>** key.

3. Check that the **"Units"** for the current job are satisfactory. Generally, an SDR33 is configured so that the default units are appropriate for the countries where it is sold. Sometimes, however, you may wish to use different units from the norm (e.g., for a specific contract that specifies military units or for an overseas surveying job, etc.).

   When you have selected the ***"Units"*** menu, you will see a screen similar to the one on the left :



   Your SDR33 may be configured differently from the screen shown here with slightly different menu selections.

   <u>You should set the units as shown above</u> on the right. All of the fields are selectors, so move to each line and select the appropriate values using the <⇐> and <⇒> arrow keys.

Note: Unless the units in your SDR33 are set to those illustrated above, the tutorial lessons will make little sense. You must also remember to reset the units to sensible values (for your country) before using the SDR33 in the field. A simple way to reset the units may be to perform a cold boot of the SDR33 (see the **SDR33 Reference Manual**, Chapter 2, ***"Cold boot"***). This will also remove any tutorial jobs from the SDR33's memory.

4. When the units are set as indicated in the illustration, press the **<OK>** key to return to the ***"Functions"*** menu.

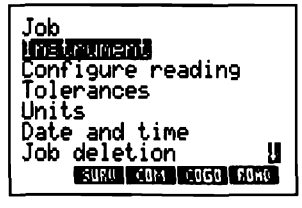
Note: Pressing the **<ENTER>** key when the cursor is positioned on the last field of *most* screens is equivalent to pressing the **<OK>** key. The SDR33 accepts the current screen and moves to the next logical screen.

1.4 Setting the instrument selection

Before using your SDR33 with a total station for field work, it is important to set both up properly so that units and corrections are applied correctly. (See Appendix B of the **SDR33 Reference Manual** for details.) For the purposes of this tutorial, however, we will ignore these details and use the ***"Manual"*** instrument setting (i.e., we will enter all survey data on the SDR33's keyboard, rather than using a total station).

Follow these steps to set the instrument selection:

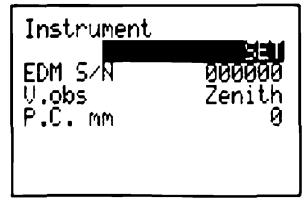
1. From the ***"Functions"*** menu, move the highlighted cursor until the ***"Instrument"*** entry of the menu is highlighted or press the **<I>** key to go straight to the ***"Instrument"*** entry.



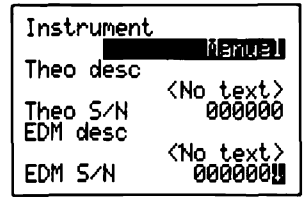
2. Press the **<ENTER>** or **<OK>** key to select this option.

Note: When in an SDR33 menu, you may type the initial letter of a menu–entry's name to proceed directly to that entry. If more than one entry begins with the same letter, repeatedly pressing the key corresponding to that letter moves the highlight from one such entry to the next.

You should now see the following ***"Instrument selection"*** screen:



3. If the value of the ***"Instrument"*** field is **not** ***"Manual"*** (it will probably be the ***"SET"*** instrument by default) use the **<⇐>** or **<⇒>** arrow keys to step through the instrument types until the ***"Manual"*** option appears.



When ***"Manual"*** is highlighted, you can use **<ENTER>**, **<⇓>**, or **<⇑>** to enter the various facets of your manual ***"instrument,"*** such as ***"Theo desc"*** (a short description of the theodolite being used, if any), ***"Theo Serial"*** (the serial number of your theodolite, if any), etc. We are not particularly interested in such details at present so we will accept (with the **<OK>** key) our manual ***"instrument"*** and return to the ***"Functions"*** menu.

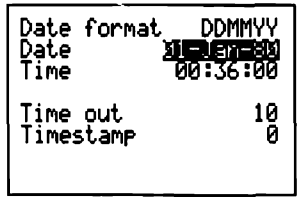
4. Press the **<OK>** key again. The SDR33 beeps and lets us know that it has recorded our choice of instrument into the database for the current job (**"SMITH 001"**).

1.5 Setting the date and time

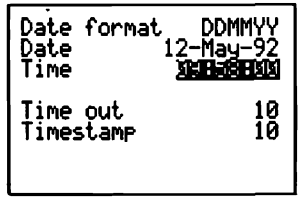
When you receive your SDR33 and first turn it on, the date and time will probably be as they were set in the factory (i.e., 1 January, 1980 and 0:00:00). You should set the date and time appropriately to your time zone.

Follow these steps to set the date:

1. Select the ***"Date and time"*** entry in the ***"Functions"*** menu by moving the cursor until this entry is highlighted.
2. Press the **<ENTER>** or **<OK>** key. You should see the following screen.



3. If the ***"Date"*** field's value is incorrect, position the cursor over it and type the correct date in the format shown by the ***"Date format"*** field. **DDMMYY** means that you should type the day (between 01 and 31,) followed by the month (between 01 for January and 12 for December,) followed by the year (92 for 1992, 93 for 1993, etc.). The format **MMDDYY** means that the month is entered before the day. You must type two digits for each component of the date and do not enter any spaces or punctuation.
4. Press the **<ENTER>** key to accept and display the new date.
5. Check that the date is correct. If it is not, follow the above instructions again until the displayed date is correct.



Follow these steps to set the time:

1. Position the cursor over the ***"Time"*** field and type the correct time into the field. Use 24–hour clock format, i.e., **HHMMSS**. You must type two digits for each component of the time (e.g., 083000 for 8:30 a.m. or 172500 for 5:25 p.m. Leave the seconds component as 00). There should be no spaces or punctuation in the time entry.

2. Press **<ENTER>** and check that the time displayed is what you intended.

1.5.1 Timeout and Timestamp

The final two fields of this screen are ***"Timeout"*** and ***"Timestamp."*** ***"Timeout"*** specifies the time, in minutes, which the SDR33 will allow to elapse between keystrokes before switching itself off. The SDR33 attempts to maximize battery life by "going to sleep" if it is unused for a period of time. You may set the timeout period as low as one minute or as high as 99 minutes. The latter is not recommended, as it is easy to forget to turn off the SDR33. (It is frustrating to find the battery discharged several days later.) If you set the timeout to one minute, you may often find that the SDR33 turns off while you are sighting a point, etc. If this happens, press the **<1/0>** key to turn it back on. It will be in exactly the same state as it was before it turned itself off.

The ***"Timestamp"*** option may be used to record the time (in the database) at the requested interval (in minutes). The value 0 means that the SDR33 should not store timestamps at all.

Press **<OK>** to save your data and time settings and to return to the ***"Functions"*** menu.

1.6 Checking the configuration

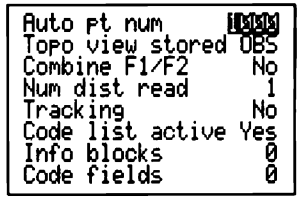
There are several miscellaneous configuration parameters that affect the behavior of the SDR33. These parameters appear under the ***"Configure reading"*** menu. It is a good idea to check these settings before you start any field work.

Follow these steps to check Configuration parameters:

1. Select the ***"Configure reading"*** option.

Note: You can generally (unless doing so would result in the loss of some important data) move up the menu hierarchy to the ***"Start up screen"*** by repeatedly pressing the **<CLEAR>** key. If you become "lost" in the depths of the SDR33, and you cannot find your way around (even with the help of this **Guide** and the **SDR33 Reference Manual**), press the **<CLEAR>** key. Examine each level as you step your way out until you arrive back on familiar ground. There is one exception to this process: if you are asked a question with a ***"Yes"*** or ***"No"*** response, **<CLEAR>** will not bypass the prompt.

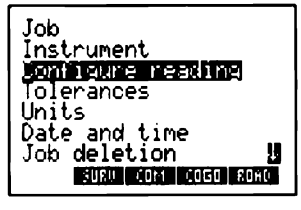
The ***"Configuration"*** screen should look like this:



As with the ***"units,"*** some of the SDR33's configuration parameters will be configured differently for different markets.

2. Change the values appearing on your screen to those illustrated in the diagram above. Again, you should remember to reset them to their defaults (or perform a cold boot) before undertaking field work with the SDR33.

You will now be back at the ***"Functions"*** menu.



You have now created a new job and made sure that the SDR33 is configured correctly for field work.

The following lesson uses the SDR33's feature–code–list mechanism to set up appropriate codes before they are actually needed. This simplifies code entry when you're in the field.

The following is a printout produced by an SDR33 describing the database (for the job "**SMITH 001**") after the first lesson is completed.

SDR33 V04–03.00	Copyright STI		13–May–92 11:55
	Angle Degrees	Dist Meters	Press Millibar
	Temp Celsius	Coord N–E–Elev	
JOB	SMITH 001	Point id Numeric (4)	
	Atmos crn No	C and R crn No	Refract const 0.14
	Record elev Yes	Sea level crn No	
SCALE	S.F. 1.00000000		
NOTE TS	12–May–92 09:59		
NOTE	LOT4 DP356784	16 SHIRAZ RD	DOONVILLE
INSTRUMENT	Manual	EDM <No text>	EDM serial 000000
	Theo desc <No text>	Theo serial 000000	Mount Not applic
	V.obs Zenith	EDM o/s <Null>	Refl o/s <Null>
	P.C. mm 0.000		

** End of report **

Lesson 2

Defining a feature code list

Before collecting traverse data, we will discuss feature coding and its significance to efficient SDR33 use. The SDR method of feature coding is based on a **"plain language"** description of a feature. The style of feature coding you use is dependent upon the requirements of any computer software that will subsequently process the output of your SDR33 (e.g., SOKKIA Software). To help you consistently code different features, the SDR33 stores feature code lists. The SDR33 can store as many lists and feature codes as you wish, constrained only by available memory space.

We will now create a feature code list and enter some appropriate codes to help us collect information for Mrs. Smith's job. Access the feature code list whenever you wish to enter a code (during actual field work) via the ***"Feature code list"*** entry in the ***"Functions"*** menu.

In this lesson you will:

Access the ***"Feature code"*** menu
Move through menus, screens
Name the feature code list
Learn how to correct typing errors
Enter feature codes
Learn how to delete and edit codes.

2.1 Quick summary

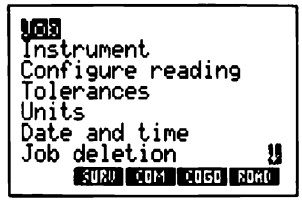
Brief steps for using feature codes are listed below:

- To create a new feature code list, press **<FUNC>** ***"Feature code list"*** **<LISTS> <ADD>**. Then type in name of new list.
- To select an existing feature code list, press **<FUNC>** ***"Feature code list"*** **<LISTS>**. Then position highlight cursor over the list you wish to select. Press **<OK>** or **<ENTER>**.
- To add a feature code to the currently selected list, press **<FUNC>** ***"Feature code list"*** **<ADD>**. Type in the new code. Press **<OK>** or **<ENTER>**.

2.2 Creating Feature code lists

Follow these steps to access the *"Feature code"* menu:

1. Enter the ***"Functions"*** menu. If you are in the ***"Start up screen,"*** press the **<F1>** key, which corresponds to the **<FUNC>** softkey. The following screen will appear:



   As you can see, there is no (visible) entry for the ***"Feature code list."*** Note, however, the **<⇓>** arrow character in the bottom–right corner of the screen (just above the softkeys); this indicates the ***"Functions"*** menu extends over more than one screen.

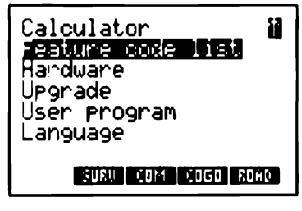
2. Move to the next screen of the menu by one of three ways:

   a. Press the **<⇓>** arrow key seven times

   b. Press the <⇑> arrow key once. Menus are circular — if you go off the bottom you get back to the top, and vice versa.

   c. Press the gold **<FUNC>** key followed by the **<⇓>** arrow key to go down a page.

The following screen displays:



Note: This screen has an <⇑> arrow at the top right of the screen, indicating that the menu extends onto a page above the currently–displayed one.

Moving through screens

Note: Whenever the SDR33 displays a logical "page" of data too long to fit onto one screen, it will position an <⇑> or <⇓> arrow (or both) in the top–right or bottom–right corner(s) of the screen to indicate that there is more information above and/or below the current screen. In such cases, pressing gold **<FUNC>** <⇑> will take you one screen–height up the logical "page." Pressing gold **<FUNC>** <⇓> will take you one screen–height down.

2.3 Naming feature code lists

Follow these steps to highlight and select the current name:

1. Highlight the ***"Feature code list"*** entry of the menu.

2. Press the **<ENTER>** or **<OK>** key to select this entry. The following screen displays:

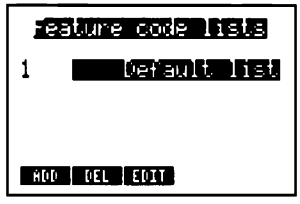
The name at the top of the screen is the name of the current feature–code list (the default being ***"Default list"***). We will change the name of this default list to "**TUTORIAL**".

2.4 Editing feature code lists

The ***"LISTS"*** softkey enables us to actually create, delete, or rename entire feature–code lists so we will use this feature to rename the ***"Default list."***

Follow these steps to rename the list:

1. Press the **<F4>** key corresponding to the ***"LISTS"*** softkey; you will see a screen like this:



Note: In the remainder of this **Guide**, we will direct you to press a softkey without giving its corresponding function key number. For example, in the above circumstance, instead of saying "Press the **<F4>** key corresponding to the ***"LISTS"*** softkey," we will say "Press the **<LISTS>** softkey."

This ***"Feature code lists"*** screen displays the names of all feature–code lists currently in the SDR33 memory. By default, only the list called ***"Default list"*** will be present. You can select an existing list and make it active (only the active list is used during the entry of feature–codes in field work) by highlighting the name of the desired list and pressing the **<ENTER>** or **<OK>** key. You can create a new list (which will then become the active list) by pressing the **<ADD>** softkey and entering a name for the new list. You can delete lists that are no longer required using the **<DEL>** softkey, and you can change the name of the currently–highlighted list using the **<EDIT>** softkey.

2. Press the **<EDIT>** softkey; you will see the following screen:

3. Type in the new list name as follows:

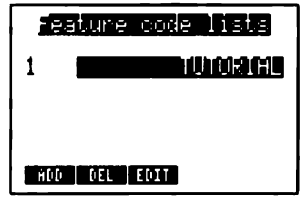
TUTORIAL

4. Blank out the rest of the line with spaces, then press the **<ENTER>** key.

Correcting typing errors

Note: When typing in names and values, correct errors by pressing the **<CLEAR>** key. This clears the whole field; pressing **<CLEAR>** again will reinstate the original value of the field. Pressing the **<BKSP>** key deletes the last character typed (the character to the immediate left of the cursor). Pressing the gold **<FUNC><DEL>** key–sequence deletes the character at the cursor location.

Your screen should be the ***"Feature code lists"*** screen with the name of the currently–highlighted list changed, as shown below:



5. Press the **<ENTER>** or **<OK>** key to get back to the first feature–code screen, which will have the new list name on the top line.

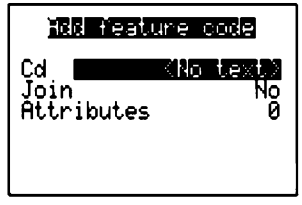
Note: Feature codes and job files are stored in the same memory space. If your codes use a lot of memory the capacity of the SDR33 for field and calculations data is reduced.

2.5 Entering feature codes

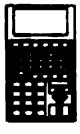
We will now proceed to add some feature codes to the "**TUTORIAL**" list.

Follow these steps to enter feature codes:

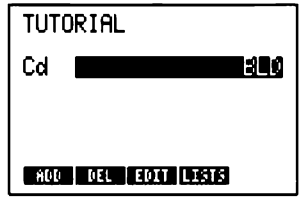
1. Press the **<ADD>** softkey. The following screen appears:



2. Type the following code:



BLD <OK>



This is the feature code for a "**B**ui**LD**ing."

3. Press **<ADD>** again and type:

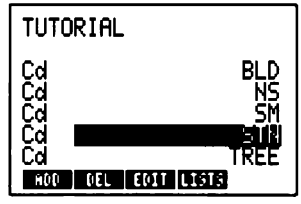
NS <OK>

This is a code for a "**N**atural **S**urface."

4. Type in the following codes in the same way:

Press: **<ADD>**
Type: **TREE <OK>**
Press: **<ADD>**
Type: **SM <OK>**
Press: **<ADD>**
Type: **STN <OK>**

The codes *SM* and *STN* denote "Survey Mark" and "STatioN."



Deleting and editing codes

Using the <⇑> and <⇓> arrow keys, you can scroll through the codes that you have entered. If you wish to delete any of the codes, position the cursor over the unwanted code and press the **<DEL>** softkey. Edit a particular code by positioning the cursor over it, pressing the **<EDIT>** softkey, and typing in a replacement code or fixing the old one.

5. Now that we have entered several feature codes, press **<CLEAR>** to return to the ***"Functions"*** menu and to the ***"Start up screen."***

Feature–code lists are described in detail in Chapter 8 of the **SDR33 Reference Manual**.

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Lesson 3 Collecting traverse data

In our example job we will measure a traverse around the perimeter of the lot to collect cadastral information as well as to provide control for a resection. We'll also complete topographical and setting out work.

In this lesson you will:

Enter coordinates of known points
Enter feature codes for points
Enter known azimuths and distances
Establish parameters for set collection
Pre–enter points for set collection
Initiate readings
Complete a traverse adjustment.

3.1 Entering coordinates of known points

Our first step in this operation is to enter the useful survey information that we already have (on our cadastral plan). We have the coordinates of two of our lot corners (0001 and 0004), as well as the azimuths and distances to several survey marks (3847, 3846, and 3830).

Follow these steps to enter coordinates of known points:

1. Move from the ***"Functions"*** menu (where you currently should be) to the ***"Survey"*** menu in either of two ways:

   a. Press **<CLEAR>** to move from the ***"Functions"*** menu to the ***"Start up screen."*** Then select the ***"Survey"*** menu my pressing the **<SURV>** softkey (which corresponds to the **<F2>** key).

   b. Press the **<SURV>** softkey on the ***"Functions"*** menu, and you go directly to the ***"Survey"*** menu.

   Each of the top–level menus (those accessible from the ***"Start up screen"***) has softkeys for direct access to the other top–level menus, thus avoiding the need to continually move up to the ***"Start up screen"*** and back down to the desired menu.

2. Select the ***"Survey"*** menu by pressing the **<SURV>** softkey from the ***"Start up screen."***

3. Select the ***"Keyboard input"*** entry of this menu (by using the **<⇓>** key or by pressing **<K>** directly).

4. Press the **<ENTER>** or **<OK>** key. The following screen appears:

We will enter the coordinates of one of our known points (0004), and then azimuths and distances from that known point to the others to demonstrate the SDR33's capabilities.

5. Select the ***"Key in coords"*** entry of the ***"Keyboard input"*** menu by pressing **<ENTER>** or **<OK>**. The following screen displays, which provides fields for the coordinates of a single point.

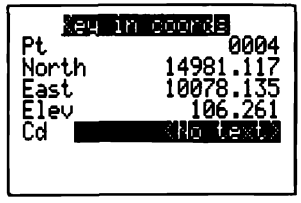
Automatic Point Ids

Note: You will notice that the ***"Pt"*** field already contains a (highlighted) point name (1000). The SDR33 maintains an ***"Auto Pt Id"*** field (in the ***"Configuration"*** menu) that determines the next point name. You can always override such automatically–generated point names, but they are often useful when you are progressing from point to point and none of the points are known/named.

6. Type in the following data with the cursor positioned over the ***"Pt"*** field.

For Pt,	type:	**4 <ENTER>**
For North,	type:	**14981.117 <ENTER>**
For East,	type:	**10078.135 <ENTER>**
For Elev,	type:	**106.261 <ENTER>**

Your screen should look like this:



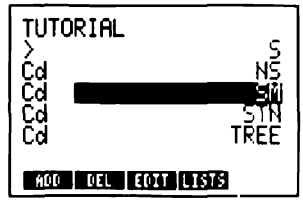
Now, since the point 0004 corresponds to a station, we should enter the feature code **STN** into the ***"Cd"*** field.

Follow these steps to enter a feature code for the point:

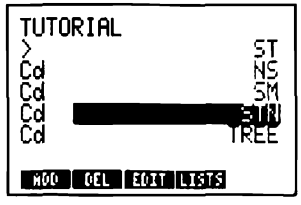
1. Position the cursor over the ***"Cd"*** field.

2. Press the **<S>** key.

   You will be automatically taken to the first feature code in the current list ("**TUTORIAL**") that starts with the letter **S**. The first code is **SM**, for **Survey Mark**, as indicated in the following display:

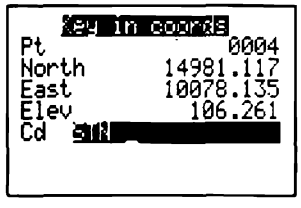


3. Press the **<T>** key and the cursor highlights the first feature code beginning with the letters **ST**, which is **STN** (for station).



4. Press the **<ENTER>** or **<OK>** key since this is the code we require.

   The ***"Key in coords"*** screen displays but with "**STN** _" in the ***"Cd"*** field. (A **'space'** character is automatically inserted in order that another code may be appended to the ***"Cd"*** field.)

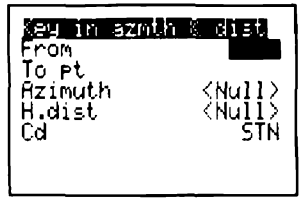


5. Press the **<ENTER>** or **<OK>** key to accept the current point and its coordinates. The SDR33 will beep and briefly display **"Input accepted"** before returning to the same screen (which will again be blank, except for the automatically–suggested point name and the **STN** code).

6. Press **<CLEAR>** to return to the ***"Keyboard input"*** menu (illustrated below) so you can enter azimuths and distances for other known points.

Follow these steps to enter known azimuths and distances:

1. Select the ***"Key in azmth & dist"*** entry by pressing the **<⇓>** key twice and then pressing **<ENTER>** or **<OK>**. The following screen displays:



   This screen accepts information about known points in a similar way to the ***"Key in coords"*** screen. In this screen the information required is an azimuth and distance between two named points. In addition to point 0004, whose coordinates we entered above, we know azimuths and distances between points 3847, 3846, 0001, and 3830.

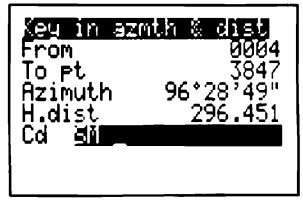
2. Enter the following data:

For From,	type:	**4 <ENTER>**
For To pt,	type:	**3847 <ENTER>**
For Azimuth,	type:	**96.2849 <ENTER>**
For H.dist,	type:	**296.451 <ENTER>**

Follow these steps to enter a feature code for the point:

1. Type **<S>** at the ***"Cd"*** prompt. This highlights the **SM** entry in the feature–code list.

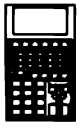
2. Press **<ENTER>** to accept the Survey Mark code (for point 3847).



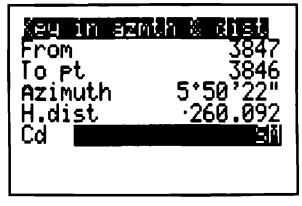
3. Press **<OK>** to accept the information on the screen. After saving the data, the SDR33 offers you the opportunity to enter an azimuth and distance between another pair of points.

Follow these steps to enter additional azimuths and distances:

1. Enter the following data:

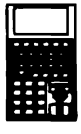


For From,	type:	**3847 <ENTER>**
For To pt,	type:	**3846 <ENTER>**
For Azimuth,	type:	**5.5022 <ENTER>**
For H.dist,	type:	**260.092 <ENTER>**
For Cd,	type:	**<OK>**

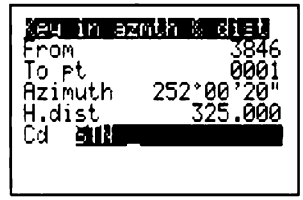


The information will be saved to the database.

2. Enter the following data for the azimuth and distance between points 3846 and 0001:



For From,	type:	**3846 <ENTER>**
For To pt,	type:	**1 <ENTER>**
For Azimuth,	type:	**252.0020 <ENTER>**
For H.dist,	type:	**325 <ENTER>**
For Cd,	type:	**<S> <T> <ENTER>**



3. Press **<OK>** to save the data.

4. Enter the following data as an azimuth and distance from point 0001 to point 3830:

For From,	type:	**1 <ENTER>**
For To pt,	type:	**3830 <ENTER>**
For Azimuth,	type:	**272.0819 <ENTER>**
For H.dist,	type:	**230.623 <ENTER>**
For Cd,	type:	**<S> <ENTER>**

5. Press **<OK>** to save the data.

   We have now entered the coordinates of one station, and azimuths and distances between four other known points.

6. Press the **<CLEAR>** key to get back to the main ***"Keyboard input"*** menu, and press it again to get out to the ***"Survey"*** menu. We will now proceed to observe a set from this station.

3.2 Set collection

The set–collection facilities provided by the SDR33 are considerably more sophisticated than those provided by the SDR20 series. Essentially, the ways

you may collect sets are controlled through a series of parameters. Once you have set these parameters for your purposes, you should be able to collect multiple sets, aided by the SDR33, without having to alter these parameters again.

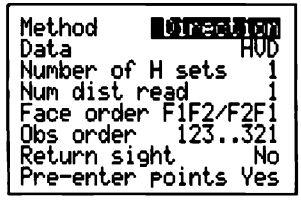
In order to calculate a traverse for Mrs. Smith's job, we will collect sets from the stations 0001, 0002, 0003, and 0004, as described in the remainder of this section.

Follow these steps to establish your set collection parameters:

1. Position the cursor on the ***"Set Collection"*** entry in the ***"Survey"*** menu and select it (using the **<ENTER>** or **<OK>** key). The following screen displays:

   This screen is where you enter your station name and backsight (and coordinates/azimuths, if these cannot be derived from data already entered). Also use it to set the parameters for set collection (via ***"OPTIONS"***).

2. Press the **<OPTIONS>** softkey; the following screen displays:



Note: It is good practice to check the suitability of the various parameters for your purposes each time you start set collection.

For a further explanation of the meaning of the various options, see the **SDR33 Reference Manual** (Chapter 11).

3. Make sure the options are as illustrated above (they should be, by default).

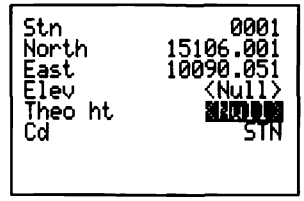
4. Press the **<OK>** key to accept these parameters; you will return to the ***"Confirm Orientation"*** screen shown previously. You should now type in the number of our first station (station 0001); type

Follow these steps to enter the station and its coordinates, the backsight, and points for set collection:

1. Type the number of our first station (station 0001):

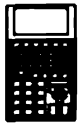
Type: **1 <Enter>**

The following screen appears:



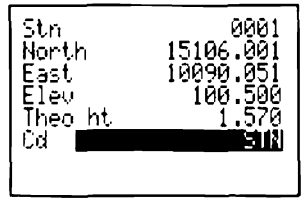
Note: The SDR33 derived the coordinates of point 0001 from the contents of the database (by following the chain from the coordinates for point 0004 through points 3847 and 3846 to 0001 using the keyed–in azimuths and distances). You only need to enter the elevation, theodolite height, and code for point 0001.

2. Position the cursor on the ***"Elev"*** field and enter the following data:



For Elev, type: **100.5 <ENTER>**
For Theo Ht, type: **1.57 <ENTER>**

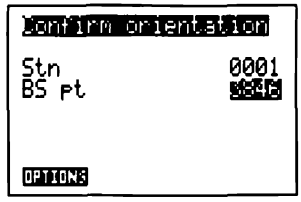
Your screen should look like this:



3. Press the **<ENTER>** or **<OK>** key to accept the station and its coordinates.

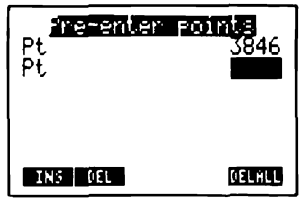
   You will return to the ***"Confirm Orientation"*** screen with the cursor now positioned on the ***"BS Pt"*** field.

4. Enter point 3846 for the backsight. Type the following:



3846 <OK>

The SDR33 computes the azimuth from the station 0001 to point 3846 and does not require you to explicitly enter the azimuth to the backsight. The message "**Analyzing Sets**" appears (while the SDR33 examines the database to see whether you have previously collected sets from station 0001), then the following screen appears:



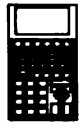
The ***"Pre–enter points"*** option (one of the set–collection parameters accessed by the **<OPTION>** key when you select ***"Set collection"***) specified that we wanted to pre–enter the names of all points that we would be observing in sets. The SDR33 can then prompt for observations to each point.

Note: If you normally do not follow any particular order of observation while collecting sets, change the ***"Pre–enter points"*** option to ***"No."*** In general, however, the SDR33 is of more assistance if you do pre–enter points, specify how many sets you wish to observe, and whether or not you want to take a return–sight, etc.

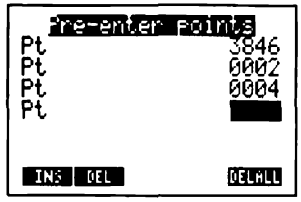
Point order

Notice that point 3846 (the backsight) has already been selected as the first point for observation. You may alter the order of observation so that the backsight is not the first point, but you will not be permitted to observe a set that does **not** contain any observation to the backsight. (The exception to this is if you are collecting sets to perform a resection.) In general, it is better to observe the backsight first in a set, particularly if you intend to take a return sight, because the first point observed in a set will be treated as the reference point. The difference(s) between the first observation to the reference point and the return observation to the reference point will be distributed across all other observations in the set. Thus, it makes more sense for the reference point to be the backsight, and the backsight to be the first point observed in a set.

5. Add the points 0002 and 0004 to the list of points to observe, by typing:



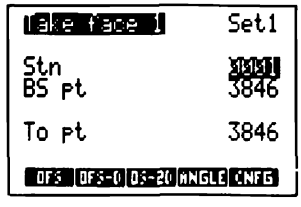
2 <ENTER>
4 <ENTER>



6. Press the **<OK>** key to indicate that the sequence of points to observe is complete.

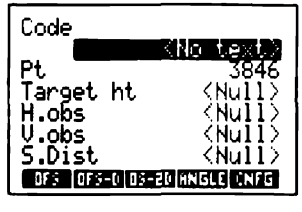
Follow these steps to take readings for the set from station 0001:

The following screen (called the ***"Take reading"*** screen) appears. After step 6 above. This screen informs you that you are taking face 1 of set 1 (i.e., the first face of the first set collected) from station 0001. The screen indicates that the backsight for this station is 3846 and that you should now sight to point 3846 and take a reading.



Note: The softkeys on the bottom of the ***"Take reading"*** screen indicate various types of readings that are possible at this point, including angles–only readings and various offset readings. In general, you press the large **<READ>** key to initiate a reading.

1. Press the **<ANGLE>** softkey to take an angles–only reading since we will not observe an EDM distance to our backsight. The following screen appears:



Note: The angle–only screen has a prompt for a slope distance that shows a null reading (also the case when you're using a total station). This field is included if you want to record a taped measurement.

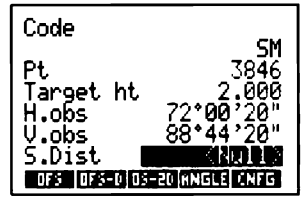
2. Enter the following data:

For Cd, type: **<S> <ENTER> <ENTER>**

Now the **SM** code is on the screen.

For Target ht,	type	**2 <ENTER>**
For H.obs,	type	**72.0020 <ENTER>**
For V.obs,	type	**88.4420 <ENTER>**

The screen should look like this:



3. Accept the data and move on the the next reading in one of two ways:

   a. Press **<OK>** to accept the screen of data and bring up the next point's ***"Take reading"*** prompt screen.

   b. Press **<READ>**, which accepts the current screen of data and automatically initiates the next reading.

Note: In practice, sight the total station at the new point with the previous point's data still on the screen before pressing **<READ>**.

4. Press **<READ>** and enter the following data (for point 0002):

For Cd,	type:	**<S> <T> <ENTER> <ENTER>**
For Target Ht,	type:	**1.75 <ENTER>**
For H.obs,	type:	**93.0517 <ENTER>**
For V.obs,	type:	**89.1624 <ENTER>**
For S.Dist,	type:	**215.316 <ENTER>**

5. Press the **<READ>** key to store this observation and start another reading. The SDR33 will prompt you to enter observations to each of the pre–entered points in turn.

6. Enter the following data (for point 0004):

For Cd,	type:	**<S> <T> <ENTER> <ENTER>**
For Target Ht,	type:	**1.7 <ENTER>**
For H.obs,	type:	**185.2705 <ENTER>**
For V.obs,	type:	**87.1840 <ENTER>**
For S.Dist,	type:	**125.59 <ENTER>**

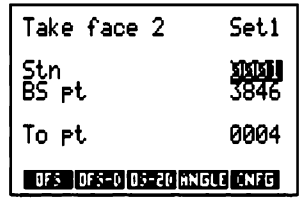
7. Press the **<READ>** key once more. The following message displays:

```
Turn face over ...

...Press any key...
```

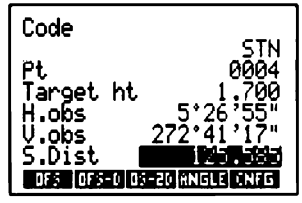
This message tells you to change faces on your theodolite.

8. Press any key and you will be able to start observations on the second face. Note that the first observation is to point 0004, the last point observed on the first face. This is because the set–collection parameter ***"Obs order"*** has the value "123. . .321," meaning that you observe points on alternate faces in opposite order.

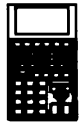


9. Press the **<READ>** key and enter information for the second–face observation to point 0004. Note that the ***"Cd"*** and ***"Target Ht"*** fields have been retained from the first face observation. Unless these have changed (in general, they won't have), move the cursor down to the ***"H.obs"*** field. Enter the following data:

For H.obs,	type:	**5.2655 <ENTER>**
For V.obs,	type:	**272.4117 <ENTER>**
For S.Dist,	type:	**125.585 <ENTER>**

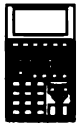


10. Press the **<READ>** key to initiate the second–face observation to point 0002. Again, the ***"Cd"*** and ***"Target Ht"*** fields are filled–in from the first–face observation; move the cursor down to the ***"H.obs"*** field and type in the following details:

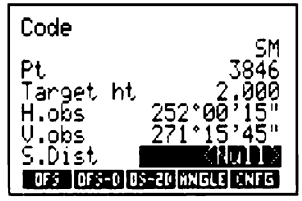


For H.obs,	type:	**273.0520 <ENTER>**
For V.obs,	type:	**270.4333 <ENTER>**
For S.Dist,	type:	**215.318 <ENTER>**

11. Press the **<ANGLE>** softkey to initiate the second (angles–only) observation to the backsight. Move the cursor down to the ***"H.obs"*** field and type in the following details:

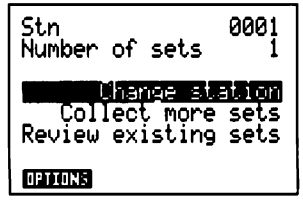


For H.obs, type: **252.0015 <ENTER>**
For V.obs, type: **271.1545 <ENTER>**



12. Press the **<OK>** key.

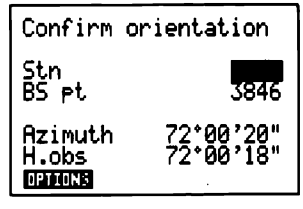
    The SDR33 displays the "**Processing Data**" message, and then the following screen appears:



We have collected our first set and will now collect a set from station 0002.

Follow these steps to enter the station, backsight and points for set collection:

1. Position the cursor on the ***"Change Station"*** entry in the menu illustrated above and press the **<ENTER>** or **<OK>** key. The ***"Confirm Orientation"*** screen (following) reappears:

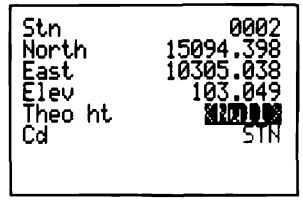


Note that the **<OPTIONS>** softkey is available at this screen.

2. Type the following in the ***"Stn"*** field to indicate station 0002:

2 <ENTER>

the following screen appears:



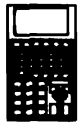
The coordinates displayed on this screen are the calculated values using the averages from the sightings made to station 0002 from station 0001 in the previously–collected set.

3. Enter a theodolite height by typing:

1.58 <ENTER>

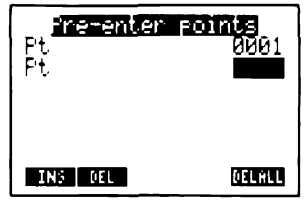
4. Accept this station by pressing the **<OK>** key. The ***"Confirm Orientation"*** screen displays with the cursor on the ***"BS pt"*** field.

5. Type the following to indicate point 0001 as the backsight:



1 <OK>

The SDR33 computes the azimuth from 0002 to 0001 and then asks us to pre–enter points:

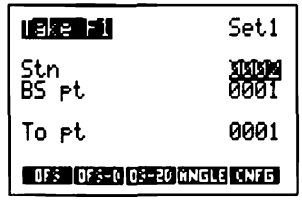


6. Type the following to indicate that we will observe point 0003:

3 <ENTER>

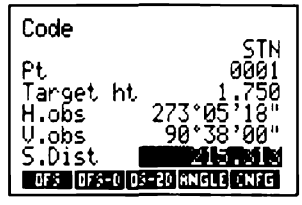
7. Press the **<OK>** key, and the ***"Take Reading"*** screen appears with a prompt to observe point 0001 (the backsight).

Follow these steps to take readings for the set from station 0002:

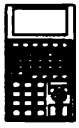


1. Press the **<READ>** key and enter the following data:

For Cd,	type:	**<S> <T> <ENTER> <ENTER>**
For Target Ht,	type:	**1.75 <ENTER>**
For H.obs,	type:	**273.0518 <ENTER>**
For V.obs,	type:	**90.38 <ENTER>**
For S.Dist,	type:	**215.313 <ENTER>**



2. Press the **<READ>** key to initiate the next reading (to point 0003). Enter the following data:



For Cd,	type:	**<S> <T> <ENTER> <ENTER>**
For Target Ht,	type:	**1.7 <ENTER>**
For H.obs,	type:	**185.2658 <ENTER>**
For V.obs,	type:	**82.4620 <ENTER>**
For S.Dist,	type:	**103.15 <ENTER>**

3. Press **<READ>**. The prompt to change faces displays

4. Press any key and then press **<READ>**.

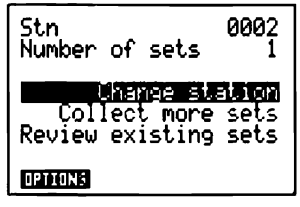
5. Enter the following information for point 0003 after moving the cursor down to the ***"H.obs"*** field:

For H.obs,	type:	**5.2703 <ENTER>**
For V.obs,	type:	**277.1343 <ENTER>**
For S.Dist,	type:	**103.152 <ENTER>**

6. Press **<READ>** and enter the following information for the final observation to point 0001:

For H.obs,	type:	**93.0520 <ENTER>**
For V.obs,	type:	**269.2204 <ENTER>**
For S.Dist,	type:	**215.31 <ENTER>**

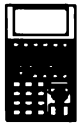
7. Press **<OK>**. Once again, you will reach the following screen:



Follow these steps to collect a set from station 0003:

1. Select ***"Change Station"*** and press **<ENTER>**.

2. Type the following in the ***"Stn"*** field:



3 <ENTER>

3. Note the coordinates calculated by the SDR33 for the point 3 and then enter the following theodolite height:

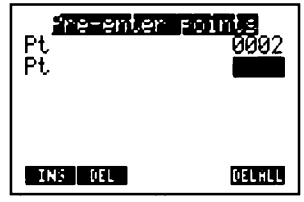
1.6 <ENTER>

4. Press **<OK>** to accept the station.

5. Type the following to indicate point 0002 as the backsight:

2 <OK>

You will again see the pre–entry screen (below) with the backsight (0002) already entered:



6. Enter point 0004 by typing:

4 <OK> <OK>

The ***"Take reading"*** screen displays.

7. Press the **<READ>** key. Enter the following data as observations to points 0002 and 0004 from station 0003:

Code	Point	Target Ht	H.obs	V.obs	S.Dist	
STN	0002	1.75	5.2703	97.0445	103.136	**<READ>**
STN	0004	1.7	266.5950	92.3050	217.69	**<READ>**
			. . . change faces . . .			
STN	0004	1.7	86.5948	267.2909	217.69	**<READ>**
STN	0002	1.75	185.2658	262.5515	103.135	**<OK>**

Follow these steps to collect a set from station 0004:

1. Select ***"Change Station."***

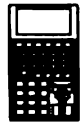
2. Enter the following in the ***"Stn"*** field:

4 <OK>

3. Enter the following theodolite height:

1.59 <OK>

4. Type the following to indicate point 0003 as the backsight:

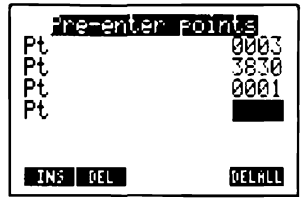


3 <OK>

5. Enter the following at the point pre–entry screen:

3830 <ENTER
1 <OK>

Your screen should look like this:

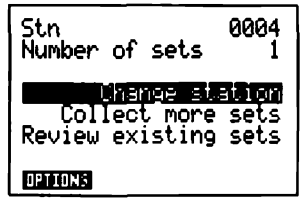


6. Press the **<OK>** key and enter the following data as observations for the set from station 0004:

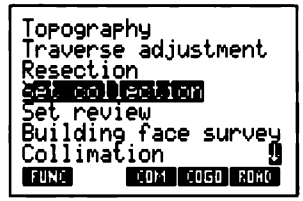
Press the **<ANGLE>** softkey as indicated below to initiate an angles–only reading.

Code	Point	Target Ht	H.obs	V.obs	S.Dist	
STN	0003	1.75	86.5950	87.2505	217.7	**<ANGLE>**
SM	3830	2	301.2455	89.0010		**<READ>**
STN	0001	1.7	5.27	92.3445	125.58	**<READ>**
			. . . change faces . . .			
STN	0001	1.7	185.2658	267.2515	125.577	**<ANGLE>**
SM	3830	2	121.25	270.5950		**<READ>**
STN	0003	1.75	266.5950	272.3458	217.7	**<OK>**

You will finally arrive at the following screen:



7. Press the **<CLEAR>** key to return to the ***"Survey"*** menu illustrated below:



We may now use the data collected in the above sets to calculate and adjust a traverse.

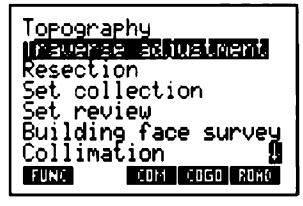
Note: Observations collected in sets may be viewed using the special ***"Set review"*** mechanism. This powerful facility is described in Chapter 11 of the **SDR33 Reference Manual**.

3.3 Traverse adjustment

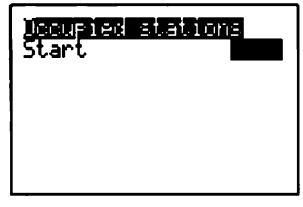
We will now use the information collected in the sets from stations 0001, 0002, 0003, and 0004 to perform a traverse adjustment.

Follow these steps to complete a traverse adjustment:

1. Highlight the ***"Traverse adjustment"*** entry on the ***"Survey"*** menu and press **<ENTER>** or **<OK>** to select it.



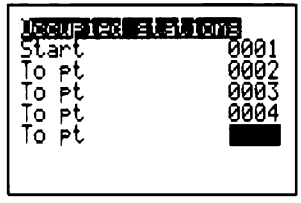
The ***"Occupied stations"*** screen (below) prompts you for the station point numbers that you occupied in the course of your traverse.



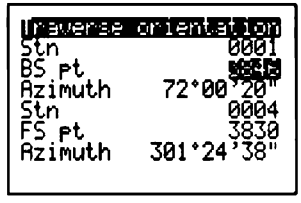
2. Type the following:

Type **1 <ENTER>**
Type **2 <ENTER>**

The traverse program automatically attempts to generate a route using the connected traverse stations in the job. Whenever the program arrives at a station that could be a useful closing point it stops (i.e., it ceases to display the "**Searching ...**" message) and awaits further station numbers to continue or close. In a few seconds you will see the following:

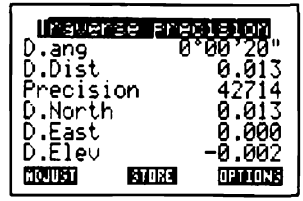


3. When stations 0001 to 0004 are shown on the screen, press **<OK>**. The message "**Processing data**" displays, and the following screen appears:



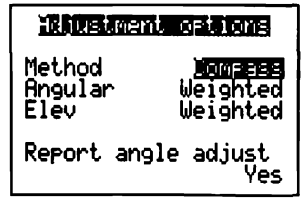
We will utilize the orientation shown in the above screen for this example.

4. Press the **<OK>** key to accept this orientation. The SDR33 then calculates a closure using the two established survey marks (3846 and 3830) and our occupied stations (0001 to 0004). The following screen shows the results of this calculation:



5. Record this traverse precision data by selecting the **<STORE>** softkey. This action stores two notes in the database that record the traverse misclose (closure) details shown on the above screen. The **<STORE>** softkey will disappear once it has been selected.

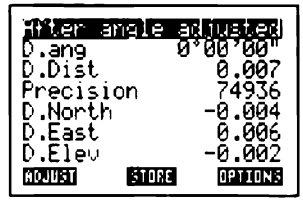
6. Check and/or set the traverse adjustment options by selecting the **<OPTIONS>** softkey. The following screen displays:



The ***"Method"*** field allows you to select the coordinate adjustment method to be used in the traverse adjustment. Leave this set on the default ***"Compass"*** method. This will adjust the coordinates according to the Compass (also referred to as Bowditch) rule. The other fields on this screen should be set as shown. Refer to the **SDR33 Reference Manual** (Chapter 12) for details relating to the traverse adjustment methods.

7. Select **<OK>** to save these traverse adjustment options and return to the previous ***"Traverse precision"*** screen.

8. Select the **<ADJUST>** softkey to carry out the angular adjustment. The angular adjustment is always carried out first when it is applied. After the angular adjustment has been computed the following screen displays:



The displayed traverse misclose details are the revised values computed after the angular misclose in the traverse has been adjusted out.

9. Select the **<STORE>** softkey to record the misclose details in the SDR33 database.

10. Select the **<ADJUST>** softkey to carry out the coordinate adjustment. Once the coordinate adjustment has been completed, the adjusted coordinates for each traverse point are stored at the end of the database. These coordinates will then be used in all subsequent calculations involving these traverse points. Once these adjusted coordinates have been saved, the ***"Survey"*** menu displays.

The following printout produced by the SDR33 shows the contents of the database (for the "**SMITH 001**" job) after this lesson has been completed. Note the POS records with the adjusted coordinates of traverse points (2 and 3) at the end of the printout.

SDR33 V04–03.00	Copyright STI		13–May–92 11:57
	Angle Degrees	Dist Meters	Press Millibar
	Temp Celsius	Coord N–E–Elev	
JOB	SMITH 001	Point id Numeric (4)	
	Atmos crn No	C and R crn No	Refract const 0.14
	Record elev Yes	Sea level crn No	
SCALE	S.F. 1.00000000		
NOTE TS	12–May–92 09:59		
NOTE	LOT4 DP356784	16 SHIRAZ RD	DOONVILLE
INSTRUMENT	Manual	EDM <No text>	EDM serial 000000
	Theo desc <No text>	Theo serial 000000	Mount Not applic
	V.obs Zenith	EDM o/s <Null>	Refl o/s <Null>
	P.C. mm 0.000		
NOTE TS	12–May–92 10:15		

POS KI 0004	North 14981.117	East 10078.135	Elev 106.261
	Code STN		
RED KI 0004–3847	Azimuth 96–28'49"	H.dist 296.451	V.dist <Null>
	Code SM		
RED KI 3847–3846	Azimuth 5–50'22"	H.dist 260.092	V.dist <Null>
	Code SM		
RED KI 3846–0001	Azimuth 252–00'20"	H.dist 325.000	V.dist <Null>
	Code STN		
RED KI 0001–3830	Azimuth 272–08'19"	H.dist 230.623	V.dist <Null>
	Code SM		
STN SC 0001	North 15106.001	East 10090.051	Elev 100.500
	Theo ht 1.570	Code STN	
SET SC 0001	Set # 1	Point count 6	
TARGET	Target ht 2.000		
OBS F1 0001–3846	S.dist <Null>	V.obs 88–44'20"	H.obs 72–00'20"
	Code SM		
NOTE TS	12–May–92 10:25		
TARGET	Target ht 1.750		
OBS F1 0001–0002	S.dist 215.316	V.obs 89–16'24"	H.obs 93–05'17"
	Code STN		
TARGET	Target ht 1.700		
OBS F1 0001–0004	S.dist 125.590	V.obs 87–18'40"	H.obs 185–27'05"
	Code STN		
OBS F2 0001–0004	S.dist 125.585	V.obs 272–41'17"	H.obs 5–26'55"
	Code STN		
TARGET	Target ht 1.750		
OBS F2 0001–0002	S.dist 215.318	V.obs 270–43'33"	H.obs 273–05'20"
	Code STN		
TARGET	Target ht 2.000		
OBS F2 0001–3846	S.dist <Null>	V.obs 271–15'45"	H.obs 252–00'15"
	Code SM		
NOTE SC	The following MCs are derived from set(s) 1		
OBS MC 0001–3846	S.dist <Null>	V.ang <Null>	Azimuth 72–00'20"
	Code SM		
OBS MC 0001–0002	S.dist 215.315	V.ang 89–19'18"	Azimuth 93–05'21"
	Code STN		
OBS MC 0001–0004	S.dist 125.581	V.ang 87–22'15"	Azimuth 185–27'03"
	Code STN		
BKB SC 0001–3846	Azimuth 72–00'20"	H.obs 72–00'18"	
STN SC 0002	North 15094.398	East 10305.038	Elev 103.049

	Theo ht 1.580	Code STN	
SET SC 0002	Set # 1	Point count 4	
TARGET	Target ht 1.750		
OBS F1 0002–0001	S.dist 215.313	V.obs 90–38'00"	H.obs 273–05'18"
	Code STN		
NOTE TS	12–May–92 10:36		
TARGET	Target ht 1.700		
OBS F1 0002–0003	S.dist 103.150	V.obs 82–46'20"	H.obs 185–26'58"
	Code STN		
OBS F2 0002–0003	S.dist 103.152	V.obs 277–13'43"	H.obs 5–27'03"
	Code STN		
TARGET	Target ht 1.750		
OBS F2 0002–0001	S.dist 215.310	V.obs 269–22'04"	H.obs 93–05'20"
	Code STN		
NOTE SC	The following MCs are derived from set(s) 1.		
OBS MC 0002–0001	S.dist 215.313	V.ang 90–40'41"	Azimuth 273–05'21"
	Code STN		
OBS MC 0002–0003	S.dist 103.136	V.ang 82–50'17"	Azimuth 185–27'02"
	Code STN		
BKB SC 0002–0001	Azimuth 273–05'21"	H.obs 273–05'19"	
STN SC 0003	North 14992.530	East 10295.317	Elev 115.908
	Theo ht 1.600	Code STN	
SET SC 0003	Set # 1	Point count 4	
OBS F1 0003–0002	S.dist 103.136	V.obs 97–04'45"	H.obs 5–27'03"
	Code STN		
TARGET	Target ht 1.700		
OBS F1 0003–0004	S.dist 217.690	V.obs 92–30'50"	H.obs 266–59'50"
	Code STN		
OBS F2 0003–0004	S.dist 217.690	V.obs 267–29'09"	H.obs 86–59'48"
	Code STN		
TARGET	Target ht 1.750		
OBS F2 0003–0002	S.dist 103.135	V.obs 262–55'15"	H.obs 185–26'58"
	Code STN		
NOTE SC	The following MCs are derived from set(s) 1.		
OBS MC 0003–0002	S.dist 103.154	V.ang 97–09'43"	Azimuth 5–27'02"
	Code STN		
OBS MC 0003–0004	S.dist 217.694	V.ang 92–32'25"	Azimuth 266–59'51"
	Code STN		
BKB SC 0003–0002	Azimuth 5–27'02"	H.obs 5–27'01"	

STN SC 0004	North 14981.117	East 10078.135	Elev 106.261
	Theo ht 1.590	Code STN	
NOTE TS	12–May–92 10:46		
SET SC 0004	Set # 1	Point count 6	
OBS F1 0004–0003	S.dist 217.700	V.obs 87–25'05"	H.obs 86–59'50"
	Code STN		
TARGET	Target ht 2.000		
OBS F1 0004–3830	S.dist <Null>	V.obs 89–00'10"	H.obs 301–24'55"
	Code SM		
TARGET	Target ht 1.700		
OBS F1 0004–0001	S.dist 125.580	V.obs 92–34'45"	H.obs 5–27'00"
	Code STN		
OBS F2 0004–0001	S.dist 125.577	V.obs 267–25'15"	H.obs 185–26'58"
	Code STN		
TARGET	Target ht 2.000		
OBS F2 0004–3830	S.dist <Null>	V.obs 270–59'50"	H.obs 121–25'00"
	Code SM		
TARGET	Target ht 1.750		
OBS F2 0004–0003	S.dist 217.700	V.obs 272–34'58"	H.obs 266–59'50"
	Code STN		
NOTE SC	The following MCs are derived from set(s) 1.		
OBS MC 0004–0003	S.dist 217.693	V.ang 87–27'35"	Azimuth 86–59'31"
	Code STN		
OBS MC 0004–3830	S.dist <Null>	V.ang <Null>	Azimuth 301–24'38"
	Code SM		
OBS MC 0004–0001	S.dist 125.583	V.ang 92–37'45"	Azimuth 5–26'40"
	Code STN		
BKB SC 0004–0003	Azimuth 86–59'31"	H.obs 86–59'50"	
NOTE TS	12–May–92 10:56		
NOTE TV	Start 0001	To pt 0004	
NOTE TV	BS pt 3846	Azimuth 72–00'20"	
NOTE TV	FS pt 3830	Azimuth 301–24'38"	
NOTE TV	Method Compass	Angular Weighted	Elev Weighted
NOTE TV	D.ang 0–00'20"	D.Dist 0.013	Precision 42714
NOTE TV	D.North 0.013	D.East 0.000	D.Elev –0.002
NOTE TV	Method Compass	Angular Weighted	Elev Weighted
NOTE TV	D.ang 0–00'00"	D.Dist 0.007	Precision 74936
NOTE TV	D.North –0.004	D.East 0.006	D.Elev –0.002
POS AJ 0002	North 15094.403	East 10305.035	Elev 103.049

	Code STN		
POS AJ 0003	North 14992.526	East 10295.318	Elev 115.909
	Code STN		

** End of report **

Lesson 4 Collecting Topographical Data

In this lesson you will:

Complete station setup and backsight for topography observations
Take topography readings
Take offset readings.

4.1 Quick summary

A brief outline of steps to collect topographical data is listed below:

1. Select job name; default is current job.
2. Press: **<SURV>** softkey and select ***"Topography"*** option.
3. Enter the required information for **Stn** (Id of instrument set up) and **Theo ht. North, East, Elev,** and **Cd** (identification of observed point) are optional. (Bold text represents a screen prompt or message.)
4. Enter **BS pt** (Id of point used as backsight).
5. **Key in azimuth** to BS or **Key in coords** of BS. Move highlight cursor to select. Azimuth required if **Stn** coord not given in step (3).
6. Connect to instrument, press **<READ>** key to take BS observation, enter target height (instrument must be on and pointed at target).
7. You may change **Stn** number or **BS pt** number or take previous observation again. Otherwise take additional observations to continue survey.
8. Enter codes as needed, last code repeats unless overwritten. If keys pressed for code match feature–code list entries, the list is displayed with the matched code highlighted. If the highlighted code is correct, press **<OK>** or **<ENTER>** to copy it into the code field on the measurement screen.
9. Press **<OK>** to store data or press **<READ>**, and the previous observation is stored before beginning the new observation. If you wish to reject a reading, press **<CLEAR>** and answer the **Discard data?** question.

10. To move to new set up, change **Stn** number and **BS pt**, and continue from step (5) above.

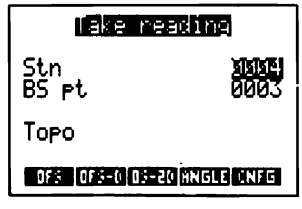
4.2 Setup and backsight

Mrs. Smith requires a simple contour and detail survey to check on a copy of a previous survey. After the previous lesson you should still be in the ***"Survey"*** menu.

Follow these steps to complete setup and backsight:

1. Press **<T>** or use the arrow keys to highlight the ***"Topography"*** entry:

2. Press **<ENTER>** or **<OK>**. The following screen appears:



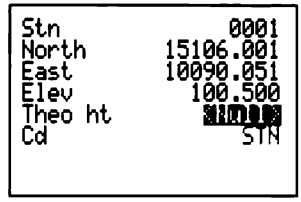
An alternate way to enter *"Topography"*

Note: Whenever you are **not** taking readings for some other purpose (i.e., whenever you are not collecting sets or performing a resection, etc.) pressing the **<READ>** key automatically enters topographical surveying mode in the same way as selecting the ***"Topography"*** entry of the ***"Survey"*** menu.

3. Highlight the ***"Stn"*** field and type:

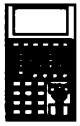
1 <ENTER>

The following station setup screen appears:



This screen shows the coordinates for the station 0001.

4. Position the cursor on the ***"Theo ht"*** field and type



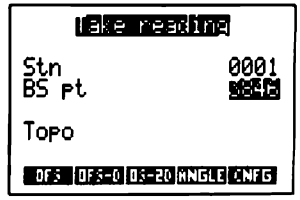
1.59 <ENTER>

5. Press the **<OK>** key to accept the station's details. You will return to the ***"Take reading"*** screen with the cursor on the ***"BS pt"*** field.

6. Type:

3846

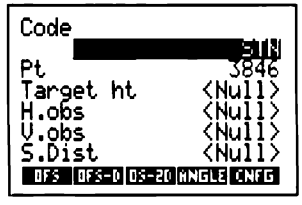
This indicates 3846 as the backsight for station 0001.



7. Press **<OK>** and the SDR33 searches its database and finds the most recent record of point 3846; it uses this record to calculate the orientation once a reading has been taken to the backsight.

The SDR33 should now be prompting you to ***"Take BS reading."***

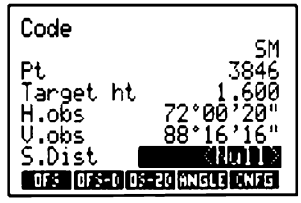
8. Press the **<ANGLE>** softkey to take an angles–only reading to the backsight. The following screen appears:



9. Enter the following data:

For Cd,	type:	**<S> <ENTER> <ENTER>**
For Target ht,	type:	**1.6 <ENTER>**
For H.obs,	type:	**72.0020 <ENTER>**
For V.obs,	type:	**88.1616 <ENTER>**

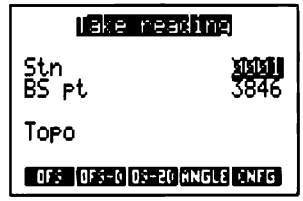
The display should look like this:



10. Press the **<OK>** key to accept the observation to the backsight. The ***"Take reading"*** screen will re–appear.

4.3 Topography readings

The SDR33 is ready for you to take topography readings. It displays the current station and backsight points to remind you where you are set up and displays the ***"Topo"*** message to indicate topographical mode.

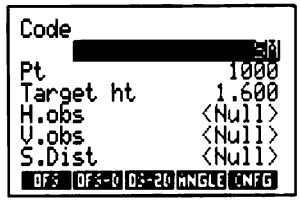


Follow these steps to take topography readings from station 0001:

1. Press the **<READ>** key to initiate a reading.

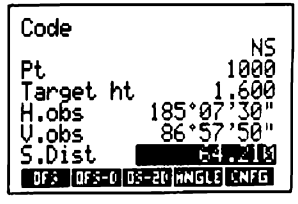
Note: In normal practice, your SDR33 would be connected to a theodolite or total station, and you would sight to a target point before pressing the **<READ>** key.

The following screen appears (note that the ***"Pt"*** field has been automatically filled in with point number 1000).



2. Enter the following data:

For Cd,	type:	**<N> <ENTER> <ENTER>**
For Target ht,	type:	**1.6 <ENTER>**
For H.obs,	type:	**185.0730 <ENTER>**
For V.obs,	type:	**86.5750 <ENTER>**
For S.Dist,	type:	**64.21**



3. Press the **<READ>** key to initiate the next reading.

4. Enter the following data in the same manner as above:

Code	Pt	Target Ht	H.obs	V.obs	S.Dist	
NS	1001	1.6	159.3650	86.18	126.2	**<READ>**
NS	1002	1.6	140.3420	86.1340	79.94	**<READ>**
NS	1003	1.6	96.0120	89.0050	59.22	**<OK>**

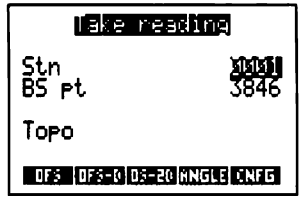
You have now entered observations to points 1000, 1001, 1002, and 1003, all of which were given the code of **NS** and target height of **1.6**.

4.4 Changing stations

At this point, we move on to station 0002.

Follow these steps to take topography readings from station 0002:

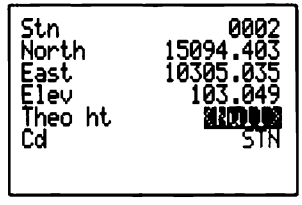
1. Highlight the ***"Stn"*** field of the ***"Take reading"*** screen.



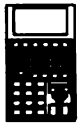
2. Type

2 <ENTER>

The coordinates for station 0002 display:

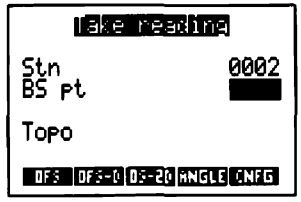


3. Type in this theodolite height:



1.57

Press **<OK>** to accept the station setup for 0002.

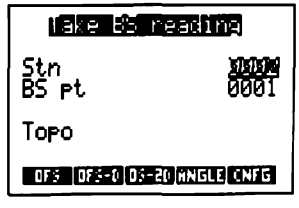


You will now be prompted for the backsight station number.

4. Type

1 <ENTER>

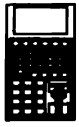
The SDR33 computes the azimuth to 0001 from 0002, and uses this to calculate the orientation once you have taken an observation to the backsight.



The SDR33 prompts you to **"Take BS reading."**

5. Press the **<READ>** key to take a full reading to point 0001.

6. Type in the following data:

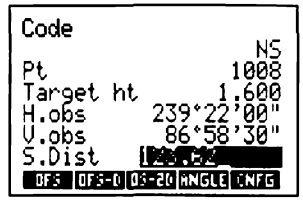


For Cd,	**type**	**<S> <T> <ENTER> <ENTER>**
For Target ht,	**type**	**1.6 <ENTER>**
For H.obs,	**type**	**273.0521 <ENTER>**
For V.obs,	**type**	**90.4015 <ENTER>**
For S.Dist,	**type**	**215.315**

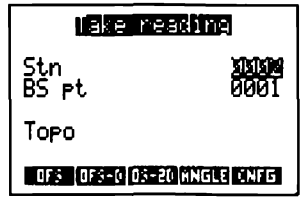
7. Press the **<READ>** key to initiate a topography reading immediately.

8. Type in the following data to take observations to points 1004, 1005, 1006, 1007 and 1008, all with a code of **NS** and target height of **1.6**.

Code	Pt	Target Ht	H.obs	V.obs	S.Dist	
NS	1004	1.6	271.5650	90.3450	95.4	**<READ>**
NS	1005	1.6	272.34	90.43	46.34	**<READ>**
NS	1006	1.6	244.01	87.5330	114.24	**<READ>**
NS	1007	1.6	240.3230	87.3645	123.72	**<READ>**
NS	1008	1.6	239.22	86.5830	123.62	

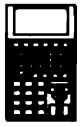


After pressing **<OK>** you will be back in the following screen:



Follow these steps to take readings from station 0003:

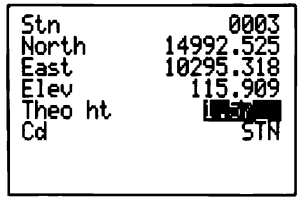
1. Position the cursor on the ***"Stn"*** field and type:



3 <ENTER>

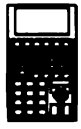
2. Type in a theodolite height:

1.57



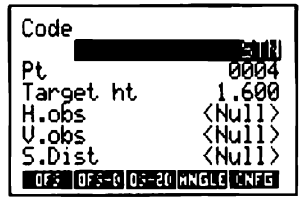
3. Press **<OK>** to accept the station setup and return to the ***"take reading"*** screen.

4. Type the backsight point:



4 <ENTER>

5. Press the **<READ>** key to take an observation to the backsight.

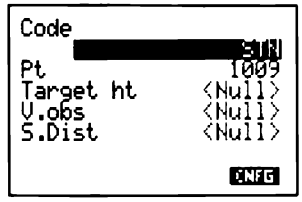


6. Enter the following data:

For Cd,	type:	**<S> <T> <ENTER> <ENTER>**
For Target ht ,	type:	**1.57 <ENTER>**
For H.obs,	type:	**266.5951 <ENTER>**
For V.obs,	type:	**92.3157 <ENTER>**
For S.Dist,	type:	**217.693 <OK>**

4.5 Offset readings

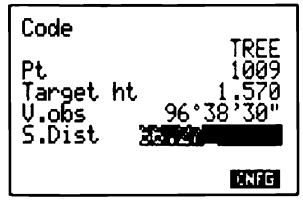
Our first reading from this station is an offset reading to a tree. In the field, you would position the prism to one side of the tree and the same distance from the instrument as the tree. You would sight on the prism then press the **<OFS>** softkey to take an offset reading; the following screen would display:



Follow these steps to complete an offset reading to a tree:

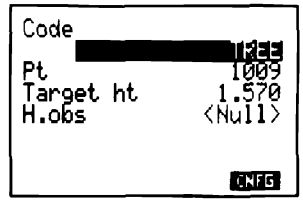
1. Type in the following data:

	Press	**<OFS>**
For Cd,	type:	**<T> <ENTER> <ENTER>**
For Target ht	type:	**1.57 <ENTER>**
For V.obs,	type:	**96.3830 <ENTER>**
For S.Dist,	type:	**66.27 <ENTER>**



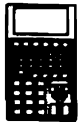
At this point, you would sight your instrument to the center of the tree trunk and press the **<READ>** key.

2. Press the **<READ>** key now and the following screen appears:



Note: The code, point number, and target height have been brought forward from the previous screen.

3. Move the cursor to the ***"H.obs"*** field and type:



325.0730 <ENTER>

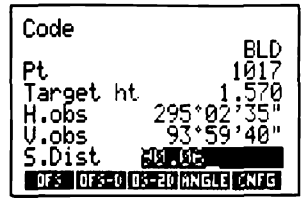
4. Press the **<READ>** key to initiate the following topographical observations and enter the following data:

Code	Point	Target Ht	H.obs	V.obs	S.Dist	
NS	1010	1.57	4.04	97.18	55.6	**<READ>**
NS	1011	1.57	273.23	92.2850	39.88	**<READ>**
NS	1012	1.57	295.55	94.0030	89.74	**<READ>**
NS	1013	1.57	268.39	92.3410	94.15	**<READ>**
NS	1014	1.57	285.0230	93.3440	100.54	**<READ>**
NS	1015	1.57	287.3120	93.4450	83.87	**<READ>**
NS	1016	1.57	287.5550	94.1310	85.28	**<READ>**

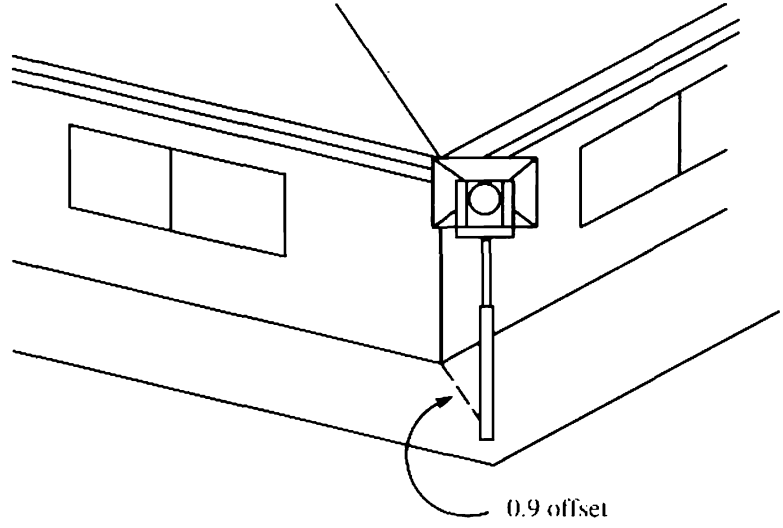
Follow these steps to complete an offset reading to the northeastern corner of the house:

1. Enter the following data:

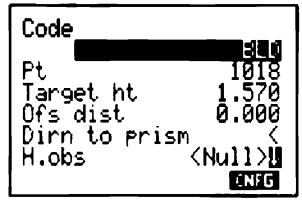
Code	Point	Target Ht	H.obs	V.obs	S.Dist	
BLD	1017	1.57	295.0235	93.5940	90.06	**<OK>**



To determine the orientation of the house, we will take a different kind of offset reading. For your reading point, you would point your instrument at the prism pole in line with the southeastern corner of the building. The prism is between the instrument and the building corner as shown in the following diagram :



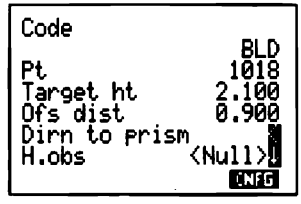
2. Press the **<OFS–D>** softkey to initiate an offset reading using a direction and offset distance. The following screen appears:



3. Position the cursor on the ***"Target ht"*** field and enter the following data:

For Target ht,	type:	**2.1 <ENTER>**
For Ofs dist,	type:	**0.9 <ENTER>**

The cursor is now positioned on the ***"Dirn to prism"*** field.



The *"Direction to prism"* field

Note: The ***"Dirn to prism"*** field is a selector field whose values indicate the position of the object relative to the prism. The position is given from the viewpoint of the person at the instruments as follows:

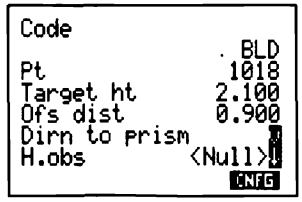
"<" indicates that the prism is to the left of the object,

">" indicates that the prism is to the right of the object,

"^" indicates that the prism is behind the object, and

"v" indicates that the prism is in front of the object.

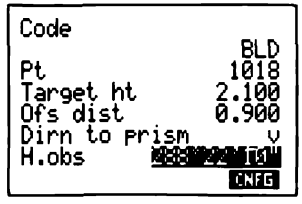
4. Use the <⇐> and <⇒> arrows until the ***"Dirn to prism"*** field has the value "v" so the prism is in front of the object being observed.



5. Press **<ENTER>**.

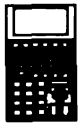
6. Position the cursor on the ***"H.obs"*** field and enter the following data:

For H.obs, type: **288.2210 <ENTER>**



The screen automatically scrolls up.

7. Enter the following data:



For V.obs, type: **94.11 <ENTER>**
For S.Dist, type: **86 <ENTER>**

8. Press the **<OK>** key to accept the offset observation.

This concludes the tutorial on topographical data collection. (We will make use of these observations in subsequent tutorials).

9. Press the **<CLEAR>** key to move back to the ***"Survey"*** menu.

More information about the topography program can be found in Chapter 7 of the **SDR33 Reference Manual**.

The following is a printout produced by the SDR33 showing the topographical data collected in the tutorial just completed:

SDR33 V04–03.00	Copyright STI		13–May–92 12:00
	Angle Degrees	Dist Meters	Press Millibar
	Temp Celsius	Coord N–E–Elev	
JOB	SMITH 001	Point id Numeric (4)	
	Atmos crn No	C and R crn No	Refract const 0.14
	Record elev Yes	Sea level crn No	
SCALE	S.F. 1.00000000		
NOTE TS	12–May–92 09:59		
NOTE	LOT4 DP356784	16 SHIRAZ RD	DOONVILLE
INSTRUMENT	Manual	EDM <No text>	EDM serial 000000
	Theo desc <No text>	Theo serial 000000	Mount Not applic
	V.obs Zenith	EDM o/s <Null>	Refl o/s <Null>
	P.C. mm 0.000		
NOTE TS	12–May–92 11:12		

The details of the first lessons are omitted for brevity, see Appendix A for a full printout ...

STN TP 0001	North 15106.001	East 10090.051	Elev 100.500
	Theo ht 1.590	Code STN	
BKB TP 0001–3846	Azimuth 72–00'20"	H.obs 72–00'20"	
TARGET	Target ht 1.600		
OBS F1 0001–3846	S.dist <Null>	V.obs 88–16'16"	H.obs 72–00'20"
	Code SM		
POS TP 1000	North 15042.137	East 10084.323	Elev 103.891
	Code NS		
POS TP 1001	North 14987.952	East 10133.920	Elev 108.634
	Code NS		
POS TP 1002	North 15044.387	East 10140.711	Elev 105.749
	Code NS		
POS TP 1003	North 15099.789	East 10148.935	Elev 101.509
	Code NS		
STN TP 0002	North 15094.403	East 10305.035	Elev 103.049
	Theo ht 1.570	Code STN	
BKB TP 0002–0001	Azimuth 273–05'17"	H.obs 273–05'21"	

OBS F1 0002–0001	S.dist 215.315	V.obs 90–40'15"	H.obs 273–05'21"
POS TP 1004	North 15097.642	East 10209.695	Elev 102.053
	Code NS		
POS TP 1005	North 15096.477	East 10258.745	Elev 102.440
	Code NS		
POS TP 1006	North 15044.385	East 10202.413	Elev 107.222
	Code NS		
POS TP 1007	North 15033.609	East 10197.405	Elev 108.173
	Code NS		
POS TP 1008	North 15031.499	East 10198.816	Elev 109.543
	Code NS		
NOTE TS	12–May–92 11:23		
STN TP 0003	North 14992.526	East 10295.318	Elev 115.909
	Theo ht 1.570	Code STN	
BKB TP 0003–0004	Azimuth 266–59'35"	H.obs 266–59'51"	
TARGET	Target ht 1.570		
OBS F1 0003–0004	S.dist 217.693	V.obs 92–31'57"	H.obs 266–59'51"
	Code STN		
POS TP 1009	North 15046.526	East 10257.675	Elev 108.244
	Code TREE		
POS TP 1010	North 15047.557	East 10299.226	Elev 109.005
	Code NS		
POS TP 1011	North 14994.874	East 10255.544	Elev 114.183
	Code NS		
POS TP 1012	North 15031.645	East 10214.797	Elev 109.636
	Code NS		
POS TP 1013	North 14990.302	East 10201.288	Elev 111.688
	Code NS		
POS TP 1014	North 15018.559	East 10198.410	Elev 109.635
	Code NS		
POS TP 1015	North 15017.717	East 10215.508	Elev 110.428
	Code NS		
POS TP 1016	North 15018.703	East 10214.397	Elev 109.634
	Code NS		
POS TP 1017	North 15030.549	East 10213.919	Elev 109.635
	Code BLD		
NOTE TS	12–May–92 11:35		
TARGET	Target ht 2.100		
NOTE OS	86.000 94–11'00"	288–22'10"	OS 0.900
NOTE OS	Dirn v		
POS TP 1018	North 15019.833	East 10213.061	Elev 109.105
	Code BLD		

** End of report **

Lesson 5 Viewing the Database

The database for the current job is always accessible for viewing by pressing the **<VIEW>** key. The SDR33's eight–line screen makes it easy to examine data in the database. The view screen also provides you with search and scrolling capabilities that make finding data easy.

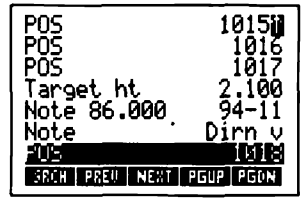
In this lesson you will:

Move through the database
Search the database
View records
Add a note to the database.

5.1 Moving through the database

Follow these steps to move through the database:

1. Press the **<VIEW>** key, and the following screen appears:



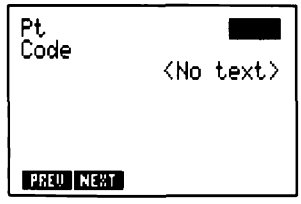
The SDR33 screen provides you with a window to view a portion of the job database. Whenever you press **<VIEW>**, the SDR33 displays the end of the current job. Any work you have just completed is immediately visible. This level gives you an abridged description of each record in the database; you can see up to seven records on the screen at once. There is a more detailed view available where the information for a single record is displayed on an entire screen. We will discuss this view after learning how to search.

2. Move the highlighted cursor from one entry to another in the database using the **<⇑>** and **<⇓>** arrow keys. Pressing the gold **<FUNC>** **<⇑>**

(or gold **<FUNC>** **<⇓>**) to move up (or down) by one screen–height (i.e., seven lines).

5.2 Searching

To search for a particular point within the database, press the **<SRCH>** (for "search") softkey. The following screen appears:



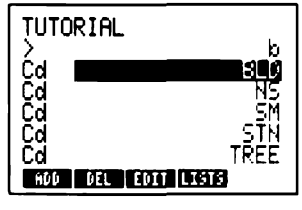
You can search for objects in the database by:

- specifying a point name (which would be typed into the ***"Pt"*** field of the above screen), **or**
- specifying a code (in the ***"Code"*** field).

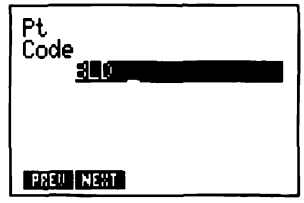
If you specify both a point name **and** a code, the SDR33 will search for any records that match **either** the given point name **or** the given code. You can also search forwards or backwards in the database.

Follow these steps to complete an example search of the database:

1. Press the **<SRCH>** softkey.
2. Highlight the ***"Code"*** field of the above screen (using the **<⇓>** key) and type **<B>**. This activates the feature–code list, with the ***"BLD"*** code highlighted, as shown below:

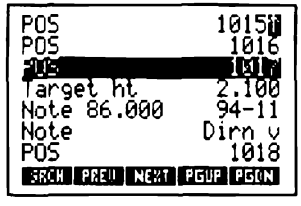


3. Press **<ENTER>** to accept "**BLD**" and return to the searching screen.



4. Press the **<OK>** key to start searching for the most recent record in the database that contained the code "**BLD**." (Since you were positioned at the end of the database, the search went backwards towards the beginning of the database by default).

   Your screen should look like this with a position **(POS)** record for point 1017 highlighted.

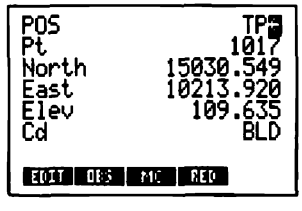


As mentioned above, you are now looking at an abridged view of records in the database.

Follow these steps to examine the details of each record:

1. Highlight the record in this abridged–view.
2. Press **<ENTER>** or the **<⇒>** key.

   If you highlight the **Pos** record for point 1017, and press the **<⇒>** key, this screen appears:



Note: The softkeys at the bottom of this inner "view" level constitute the SDR33's powerful "data–view" mechanism, described in detail in Chapter 5 of the **SDR33 Reference Manual**.

This screen displays the coordinates of point 1017, which we observed in the previous (topography) tutorial. As you can see, the code we entered for point 1017 was "**BLD**," so our search correctly located the point for us.

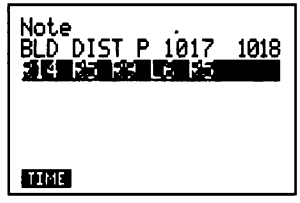
3. Press the **<CLEAR>** key to return to the "upper" view level.

5.3 Adding notes

Note: For users of SOKKIA Software, adding a note to the database just before the record for point 1017 is useful when you process the SDR33's output through the Feature–code processing. Notes are inserted prior to the record selected for viewing.

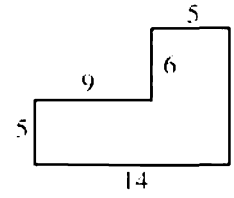
Follow these steps to insert a note:

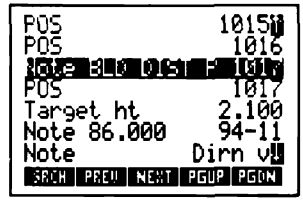
1. Press the **<NOTE>** key and type in the following:



BLD DIST P 1017 1018 R14 R5 R9 L6 R5 <ENTER>

This will be inserted as a "note" record just before the **POS** record for point 1017. This causes the automatic plotting of a building whose dimensions are contained in the notations you just typed.





2. Press **<CLEAR>** to return to the ***"Survey"*** menu.

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Lesson 6

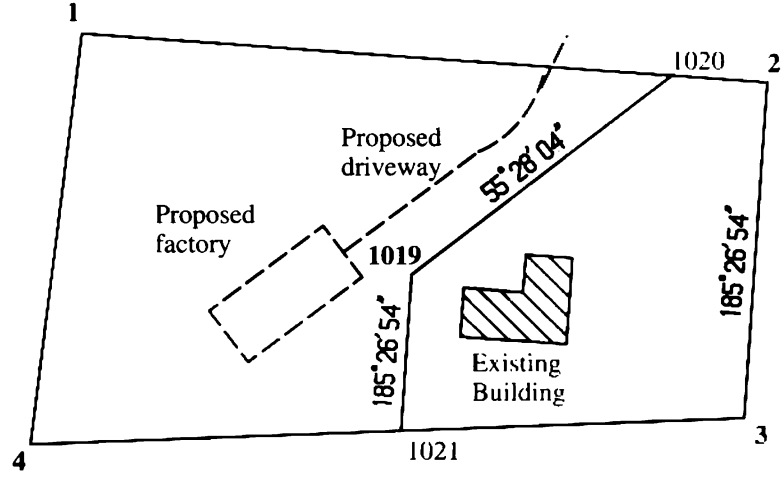
Intersections

We now want to calculate the coordinates of the points defining the boundaries surrounding the existing house.

In this lesson you will:

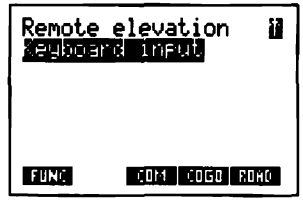
Calculate boundary coordinates by entering coordinates and azimuths.
Computing the unknown azimuth
Calculating the intersection.

One of the new boundary points is defined by coordinates. The azimuths of the two new boundaries are known as shown in the following diagram:



Follow these steps to enter the known coordinate and azimuth values:

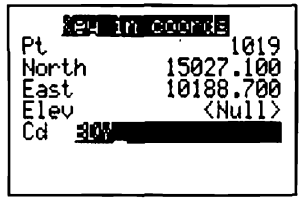
1. Select the ***"Keyboard input"*** option to specify the coordinate values for point 1019.



2. Select the option *"Key in coords."*

3. Make sure the point number is 1019 (this should be the default point number displayed), then enter the coordinates.

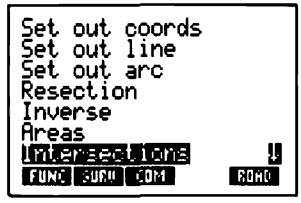
For North	Type:	**15027.100**
For East	Type:	**10188.700**
For Cd	Type:	**BDY**



4. Press **<ENTER>** to save the new point.

5. Press **<CLEAR>** twice to exit to the ***"Survey"*** menu.

6. Select the option ***"Intersections"*** from the first screen of the ***"Cogo"*** menu.



7. Enter the following point number into the ***"Pt 1"*** field of the ***"Intersections"*** screen.

1019 <ENTER>

This specifies the boundary point 1019 as the starting point for the first azimuth entered for the intersection calculation. The boundary azimuth from point 1019 is 55° 28' 04". (This azimuth puts the boundary parallel to the azimuth of the road that you'll set out in Lesson 10.)

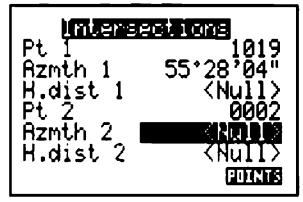
8. Type the following in the ***"Azimuth 1"*** field.

55.2804 <ENTER>

Follow these steps to compute the unknown azimuth:

1. Specify this point number in the ***"Pt 2"*** field:

2 <ENTER>

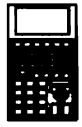


Point 2 is the point at the north east corner of the lot.

2. Move the highlight to the ***"Azmth 2"*** field and select the **<POINTS>** softkey, which computes an azimuth by specifying the point numbers of two existing points in the database. The computed azimuth is automatically placed in the azimuth field highlighted when the **<POINTS>** softkey is pressed. The following screen displays for the entry of the two point numbers:

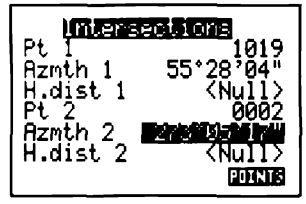
The ***"From"*** field defaults to point number 2 (the starting point for the azimuth).

3. Enter point number 1 (the point at the other end of the northern boundary line) into the ***"To pt"*** field:



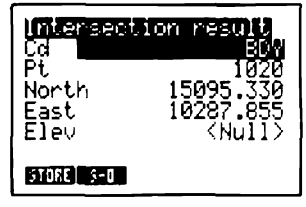
1 <ENTER>

The azimuth is computed and displayed in the ***"Azmth 2"*** field of the ***"Intersection"*** screen.



Follow these steps to compute the intersection:

1. Select **<OK>** to compute the intersection. The computed coordinates display, and the code for the new point 1020 defaults to **BDY**.



2. Press the **<OK>** key to save this new boundary point.

Follow these steps to compute another boundary intersection:

Now we need to compute the boundary intersection along the southern boundary of the lot. This time the new boundary being specified is parallel to the eastern boundary (the boundary specified by points 2 and 3). The ***"Pt 1"*** field will default to 1019 for this second calculation.

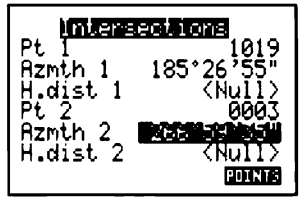
1. Highlight the ***"Azmth 1"*** field.

2. Select the **<POINTS>** softkey and enter points 2 and 3 in the ***"From"*** and ***"To pt"*** fields respectively:

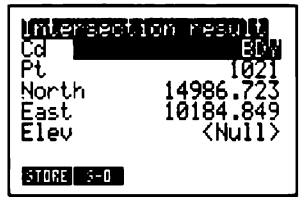
2 <ENTER>
3 <ENTER>

3. Move the highlight to the ***"Pt 2"*** field, type 3 **<ENTER>**.

4. Be sure the ***"Azmth 2"*** field is highlighted, and press the **<POINTS>** softkey to compute the azimuth from point 3 to point 4.



5. Press the **<OK>** key to compute the new intersection.



6. Select **<OK>** to save the new boundary point 1021. This completes the computation of the new boundary positions.

7. Press **<CLEAR>** to exit to the ***"Cogo"*** menu.

   The points computed by the ***"Intersections"*** option are stored as position **(POS)** records in the SDR33 database with a derivation code of **IX**.

The following printout was produced from the SDR33 after the completion of the previous tutorial:

SDR33 V04–03.00	Copyright STI		13–May–92 12:01
	Angle Degrees	Dist Meters	Press Millibar
	Temp Celsius	Coord N–E–Elev	
JOB	SMITH 001	Point id Numeric (4)	
	Atmos crn No	C and R crn No	Refract const 0.14
	Record elev Yes	Sea level crn No	
SCALE	S.F. 1.00000000		
NOTE TS	12–May–92 09:59		
NOTE	LOT4 DP356784	16 SHIRAZ RD	DOONVILLE
INSTRUMENT	Manual	EDM <No text>	EDM serial 000000
	Theo desc <No text>	Theo serial 000000	Mount Not applic
	V.obs Zenith	EDM o/s <Null>	Refl o/s <Null>
	P.C. mm 0.000		

Some data has been omitted for brevity, see previous tutorials (or Appendix A) for details ...

NOTE TS	12–May–92 13:55		
POS KI 1019	North 15027.100	East 10188.700	Elev <Null>
	Code BDY		
POS IX 1020	North 15095.330	East 10287.855	Elev <Null>
	Code BDY		
POS IX 1021	North 14986.723	East 10184.849	Elev <Null>
	Code BDY		

** End of report **

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Lesson 7

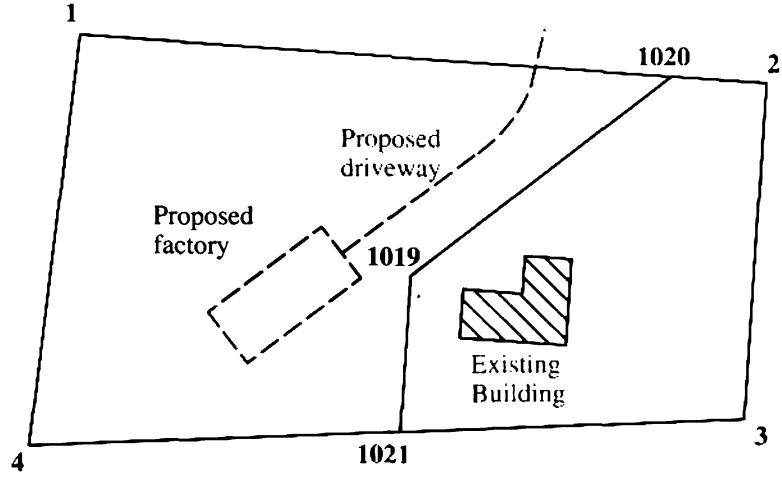
Areas

The areas program allows us to compute the area of the lot we have created that encloses the existing building.

In this lesson you will:

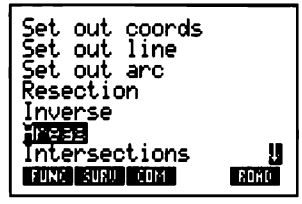
Calculate an area from known points
Adjust an area
Verify the adjustment.

As you can see in the diagram below, the lot is defined by points 2, 3, 1021, 1019, and 1020. Points 1020 and 1021 are the points computed using the ***"Intersections"*** option covered in Lesson 6.



Follow these steps to calculate the area from known points:

1. Select the ***"Areas"*** option from the first screen of the ***"Cogo"*** menu.

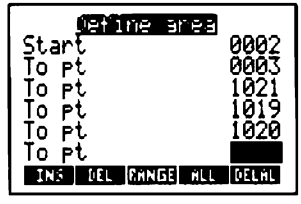


The following screen displays:

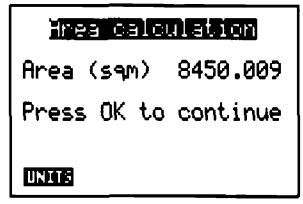
2. Specify the point Ids for the points defining the area: points 2, 3, 1021, 1019 and 1020.

Note: points must be entered in sequence.

2 <ENTER>
3 <ENTER>
1021 <ENTER>
1019 <ENTER>
1020 <ENTER>



3. Press **<OK>** to initiate the area calculation. The computed area 8450.009 square meters displays as shown in the following screen:

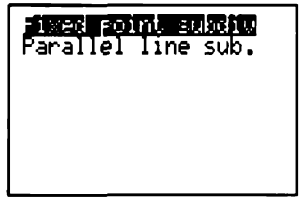


Note: The **<UNITS>** softkey is used to change the units of areas.

The ***"Areas"*** option allows you to adjust the areas of lots. In this case, we want to adjust the area of the lot to be 8,400.000 square meters.

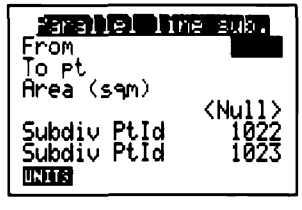
Follow these steps to adjust the area:

1. Press **<OK>** and the following area adjustment options displays:

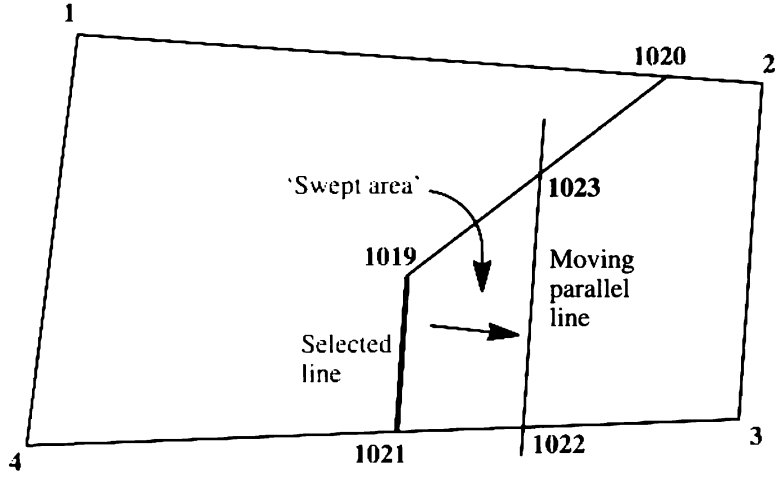


We will adjust the area by moving a line parallel to the boundary line defined by points 1019 and 1021.

2. Select the second option ***"Parallel line sub"*** by pressing the **<⇓>** key then pressing **<ENTER>**. The following screen displays:



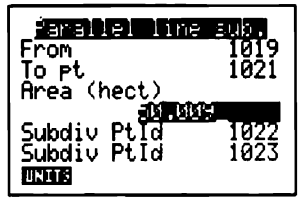
To make the adjustment, a line parallel to the selected line is moved across the area until the space covered by the moving line equals the specified area.



Since we want the final area of the lot equal 8,400 square meters, and we want to compute a new position for the boundary line from 1019 to 1021, the area that must be swept out in the adjustment is 8450.009 – 8400.000 square meters or 50.009 square meters.

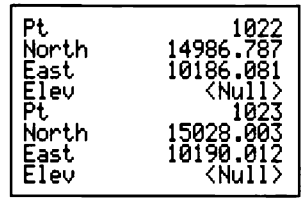
3. Enter the following point numbers and specified area:

1019 <ENTER>
1021 <ENTER>
50.009 <ENTER>

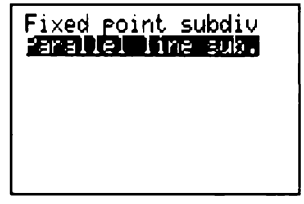


The point numbers in the two ***"Subdiv PtId"*** fields are the point numbers of the points created by the adjusted position of the boundary line.

4. Press **<OK>** to start the computation of the points and the default numbers 1022 and 1023 are accepted.



5. Press the **<OK>** key to save these new coordinates The program returns to the area adjustment option screen:



6. Press **<CLEAR>** to exit to the ***"Define area"*** screen.

You can now confirm that the area has been correctly adjusted by specifying the new points 1022 and 1023 instead of points 1021 and 1019 respectively.

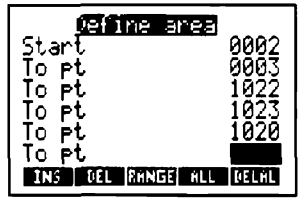
Follow these steps to verify the adjustment:

1. Move the highlight bar up to point number 1021 using the <⇑> key then enter

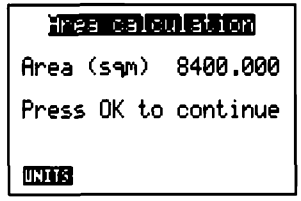
1022

Replace the point number 1019 with:

1023



2. Select **<OK>** to compute the area:



The computed area confirms that the area adjustment has been carried out correctly.

3. Press **<CLEAR>** twice to exit from this option.

4. Press the **<YES>** softkey to confirm that you wish to exit from *"Areas."*

The following printout was produced from the SDR33 after the completion of the previous tutorial:

SDR33 V04–03.00	Copyright STI		13–May–92 12:03
	Angle Degrees	Dist Meters	Press Millibar
	Temp Celsius	Coord N–E–Elev	
JOB	SMITH 001	Point id Numeric (4)	
	Atmos crn No	C and R crn No	Refract const 0.14
	Record elev Yes	Sea level crn No	
SCALE	S.F. 1.00000000		
NOTE TS	12–May–92 09:59		
NOTE	LOT4 DP356784	16 SHIRAZ RD	DOONVILLE
INSTRUMENT	Manual	EDM <No text>	EDM serial 000000
	Theo desc <No text>	Theo serial 000000	Mount Not applic
	V.obs Zenith	EDM o/s <Null>	Refl o/s <Null>
	P.C. mm 0.000		

Some data has been omitted for brevity, see previous tutorials (or Appendix A) for details ...

NOTE AR	Area (sqm): 8450.009	Boundary= 0002, 0003, 1021, 1019,	
NOTE AR	1020.		
NOTE AR	Parallel line sub. Area (sqm): 50.009		
POS AR 1022	North 14986.787	East 10186.081	Elev <Null>
POS AR 1023	North 15028.003	East 10190.012	Elev <Null>

** End of report **

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Lesson 8

Resection

The point of this lesson is to locate a new station within the confines of Mrs. Smith's lot. We will select a position and determine its coordinates using the resection program. The resection program utilizes the set collection routines that we previously used for the collection of traverse data.

In this lesson you will:

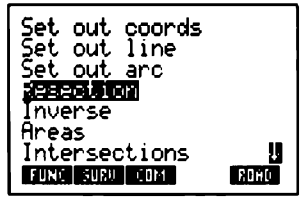
Complete setup details for the resection
Make the observations
Calculate the resection.

Note: This lesson requires the data from Lesson 2. If you have not worked through Lesson 2, please go back and complete it before proceeding any further (or download the appropriate file from your PC).

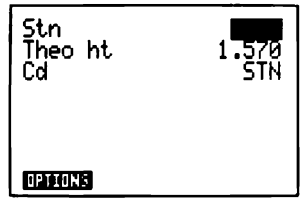
8.1 Resection setup

Follow these steps to enter the point number, theodolite height, and code for the new station:

1. Type **<R>** or position the cursor over the ***"Resection"*** entry in the ***"Cogo"*** menu.



2. Press the **<ENTER>** or **<OK>** to select that entry. The following screen appears.



3. Highlight the ***"Stn"*** field and, type:

5 <ENTER>

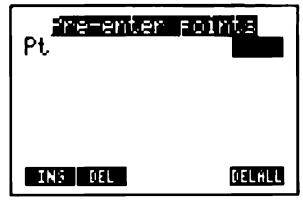
The SDR33 searches its database to determine whether it is able to directly calculate the coordinates for point 0005. As there have been no observations to 0005 in previous tutorials, it is unable to do so. We will be allowed to proceed with the resection.

We will use the same **<OPTIONS>** as for previous set–collection sessions (see Lesson 3).

4. Enter theodolite and code data for point 0005:

For Theo ht,	type:	**1.58 <ENTER>**
For Cd,	type:	**STN <ENTER>**

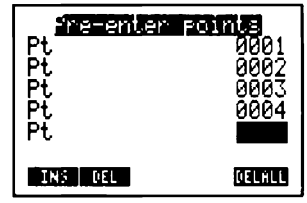
The SDR33 analyzes the existing sets in the database, and then permits us to pre–enter any points that we wish to observe from point 0005.



Note: Since we have not been prompted for any backsight (if we knew the azimuth from point 0005 to another point, we could determine the coordinates of point 0005 directly), the SDR33 does not insert any backsight into the pre–entered points list.

5. Enter the following point numbers:

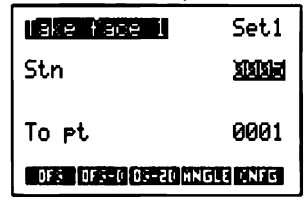
1 <ENTER> 2 <ENTER> 3 <ENTER> 4 <ENTER>



6. Press the **<OK>** key.

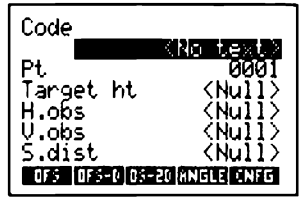
8.2 Resection observation

The following screen appears and requests that we make an observation from station 0005 to point 0001 (on face 1 of our instrument).



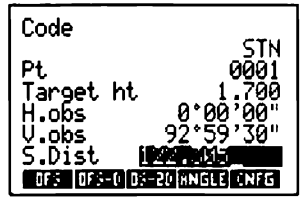
Follow these steps to make the observation:

1. Press the **<READ>** key, and the following screen appears:



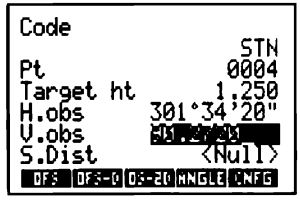
2. Type in the following data:

For Cd,	type:	**<S> <T> <ENTER> <ENTER>**
For Target ht,	type:	**1.7 <ENTER>**
For H.obs,	type:	**0 <ENTER>**
For V.obs,	type:	**92.5930 <ENTER>**
For S.Dist,	type:	**122.305**



3. Press the **<READ>** key to initiate the next reading and the following observations to points 0002, 0003, and 0004.

Code	Pt	Target Ht	H.Obs	V.Obs	S.Dist	
STN	2	1.68	125.4540	91.5020	119.821	**<ANGLE>**
STN	3	1.2	177.57	85.3935		**<ANGLE>**
STN	4	1.25	301.3420	90.2720		**<OK>**



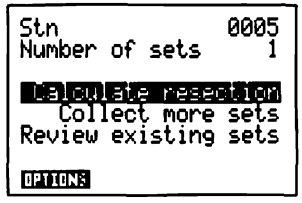
4. Press the **<ANGLE>** softkey to initiate the angles–only observation to 0004 after turning over the instrument's face.

5. Enter the following observational data for the second face:

Code	Pt	Target Ht	H.Obs	V.Obs	S.Dist	
STN	4	1.25	121.3423	269.3245		**<ANGLE>**
STN	3	1.2	357.5703	274.2010		**<READ>**
STN	2	1.68	305.4532	268.0935	119.82	**<READ>**
STN	1	1.7	180.0004	267.0030	122.303	**<OK>**

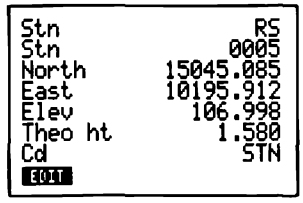
8.3 Resection calculation

On the second face, we will have made observations to points 0004, 0003, 0002, and 0001 (in that order) as specified by the ***"Obs order"*** set–collection option. The following screen appears:



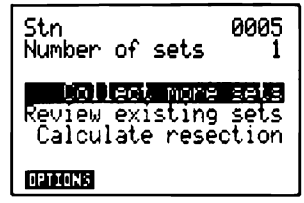
Follow these steps to calculate the resection:

1. Select the ***"Calculate resection"*** option (by pressing **<ENTER>** or **<OK>** when it is highlighted to use the set just collected to calculate resection coordinates for point 0005. The SDR33 searches its database for useful data, calculating better and better approximations to the coordinates for point 0005, and then displays the following screen:



2. Press the **<OK>** key to accept these coordinates since this is a reasonable computed result for station 0005's coordinates.

   This completes the resection of station 0005. This station will be the basis of our setout of the factory and road which form part of Mrs. Smith's job.



3. Press the **<CLEAR>** key to return to the ***"Survey"*** menu. More information about the resection program can be found in Chapter 13 of the **SDR33 Reference Manual**.

The following printout was produced by the SDR33 from the data entered in the previous tutorial:

SDR33 V04–03.00	Copyright STI		13–May–92 16:04
	Angle Degrees	Dist Meters	Press Millibar
	Temp Celsius	Coord N–E–Elev	
JOB	SMITH 001	Point id Numeric (4)	
	Atmos crn No	C and R crn No	Refract const 0.14
	Record elev Yes	Sea level crn No	
SCALE	S.F. 1.00000000		
NOTE TS	12–May–92 09:59		
NOTE	LOT4 DP356784	16 SHIRAZ RD	DOONVILLE
INSTRUMENT	Manual	EDM <No text>	EDM serial 000000
	Theo desc <No text>	Theo serial 000000	Mount Not applic
	V.obs Zenith	EDM o/s <Null>	Refl o/s <Null>
	P.C. mm 0.000		

Some data has been omitted for brevity, see previous tutorials (or Appendix A) for details ...

STN RS 0005	North <Null>	East <Null>	Elev <Null>
	Theo ht 1.580	Code STN	
SET SC 0005	Set # 1	Point count 8	
TARGET	Target ht 1.700		
OBS F1 0005–0001	S.dist 122.305	V.obs 92–59'30"	H.obs 0–00'00"

	Code STN			
NOTE TS	12–May–92 15:27			
TARGET	Target ht 1.680			
OBS F1 0005–0002	S.dist 119.821		V.obs 91–50'20"	H.obs 125–45'40"
	Code STN			
TARGET	Target ht 1.200			
OBS F1 0005–0003	S.dist <Null>		V.obs 85–39'35"	H.obs 177–57'00"
	Code STN			
TARGET	Target ht 1.250			
OBS F1 0005–0004	S.dist <Null>		V.obs 90–27'20"	H.obs 301–34'20"
	Code STN			
OBS F2 0005–0004	S.dist <Null>		V.obs 269–32'45"	H.obs 121–34'23"
	Code STN			
TARGET	Target ht 1.200			
OBS F2 0005–0003	S.dist <Null>		V.obs 274–20'10"	H.obs 357–57'03"
	Code STN			
TARGET	Target ht 1.680			
OBS F2 0005–0002	S.dist 119.820		V.obs 268–09'35"	H.obs 305–45'32"
	Code STN			
TARGET	Target ht 1.700			
OBS F2 0005–0001	S.dist 122.303		V.obs 267–00'30"	H.obs 180–00'04"
	Code STN			
NOTE RS	The following MCs are derived from set(s) 1.			
OBS MC 0005–0001	S.dist 122.310		V.ang 93–02'52"	Azimuth 299–55'08"
	Code STN			
OBS MC 0005–0002	S.dist 119.824		V.ang 91–53'15"	Azimuth 65–40'42"
	Code STN			
OBS MC 0005–0003	S.dist <Null>		V.ang 85–39'43"	Azimuth 117–52'07"
	Code STN			
OBS MC 0005–0004	S.dist <Null>		V.ang 90–27'18"	Azimuth 241–29'27"
	Code STN			
NOTE RS	0001	DValues 0.001	0–00'08"	0–00'05"
NOTE RS	0002	DValues 0.009	0–00'04"	0–00'05"
NOTE RS	0003	DValues <Null>	<Null>	0–00'05"
NOTE RS	0004	DValues <Null>	<Null>	0–00'05"
STN RS 0005	North 15045.085		East 10195.912	Elev 106.998
	Theo ht 1.580		Code STN	
BKB RS 0005–0004	Azimuth 241–29'32"		H.obs 301–34'20"	

** End of report **

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Lesson 9 Setting out points

We now want to set out a building to illustrate the SDR33's setting–out–by coordinates features.

In this lesson you will:

Enter information required for the station, the point number, and coordinates of the backsight
Enter points to set out
Set out points.

9.1 Quick summary

A brief outline of steps to set out points is listed below:

1. Select job name; default is current job.
2. Press: **<COGO>** softkey and select ***"Set out coords"*** option.
3. Enter the required information for **Stn** (Id of instrument set up) and **Theo ht. North**, **East**, **Elev**, and **Cd** (identification of observed point) are optional.
4. Enter **BS pt** (ID of point being used as backsight).
5. **Key in azimuth** to BS or **Key in coords** of BS. Move highlight cursor to select. Azimuth required if **Stn** coord not given in step 3.
6. Connect to instrument, press **<Read>** key to take BS observation, enter target height (instrument must be on and pointed at target).
7. Enter points to be set out. Select either single point entry or enter a range of points. Press **<All>** for all to be put on list. If points you enter are not in the SDR33 database, you will be prompted for northing, easting and elevation. When you're finished, points list appears.
8. Select point to set out with highlight cursor, press **<OK>**.

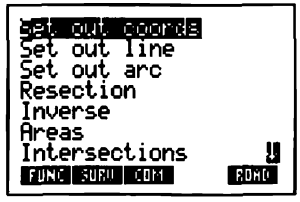
9. Aim instrument as prompted, position prism pole along line of sight at approximate distance, press **<Read>**.
10. Check if target height is correct, press **<OK>** or **<ENTER>**.
11. Move rod from estimated position using instructions given on the screen. If new position is not required, press **<OK>** and go to step 9, otherwise . . . repeat as from step 6.
12. Set cut/fill, repeating from step 6 and press **<OK>**.
13. Answer question **Store result?** If yes, ID of point set out is automatically entered into the **Cd** (code) field.
14. Select next point to set out. Previously set point is no longer on setting out list.

9.2 Setting up

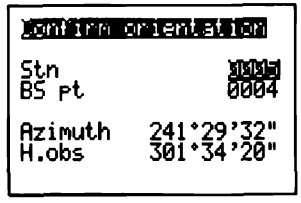
As part of the job, Mrs Smith requires a building to be set–out.

Follow these steps to verify the station and enter the backsight points and its coordinates:

1. Select the ***"Set out coords"*** option of the setting out menu.



2. The following screen will appear:



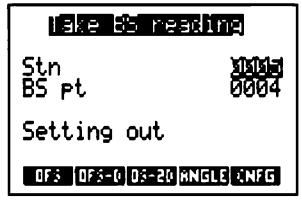
We will set up our instrument on station 0005 (as the SDR33 has anticipated!) and use station 0004 as our backsight. The SDR33 has

remembered the previous orientation to station 0004 observed during the Resection, but we wish to reorient the instrument at this station.

3. Highlight the ***"BS pt"*** field and type :

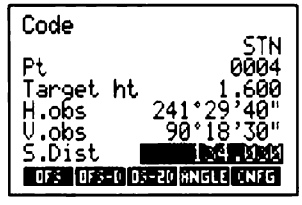
4 <ENTER>

4. The prompt to take a backsight reading is displayed. The new orientation correction is computed from this reading.



5. Press the **<READ>** key, and then type in the following data:

For Cd,	type:	**<S> <T> <ENTER> <ENTER>**
For Target ht,	type:	**1.6 <ENTER>**
For H.obs,	type:	**241.2940 <ENTER>**
For V.obs,	type:	**90.1830 <ENTER>**
For S.Dist,	type:	**134.03 <ENTER>**



9.3 Entering list of points to be set out

Check that the data you have typed is correct before continuing.

Follow these steps to enter points to set out:

1. Press **<OK>**, and the following screen will appear:

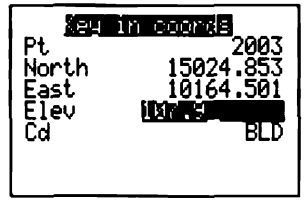
2. Number the corners of the building as points 2000 to 2003.

For Pt, type: **2000 <ENTER>**

The SDR33 search's its database and then request coordinates for the point, as indicated by the screen below:

3. Type in the following data:

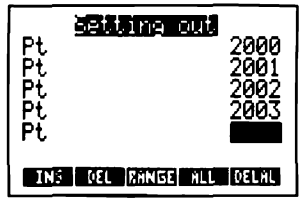
Pt	North	East	Elv	Cd	
2000	15017.392	10169.534	107.9	BLD	**<OK>**
2001	15007.327	10154.611	107.9	BLD	**<OK>**
2002	15014.788	10149.579	107.9	BLD	**<OK>**
2003	15024.853	10164.501	107.9	BLD	



9.4 Setting out list of points

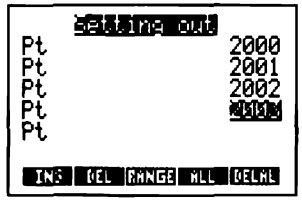
Follow these steps to set out points:

1. Press **<OK>** and the following screen will appear:

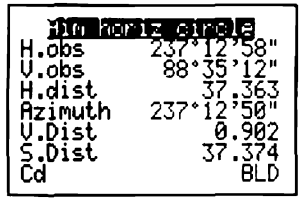


The first point we will set out is point 2003.

2. Use the <⇑> arrow key to highlight 2003 on the screen.



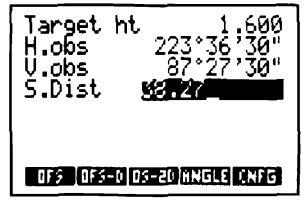
3. Press **<OK>** or **<ENTER>** and the following screen will appear:



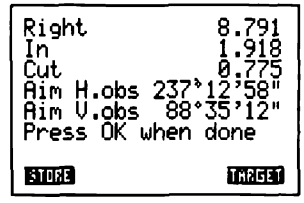
The SDR33 is giving you all the data required to set out this point. In practice the total station would now be turned to the given H.obs, and you would take a reading.

4. Press the **<READ>** key. The total station would now be initiated and values would automatically be entered into the next screen. For our purposes enter the following data:

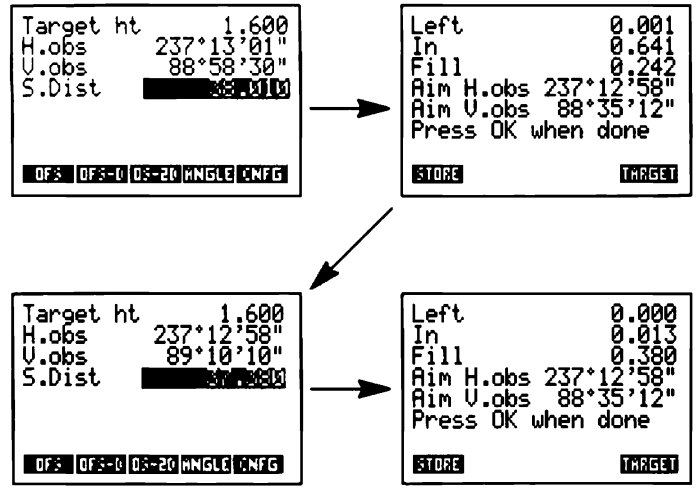
For Target ht,	type:	**1.6 <ENTER>**
For H.obs,	type:	**223.3630 <ENTER>**
For V.obs,	type:	**87.2730 <ENTER>**
For S.Dist,	type:	**38.27**



5. Press **<OK>** and the following results will appear in the next screen:

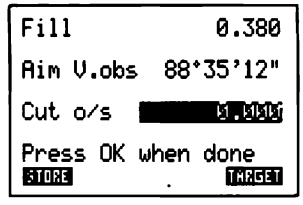


From here, you can direct the person holding the rod and then press **<READ>** to measure again and refine the horizontal positing. (Pressing **<Clear>** will return you to the ***"Aim H.circle"*** screen).



6. Press **<OK>** and you are ready to set out the height.

   The following screen appears:



   The fill value shown on this screen represents the vertical distance from the base of the prism pole to the required set out elevation.

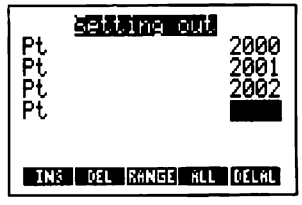
   Note: The ***"Cut o/s"*** field will not be discussed in this guide. Please refer to Chapter 18 of the **SDR33 Reference Manual** for a detailed explanation of this feature.

   As before, pressing **<READ>** will measure again and update the Cut or Fill value, and **<OK>** will finish vertical setting out and pressing **<Clear>** will return you to horizontal setting out.

7. Press **<OK>**; the next screen gives you the opportunity to change the point number or code of the point that you have just set out. The code

field has the original coordinated point number as a default for later cross referencing of coordinated and set out points.

8. Press the **<YES>** softkey to save the result; this returns you to the list of points to set–out.



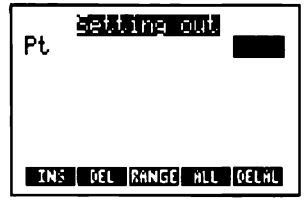
Notice that point 2003, which has just been set out, has been removed from the list of points.

9. Use the <⇑> key to select the next point to set out. Practice the set out procedure by entering the following data for each coordinated point. The following data lists the measured values for points 2002 to 2000 and all the steps required. Be sure to store your results for later comparison.

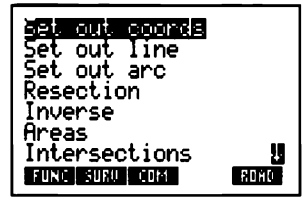
10. Press **<OK>** and then **<READ>**, then type in the following data:

Pt	Target Ht	H.Obs	V.Obs	S.Dist
2002	1.6	236.4920	88.1725	55.38
	press **<OK> <OK> <OK> YES <⇑> <OK> <READ>**			
2001	1.6	227.3405	88.5030	55.97
	press **<OK> <OK> <OK> YES <⇑> <OK> <READ>**			
2000	1.6	223.3630	88.4235	38.26
	press **<OK> <OK> <OK> YES**			

You will return to the following screen, which asks for more points to be added to the setting out list.



11. Press the **<Clear>** key to return to the ***"Setting out"*** menu. For more details on using the Set out program refer to Chapter 18 of the **SDR33 Reference Manual**.



The following printout was produced from the SDR33 after the completion of the previous tutorial:

SDR33 V04–03.00	Copyright STI		13–May–92 12:05
	Angle Degrees	Dist Meters	Press Millibar
	Temp Celsius	Coord N–E–Elev	
JOB	SMITH 001	Point id Numeric (4)	
	Atmos crn No	C and R crn No	Refract const 0.14
	Record elev Yes	Sea level crn No	
SCALE	S.F. 1.00000000		
NOTE TS	12–May–92 09:59		
NOTE	LOT4 DP356784	16 SHIRAZ RD	DOONVILLE
INSTRUMENT	Manual	EDM <No text>	EDM serial 000000
	Theo desc <No text>	Theo serial 000000	Mount Not applic
	V.obs Zenith	EDM o/s <Null>	Refl o/s <Null>
	P.C. mm 0.000		
BKB TP 0005–0004	Azimuth 241–29'32"	H.obs 241–29'40"	

Some data has been omitted for brevity, see previous tutorials (or Appendix A) for details ...

TARGET	Target ht 1.600		
OBS F1 0005–0004	S.dist 134.030	V.obs 90–18'30"	H.obs 241–29'40"
	Code STN		
POS KI 2000	North 15017.392	East 10169.534	Elev 107.900
	Code BLD		
POS KI 2001	North 15007.327	East 10154.611	Elev 107.900
	Code BLD		
POS KI 2002	North 15014.788	East 10149.579	Elev 107.900
	Code BLD		
POS KI 2003	North 15024.853	East 10164.501	Elev 107.900
	Code BLD		
POS TP 1024	North 15024.846	East 10164.490	Elev 107.520
	Code 2003		
NOTE SO	Fill 0.380	D.North 0.007	D.East 0.011
NOTE TS	12–May–92 15:49		
POS TP 1025	North 15014.791	East 10149.582	Elev 108.630
	Code 2002		
NOTE SO	Cut 0.730	D.North –0.003	D.East –0.003
POS TP 1026	North 15007.328	East 10154.612	Elev 108.110
	Code 2001		
NOTE SO	Cut 0.210	D.North –0.001	D.East –0.001
POS TP 1027	North 15017.388	East 10169.531	Elev 107.840
	Code 2000		
NOTE SO	Fill 0.060	D.North 0.004	D.East 0.003

** End of report **

Lesson 10 Road setout

The job for Mrs Smith requires a simple road to be set out from the building site that we set out in Lesson 9 to the northern boundary.

In this lesson you will:

Define the shape of the cross-section template
Name the road definition
Create the horizontal and vertical definitions
Define the design formation in cross-section
Set out the center line and sideslopes
Set out the sideslope (catch) points.

We have been given certain design parameters by Mrs Smith's engineer, which are mentioned in the following section. We will be using Station 0005 for this exercise.

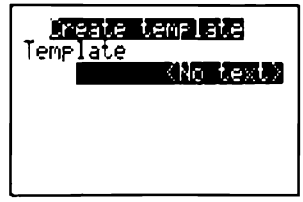
10.1 Template definition

We will start by defining the shape of the cross-section template designed by Mrs. Smith's engineer.

Follow these steps to define the shape of the cross-section template:

1. Highlight the ***"Define template"*** entry in the ***"Road"*** menu, and press **<ENTER>** or **<OK>** to select it.

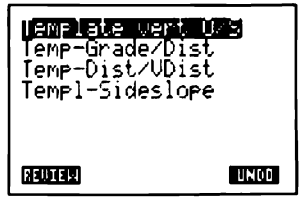
The following screen appears:



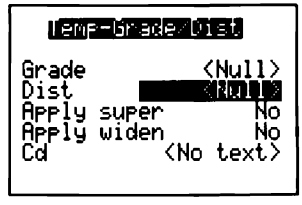
2. Type the following in the ***"Template"*** field.

<INTERLOT> <ENTER>

3. Press **<ENTER>** again to avoid saving any ***"note"*** to the database.
4. Select the ***"Temp–Grade/Dist"*** entry of the next menu:



The following screen appears:

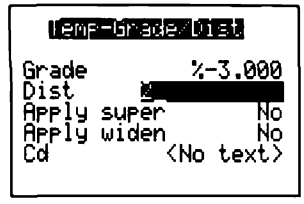


5. Type the actual value of the grade (ie., –3%)

For Grade, type: **–3 <ENTER>**

6. Enter the following value for *"Dist"*.

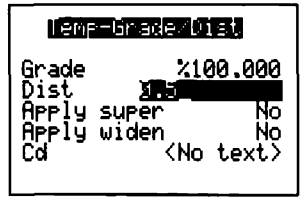
For Dist, type: **2 <OK>**



7. Press **<ENTER>** when you return to the *"Temp–Grade/Dist"* menu, so you can enter another segment of this template.

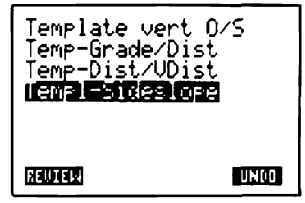
8. Type the following values:

For Grade, type: **100 <ENTER>**
For Dist, type: **0.5 <OK>**

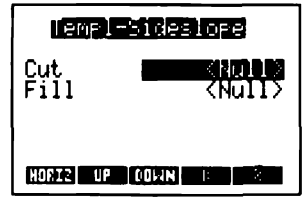


We have now entered two segments of our template; the final segment will be a side slope.

9. Select the ***"Templ–Sideslope"*** entry of the current menu.



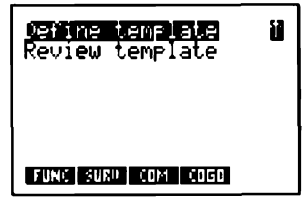
The following screen (which defines both the cut and fill sideslopes) appears:



10. Define the sideslopes as follows:

For Cut,	type:	**25 <ENTER>**
For Fill,	type:	**25 <ENTER>**

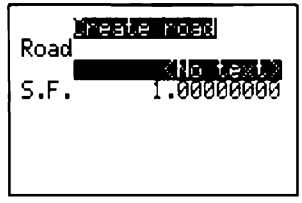
You return to the ***"Road"*** menu (shown below):



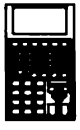
10.2 Road definition

Follow these steps to name the road definition:

1. Highlight the ***"Define road"*** option and press **<ENTER>** The following screen will appear:



2. Type the following:

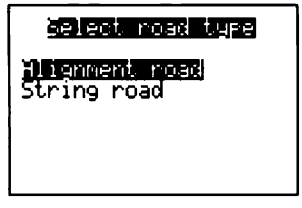


FACTORY SITE <ENTER>

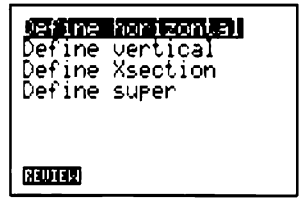
(We will leave the scale factor at 1.00000000)

3. Press **<ENTER>** or **<OK>** to continue because we do not want to attach any notes.

The following screen will appear:



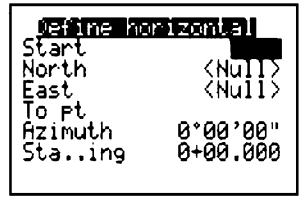
4. Press **<ENTER>** to select an alignment road. The following screen will appear:



10.2.1 Horizontal road geometry

Follow these steps to create the horizontal definition:

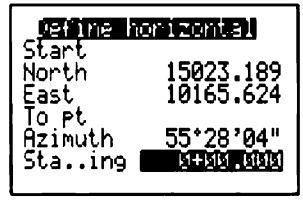
1. Press **<ENTER>** to select ***"Define horizontal"***; and the following screen appears:



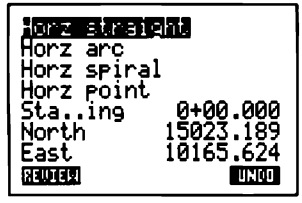
2. Press the **<ENTER>** (or **<⇓>** key) to avoid the Start point (for more details see Chapter 28 in the **SDR33 Reference Manual**).

3. Enter the following data:

For North,	type:	**15023.189 <ENTER>**
For East,	type:	**10165.624 <ENTER> <ENTER>**
For Azimuth,	type:	**55.2804**



4. Press **<ENTER>** then press the **<OK>** to accept these details; the following screen appears:



Our horizontal definition starts with a straight.

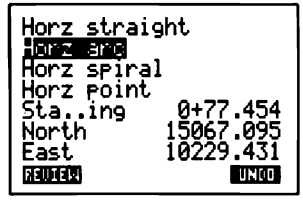
5. Press **<ENTER>** with the ***"Horz straight"*** entry of the menu highlighted, and you will see the following screen:

6. Type this information:

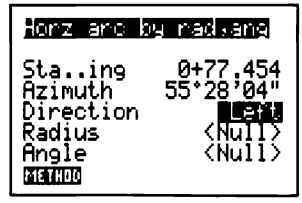
77.454 <ENTER>

We will now define an arc.

7. Highlight ***"Horz arc"*** and press **<ENTER>**.



The following screen appears:



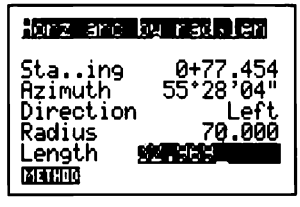
By pressing the **<METHOD>** softkey, you can change the method of arc entry.

8. Press **<METHOD>** (if necessary) to change the method to ***"Radius, Length,"*** press the <⇓> key to move to the radius field, and then type in the following data:

For Radius, type: **70 <ENTER>**

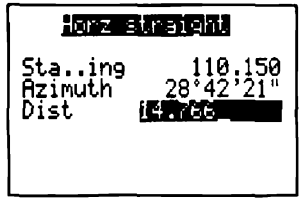
9. Enter this value:

For Length, type: **32.696**



10. Press **<ENTER>** to accept this information and return to the menu.
11. Define the final straight on this road by selecting ***"Horz straight,"***.
12. Type in the following value:

For Dist, type: **14.766**

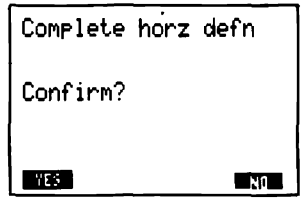


13. Press **<ENTER>** to accept this information and return to the menu.

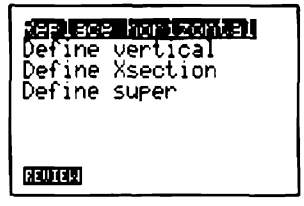
14. Press the **<REVIEW>** softkey to view the database.

This viewing mechanism was described in Lesson 5; you can select a particular feature using the **<⇑>** and **<⇓>** keys (or by searching, etc.) and the details of a selected feature can be viewed using the **<⇒>** or **<ENTER>** key.

15. Press **<CLEAR>** until you see the question "**Complete horiz defn?**", and press **<YES>**.



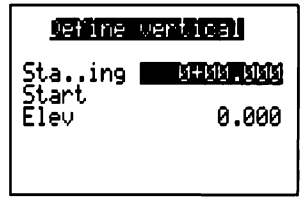
The following screen appears:



10.2.2 Vertical road geometry

Follow these steps to create the vertical definition:

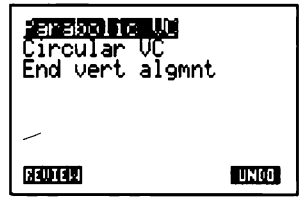
1. Highlight the ***"Define vertical"*** option, and press **<ENTER>** to select it; the following screen appears:



2. Press **<ENTER>** **<ENTER>** (or **<⇓>** **<⇓>**) to move the cursor to the ***"Elev"*** field, and type:

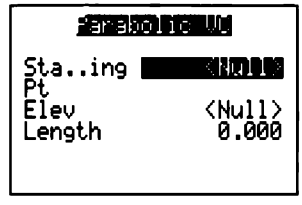
107.8 <ENTER>

The next screen defines the vertical geometry types.



We require a parabolic vertical curve

3. Make sure that ***"Parabolic VC"*** is highlighted and press **<ENTER>**; the following screen appears:

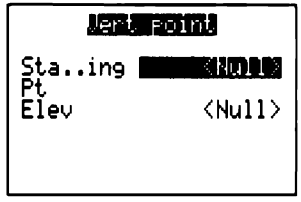


4. Enter the following data:

For Sta..ing,	type:	**62 <ENTER>**
For Pt,	type:	**<ENTER>**
For Elev,	type:	**105.5 <ENTER>**
For Length,	type:	**50 <ENTER>**

The screen will be accepted and return you to the vertical geometry definition menu.

5. Select the ***"End vert algmnt"*** option, and the following screen appears:



6. Enter the following data:

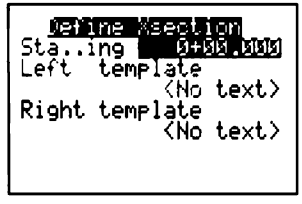
For Sta..ing,	type:	**108.21 <ENTER>**
For Pt,	type:	**<ENTER>**
For Elev,	type:	**102.295 <ENTER>**

You will be back at the road definition screen.

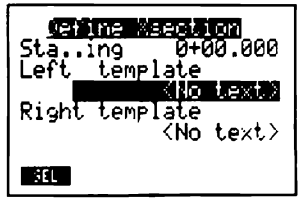
10.3 Cross section definition

Follow these steps to define the design formation in cross section;

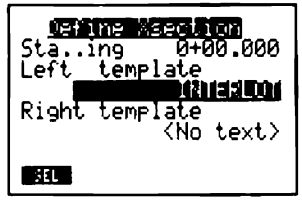
1. Select ***"Define Xsection"*** and the following screen appears:



2. Press **<ENTER>** to accept the 0.000 station.



3. Press the **<SEL>** softkey to select a template. As we have only defined one (called "**INTERLOT**"), the choice is simple; press **<ENTER>** to select **INTERLOT**.



4. Move the cursor to the ***"Right template"*** field and press **<SEL>** **<ENTER>** for the right template.

5. Accept the screen using either **<ENTER>** or **<OK>**.

6. Enter the end station into the ***"Stationing"*** field, type :

124.916 <OK>

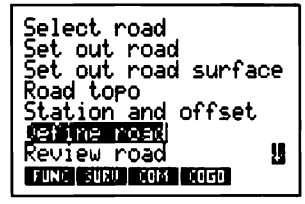
7. Press **<CLEAR>** to exit.

Note: Notice that the prompts on the ***"Road definition"*** screen have changed from ***"Define"*** to ***"Replace."***

10.4 Setting out the road

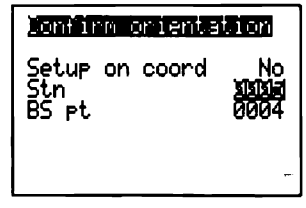
Follow these steps to set out the centerline and side slopes of one cross section:

1. Press the **<Clear>** key to return to the ***"Roading"*** menu, illustrated below:

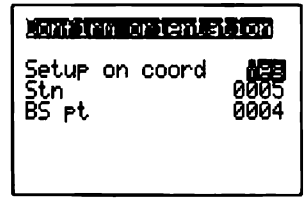


2. Select the ***"Set out Road"*** entry.

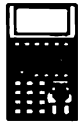
   Messages will flash on the screen to indicate that the system is comparing the road definition with any previous ones attached to the current job. If the comparison indicates a different definition, the system loads the new one to replace the old. The following screen will eventually appear:



3. Move to the ***"Setup on coord"*** field and press the **<⇒>** (or **<⇐>**) key.

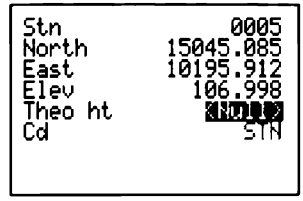


4. Press **<ENTER>** and type:



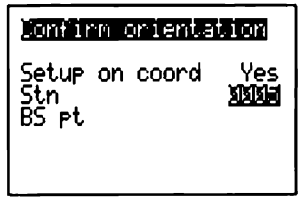
For Stn, type: **5 <ENTER>**

The next screen shows the coordinates for station 5.



5. Highlight the ***"Theo Ht"*** field and enter:

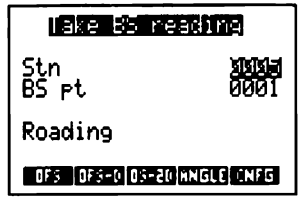
1.6 <ENTER> <OK>



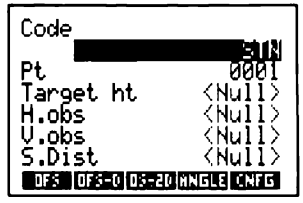
6. Move the highlight to the ***"Bs pt"*** field, type:

For BS pt, type: **1 <ENTER>**

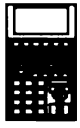
You will then be prompted to take a reading to the backsight.



7. Press the **<ANGLE>** softkey to initiate an angles–only reading.



8. Enter the following data:



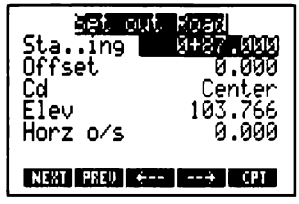
For Cd,	type:	**<S> <T> <ENTER> <ENTER>**
For Target ht,	type:	**1.6 <ENTER>**
For H.Obs,	type:	**299.5514 <OK>**

The following screen appears:

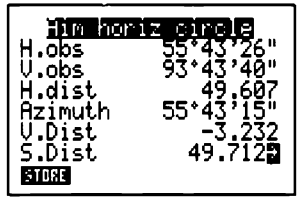
By pressing the **<INCR>** softkey, you can toggle between ***"INCR"*** (increment) and ***"CPT"*** (control point). This enables you to find a change in grade or a change in direction quickly, while still allowing access to the even station data. We will set out the tangent point at station 87.

9. Press **<INCR>** (if displayed) until ***"CPT"*** appears at the right of the softkey line.

10. Press the **<NEXT>** softkey (three times) until **87.000** appears in the *"Sta..ing"* field.



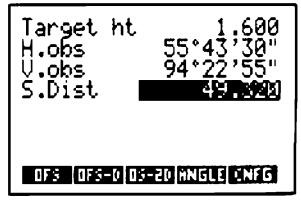
11. Press the **<OK>** key and the following screen will appear:



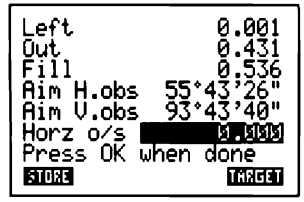
This screen gives you all the information you will need to set out this point.

12. Press the **<READ>** key, and enter the following data:

For Target ht,	type:	**1.6 <ENTER>**
For H.Obs,	type:	**55.4330 <ENTER>**
For V.Obs,	type:	**94.2255 <ENTER>**
For S.Dist,	type:	**49.32**

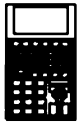


13. Press **<OK>** and the following screen appears:



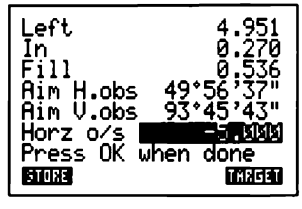
This screen indicates where the prism pole is in relation to the instrument, the road definition and the instrument's horizontal circle. The highlight has positioned itself automatically at the ***"Horz o/s"*** field. This field is useful if you wish to offset the defined point to a new location. We will utilize this feature to offset the centreline point away from the earthworks extremities.

14. Type:



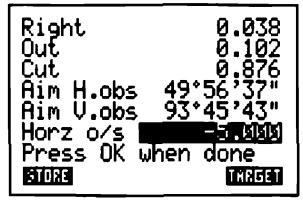
For Horz o/s, type: **–5 <ENTER>**

This changes the values on the screen.

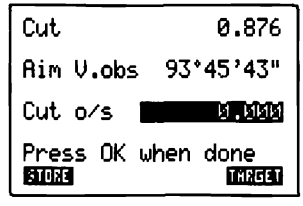


Take another reading, this time to the offset point, type:

For Target ht,	type:	**<ENTER>**
For H.Obs,	type:	**49.54 <ENTER>**
For V.Obs,	type:	**92.45 <ENTER>**
For S.Dist,	type:	**49.11 <OK>**



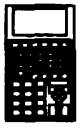
15. Press **<OK>** to see the vertical difference between defined and measured values. The following screen appears:



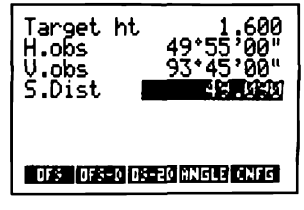
Changing the value in the ***"Cut o/s"*** field (which will be highlighted) will change the value of the field called ***"Aim for V.obs."***

Note: At this point, you could press **<Clear>** to return to the horizontal values, press **<OK>** to save that reading or press **<READ>** to take another reading.

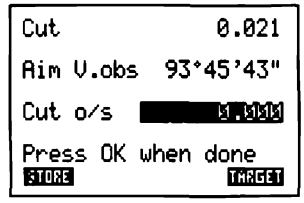
16. Press the **<READ>** key again, then enter the following data:



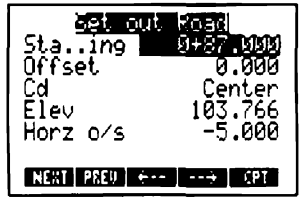
For Target ht,	type:	**<ENTER>**
For H.Obs,	type:	**49.55 <ENTER>**
For V.Obs,	type:	**93.45 <ENTER>**
For S.Dist,	type:	**49.09**



17. Press the **<OK>** key. The following display will reappear. The values that have been defined are now sufficiently accurate for field purposes.



18. Press **<OK>** twice to store the final measured values. This returns us to the ***"Set out road"*** screen.

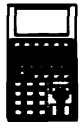


10.5 Sideslope (catch) points

Follow these steps to set out the side slope points:

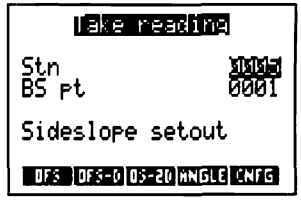
1. Change the ***"Cd"*** field to ***"L Sideslope,"*** by pressing the **<⇐>** softkey three times.

2. Move to the ***"Horz o/s"*** field (by pressing **<⇓>** key), and reset the value of the horizontal offset to zero by entering:

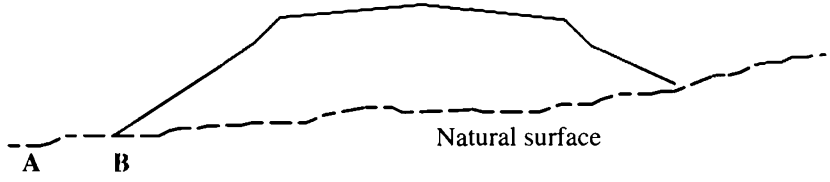


For Horz o/s, type: **0 <OK>**

The following screen appears:

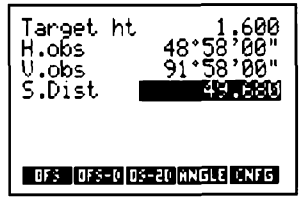


3. Press the **<READ>** key to take an initial approximate reading to where the sideslope meets the natural surface (point A in the following diagram).

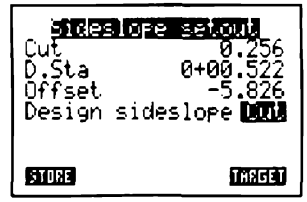


4. Enter the following data:

For Target ht,	type:	**<ENTER>**
For H.obs,	type:	**48.58 <ENTER>**
For V.obs,	type:	**91.58 <ENTER>**
For S.Dist,	type:	**49.68**



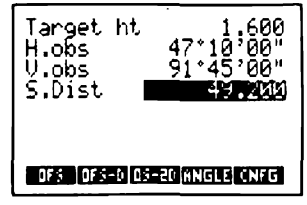
5. Press **<OK>**, and the screen illustrated below appears:



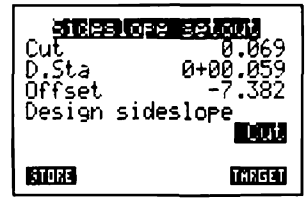
This gives you the approximate horizontal position of the base of the sideslope. The ***"Design sideslope"*** field informs you that the SDR33 considers the "cut" sideslope to be the current one to use, you may change it if you think that fill design sideslope should be used. The ***"D.sta"*** field indicates how far off the cross-section line for the station the reading is, we are trying to find the base of the sideslope, this is found when both the ***"D.sta"*** and ***"Cut"*** (or ***"Fill"***) fields are close to zero.

6. Press **<READ>** to initiate a second reading at point B; type in the following data:

For Target ht,	type:	**<ENTER>**
For H.obs,	type:	**47.10 <ENTER>**
For V.obs,	type:	**91.45 <ENTER>**
For S.Dist,	type:	**49.20**

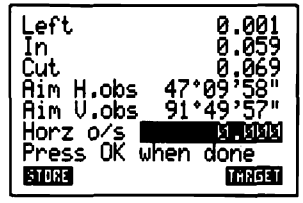


7. Press **<OK>**, and the following screen appears again:



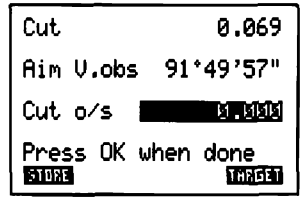
The *"Cut"* field and the *"D.sta"* field are now both close enough to zero for our needs.

8. Press **<OK>**. The following screen appears:



This screen allows you to offset the sideslope point away from the centerline.

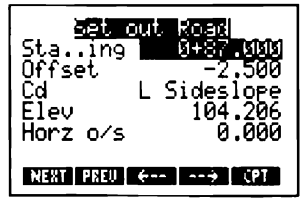
9. Press **<OK>**, and the following screen appears:



This screen allows you to offset the point vertically.

10. Press the **<OK>** key again; the store result screen appears.

11. Press **<RCHK>** to store the results as a road check record. The system will return to the *"Set out Road"* screen.



12. Press **<CLEAR>** until you are back at the ***"Start up screen"*** of the SDR33.

The above lesson covered the two types of roading points that can be set out. For more details on roading see Chapter 28 of the **SDR33 Reference Manual**.

The following printout was produced from the SDR33 after the completion of the above tutorial lesson:

SDR33 V04–03.00	Copyright STI		14–May–92 16:43
	Angle Degrees	Dist Meters	Press Millibar
	Temp Celsius	Coord N–E–Elev	
JOB	SMITH 001	Point Id Numeric (4)	Atmos crn No
	C and R crn No	Refract const 0.14	
	Record elev Yes	Sea level crn No	
SCALE	S.F. 1.00000000		
NOTE TS	12–May–92 09:59		
NOTE	LOT4 DP356784	16 SHIRAZ RD	DOONVILLE
INSTRUMENT	Manual	EDM <No text>	EDM S/N 000000
	Theo desc <No text>	Theo S/N 000000	Mount Not applic
	V.obs Zenith	EDM o/s <Null>	Refl o/s <Null>
	P.C. mm 0.000		

Some data has been omitted for brevity, see previous tutorials (or Appendix A) for details ...

ROAD	ID FACTORY SITE		
SCALE	S.F. 1.00000000		
NOTE TS	14–May–92 09:08		
HORZ ALIGN	Start Sta 0.000	End Sta 124.916	Azimuth 55–28'04"
	North 15023.189	East 10165.624	
HORZ STRAIGHT	Sta..ing 0.000	Azimuth 55–28'04"	Dist 77.454
HORZ ARC	Sta..ing 77.454	Dist 32.696	Radius –70.000
HORZ STRAIGHT	Sta..ing 110.150	Azimuth 28–42'21"	Dist 14.766

VERT ALIGN	Sta..ing 0.000	Elev 107.800	
PARABOLIC VC	Sta..ing 62.000	Elev 105.500	Length 50.000
VERT POINT	Sta..ing 108.210	Elev 102.295	
X SECTION	Sta..ing 0.000	Lt. Template INTERLOT	Rt. Template INTERLOT
X SECTION	Sta..ing 124.916	Lt. Template INTERLOT	Rt. Template INTERLOT
TEMPLATE	ID INTERLOT		
NOTE TS	14–May–92 09:06		
NOTE RO	Temp element	Grade %–3.000	H.dist 2.000
NOTE RO	V.Dist –0.060	Offset 2.000	
NOTE RO	HtDiff –0.060	Apply super No	Apply widen No
NOTE RO	Cd <No text>		
NOTE RO	Temp element	Grade %100.000	H.dist 0.500
NOTE RO	V.Dist 0.500	Offset 2.500	
NOTE RO	HtDiff 0.440	Apply super No	Apply widen No
NOTE RO	Cd <No text>		
NOTE RO	Templ–Sideslope	Cut %25.000	Fill %25.000
NOTE RO	Set out road FACTORY SITE		
ROAD STN RO 0005	Sta..ing 37.364	Offset –0.869	
	North 15045.085	East 10195.912	Elev 106.998
	Road	FACTORY SITE	Theo ht 1.600
	Cd STN		
BKB RO 0005–0001	Azimuth 299–55'03"	H.obs 299–55'14"	
TARGET	Target ht 1.600		
OBS F1 0005–0001	S.Dist <Null>	V.obs <Null>	H.obs 299–55'14"
	Code STN		
NOTE RO	Horz o/s –5.000		
ROAD POS RO 1028	Sta..ing 86.831	Offset –5.000	North 15076.629
	East 10233.389	Elev 103.787	Cd Centre
NOTE RO	Cut 0.021	D.North 0.092	D.East 0.145
NOTE RO	Design sideslope Cut		
NOTE RO	Horz o/s 0.000		
ROAD CHK RO 1029	Sta..ing 87.000	D.Sta 0.059	Offset –7.382
	D.Offset 0.000	Elev 105.496	D.Elev 0.069
	Cd L Sideslope		
NOTE RO	Cut 0.069	D.North –0.040	D.East –0.044

** End of report **

Lesson 11

Sending data

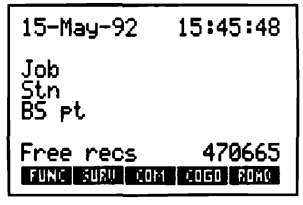
We've completed the field work for Mrs Smith's job and are ready to download the data to a computer for storage and processing.

In this lesson you will:

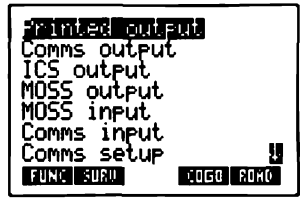
Access the ***"Communications"*** menu
- Select record views
- Set the communications parameters
- Transmit the data.

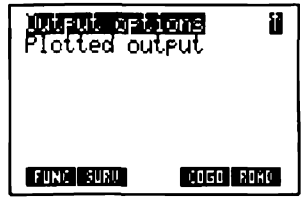
Follow these steps to access the *"Communications"* menu:

1. Make sure you are in the ***"Start up screen"*** of the SDR33 with the main softkey line shown at the bottom of the screen.



2. Press the **<COM>** softkey to access the ***"Communications"*** menu shown below:





11.1 Output record views

Follow these steps to select record views:

1. Highlight the ***"Output record views"*** entry of this menu, and press **<ENTER>** or **<OK>** to select it. The following screen will appear:

   You may select the views shown above if you want to transmit data in the view. (The view is transmitted in addition to the raw data). For example, if ***"POS view"*** is set to ***"Yes,"*** all of the observations recorded within the job file will have a coordinate record generated and transmitted.

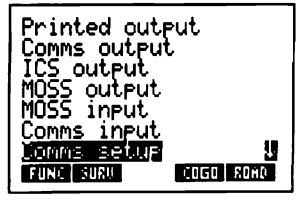
2. Make sure the ***"Current view"*** is set to ***"Yes"*** and that the rest of the entries are set to ***"No."*** Press **<OK>** to return to the previous menu.

Note: Data ***"views"*** are discussed in detail in the **SDR33 Reference Manual**, Chapter 5; it is recommended that you read and understand this feature of the SDR33, as it forms the basis of many powerful data manipulation methods.

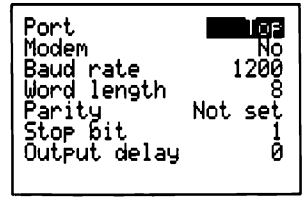
11.2 Communications setup

Follow these steps to set the SDR33's communication parameters:

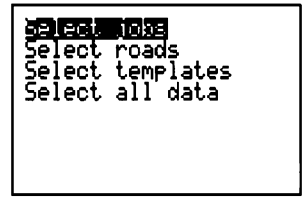
1. Connect the SDR33 to a computer (described in detail in Chapter 30 of the **SDR33 Reference Manual**), then select the ***"Comms setup."***



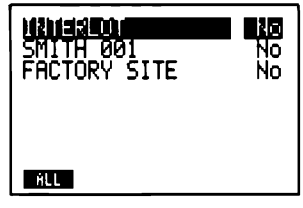
2. Set the SDR33's parameters to match the computers. Set the ***"Port"*** option to ***"Top"*** if you're using the cable and plug supplied with the SDR33. Press the **<OK>** key when you have configured the communications port appropriately.



3. Highlight the ***"Comms output"*** entry of the ***"Communications"*** menu, and press **<OK>** or **<ENTER>** to select it. The following screen appears:



4. Highlight the ***"Select all data"*** option, and press **<OK>** or **<ENTER>**; the following screen appears:



This screen displays all of the jobs and roading definitions which are currently in the database.

5. Press the **<ALL>** softkey to select the "**SMITH 001**" job and the two associated roading definition files. (All the entries change from **"No"** to **"Yes"**).

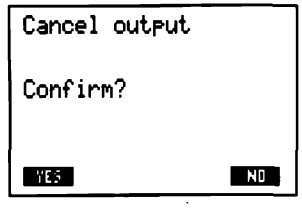
11.3 Sending

Follow these steps to transmit the data:

1. Make sure the SDR33 and the computer are connected, and the computer software is ready to receive data.

2. Press **<OK>**. The transmission of data begins.

If you want to stop the transmission, press **<Clear>** and follow the instructions on the screen.



You can follow this procedure to send the "**SMITH 001**" job to a computer or a printer (using the ***"Printed output"*** option). Compare the output produced with the printout that appears in Appendix A.

This concludes the tutorials for the SDR33. After working through this guide and understanding the **SDR33 Reference Manual**, the SDR33 will become an integral part of your surveying methodology. Should you have any questions or helpful suggestions regarding the SDR33 please refer them to the distributor from whom you purchased your SDR33.

Appendix A The Complete Tutorial Database

SDR33 V04–03.00	Copyright STI		14–May–92 16:43
	Angle Degrees	Dist Meters	Press Millibar
	Temp Celsius	Coord N–E–Elev	
JOB	SMITH 001	Point Id Numeric (4)	
	Atmos crn No	C and R crn No	Refract const 0.14
	Record elev Yes	Sea level crn No	
SCALE	S.F. 1.00000000		
NOTE TS	12–May–92 09:59		
NOTE	LOT4 DP356784	16 SHIRAZ RD	DOONVILLE
INSTRUMENT	Manual	EDM <No text>	EDM S/N 000000
	Theo desc <No text>	Theo S/N 000000	Mount Not applic
	V.obs Zenith	EDM o/s <Null>	Refl o/s <Null>
	P.C. mm 0.000		
NOTE TS	12–May–92 10:15		
POS KI 0004	North 14981.117	East 10078.135	Elev 106.261
	Code STN		
RED KI 0004–3847	Azimuth 96–28'49"	H.dist 296.451	V.Dist <Null>
	Code SM		
RED KI 3847–3846	Azimuth 5–50'22"	H.dist 260.092	V.Dist <Null>
	Code SM		
RED KI 3846–0001	Azimuth 252–00'20"	H.dist 325.000	V.Dist <Null>
	Code STN		
RED KI 0001–3830	Azimuth 272–08'19"	H.dist 230.623	V.Dist <Null>
	Code SM		
STN SC 0001	North 15106.001	East 10090.051	Elev 100.500
	Theo ht 1.570	Code STN	
SET SC 0001	Set # 1	Point count 6	
TARGET	Target ht 2.000		
OBS F1 0001–3846	S.Dist <Null>	V.obs 88–44'20"	H.obs 72–00'20"
	Code SM		
NOTE TS	12–May–92 10:25		
TARGET	Target ht 1.750		
OBS F1 0001–0002	S.Dist 215.316	V.obs 89–16'24"	H.obs 93–05'17"
	Code STN		
TARGET	Target ht 1.700		
OBS F1 0001–0004	S.Dist 125.590	V.obs 87–18'40"	H.obs 185–27'05"
	Code STN		

Appendix A: Tutorial database

OBS F2 0001–0004	S.Dist 125.585	V.obs 272–41'17"	H.obs 5–26'55"
	Code STN		
TARGET	Target ht 1.750		
OBS F2 0001–0002	S.Dist 215.318	V.obs 270–43'33"	H.obs 273–05'20"
	Code STN		
TARGET	Target ht 2.000		
OBS F2 0001–3846	S.Dist <Null>	V.obs 271–15'45"	H.obs 252–00'15"
	Code SM		
NOTE SC	The following MCs are derived from set(s) 1.		
OBS MC 0001–3846	S.Dist <Null>	V.ang <Null>	Azimuth 72–00'20"
	Code SM		
OBS MC 0001–0002	S.Dist 215.315	V.ang 89–19'18"	Azimuth 93–05'21"
	Code STN		
OBS MC 0001–0004	S.Dist 125.581	V.ang 87–22'15"	Azimuth 185–27'03"
	Code STN		
BKB SC 0001–3846	Azimuth 72–00'20"	H.obs 72–00'18"	
STN SC 0002	North 15094.398	East 10305.038	Elev 103.049
	Theo ht 1.580	Code STN	
SET SC 0002	Set # 1	Point count 4	
TARGET	Target ht 1.750		
OBS F1 0002–0001	S.Dist 215.313	V.obs 90–38'00"	H.obs 273–05'18"
	Code STN		
NOTE TS	12–May–92 10:36		
TARGET	Target ht 1.700		
OBS F1 0002–0003	S.Dist 103.150	V.obs 82–46'20"	H.obs 185–26'58"
	Code STN		
OBS F2 0002–0003	S.Dist 103.152	V.obs 277–13'43"	H.obs 5–27'03"
	Code STN		
TARGET	Target ht 1.750		
OBS F2 0002–0001	S.Dist 215.310	V.obs 269–22'04"	H.obs 93–05'20"
	Code STN		
NOTE SC	The following MCs are derived from set(s) 1.		
OBS MC 0002–0001	S.Dist 215.313	V.ang 90–40'41"	Azimuth 273–05'21"
	Code STN		
OBS MC 0002–0003	S.Dist 103.136	V.ang 82–50'17"	Azimuth 185–27'02"
	Code STN		
BKB SC 0002–0001	Azimuth 273–05'21"	H.obs 273–05'19"	
STN SC 0003	North 14992.530	East 10295.317	Elev 115.908
	Theo ht 1.600	Code STN	

SET SC 0003	Set # 1	Point count 4	
OBS F1 0003–0002	S.Dist 103.136	V.obs 97–04'45"	H.obs 5–27'03"
	Code STN		
TARGET	Target ht 1.700		
OBS F1 0003–0004	S.Dist 217.690	V.obs 92–30'50"	H.obs 266–59'50"
	Code STN		
OBS F2 0003–0004	S.Dist 217.690	V.obs 267–29'09"	H.obs 86–59'48"
	Code STN		
TARGET	Target ht 1.750		
OBS F2 0003–0002	S.Dist 103.135	V.obs 262–55'15"	H.obs 185–26'58"
	Code STN		
NOTE SC	The following MCs are derived from set(s) 1.		
OBS MC 0003–0002	S.Dist 103.154	V.ang 97–09'43"	Azimuth 5–27'02"
	Code STN		
OBS MC 0003–0004	S.Dist 217.694	V.ang 92–32'25"	Azimuth 266–59'51"
	Code STN		
BKB SC 0003–0002	Azimuth 5–27'02"	H.obs 5–27'01"	
STN SC 0004	North 14981.117	East 10078.135	Elev 106.261
	Theo ht 1.590	Code STN	
NOTE TS	12–May–92 10:46		
SET SC 0004	Set # 1	Point count 6	
OBS F1 0004–0003	S.Dist 217.700	V.obs 87–25'05"	H.obs 86–59'50"
	Code STN		
TARGET	Target ht 2.000		
OBS F1 0004–3830	S.Dist <Null>	V.obs 89–00'10"	H.obs 301–24'55"
	Code SM		
TARGET	Target ht 1.700		
OBS F1 0004–0001	S.Dist 125.580	V.obs 92–34'45"	H.obs 5–27'00"
	Code STN		
OBS F2 0004–0001	S.Dist 125.577	V.obs 267–25'15"	H.obs 185–26'58"
OBS MC 0004–0001	S.dist 125.583	V.ang 92–37'45"	Azimuth 5–26'40"
	Code STN		
TARGET	Target ht 2.000		
OBS F2 0004–3830	S.Dist <Null>	V.obs 270–59'50"	H.obs 121–25'00"
	Code SM		
TARGET	Target ht 1.750		
OBS F2 0004–0003	S.Dist 217.700	V.obs 272–34'58"	H.obs 266–59'50"
	Code STN		
NOTE SC	The following MCs are derived from set(s) 1.		
OBS MC 0004–0003	S.Dist 217.693	V.ang 87–27'35"	Azimuth 86–59'31"
	Code STN		

Appendix A: Tutorial database

OBS MC 0004–3830	S.Dist <Null>	V.ang <Null>	Azimuth 301–24'38"
	Code SM		
OBS MC 0004–0001	S.Dist 125.583	V.ang 92–37'45"	Azimuth 5–26'40"
	Code STN		
BKB SC 0004–0003	Azimuth 86–59'31"	H.obs 86–59'50"	
NOTE TS	12–May–92 10:56		
NOTE TV	Start 0001	To pt 0004	
NOTE TV	BS pt 3846	Azimuth 72–00'20"	
NOTE TV	FS pt 3830	Azimuth 301–24'38"	
NOTE TV	Method Compass	Angular Weighted	Elev Weighted
NOTE TV	D.ang 0–00'20"	D.Dist 0.013	Precision 42714
NOTE TV	D.North 0.013	D.East 0.000	D.Elev –0.002
NOTE TV	Method Compass	Angular Weighted	Elev Weighted
NOTE TV	D.ang 0–00'00"	D.Dist 0.007	Precision 74936
NOTE TV	D.North –0.004	D.East 0.006	D.Elev –0.002
POS AJ 0002	North 15094.403	East 10305.035	Elev 103.049
	Code STN		
POS AJ 0003	North 14992.526	East 10295.318	Elev 115.909
	Code STN		
NOTE TS	12–May–92 11:12		
STN TP 0001	North 15106.001	East 10090.051	Elev 100.500
	Theo ht 1.590	Code STN	
BKB TP 0001–3846	Azimuth 72–00'20"	H.obs 72–00'20"	
TARGET	Target ht 1.600		
OBS F1 0001–3846	S.Dist <Null>	V.obs 88–16'16"	H.obs 72–00'20"
	Code SM		
POS TP 1000	North 15042.137	East 10084.323	Elev 103.891
	Code NS		
POS TP 1001	North 14987.952	East 10133.920	Elev 108.634
	Code NS		
POS TP 1002	North 15044.387	East 10140.711	Elev 105.749
	Code NS		
POS TP 1003	North 15099.789	East 10148.935	Elev 101.509
	Code NS		
STN TP 0002	North 15094.403	East 10305.035	Elev 103.049
	Theo ht 1.570	Code STN	
BKB TP 0002–0001	Azimuth 273–05'17"	H.obs 273–05'21"	
OBS F1 0002–0001	S.Dist 215.315	V.obs 90–40'15"	H.obs 273–05'21"
	Code STN		

POS TP 1004	North 15097.642	East 10209.695	Elev 102.053
	Code NS		
POS TP 1005	North 15096.477	East 10258.745	Elev 102.440
	Code NS		
POS TP 1006	North 15044.385	East 10202.413	Elev 107.222
	Code NS		
POS TP 1007	North 15033.609	East 10197.405	Elev 108.173
	Code NS		
POS TP 1008	North 15031.499	East 10198.816	Elev 109.543
	Code NS		
NOTE TS	12–May–92 11:23		
STN TP 0003	North 14992.526	East 10295.318	Elev 115.909
	Theo ht 1.570	Code STN	
BKB TP 0003–0004	Azimuth 266–59'35"	H.obs 266–59'51"	
TARGET	Target ht 1.570		
OBS F1 0003–0004	S.Dist 217.693	V.obs 92–31'57"	H.obs 266–59'51"
	Code STN		
POS TP 1009	North 15046.526	East 10257.675	Elev 108.244
	Code TREE		
POS TP 1010	North 15047.557	East 10299.226	Elev 109.005
	Code NS		
POS TP 1011	North 14994.874	East 10255.544	Elev 114.183
	Code NS		
POS TP 1012	North 15031.645	East 10214.797	Elev 109.636
	Code NS		
POS TP 1013	North 14990.302	East 10201.288	Elev 111.688
	Code NS		
POS TP 1014	North 15018.559	East 10198.410	Elev 109.635
	Code NS		
POS TP 1015	North 15017.717	East 10215.508	Elev 110.428
	Code NS		
POS TP 1016	North 15018.703	East 10214.397	Elev 109.634
	Code NS		
POS TP 1017	North 15030.549	East 10213.919	Elev 109.635
	Code BLD		
NOTE	BLD DIST P 1017 1018R14 R5 R9 L6 R5		
NOTE TS	12–May–92 11:35		
TARGET	Target ht 2.100		
NOTE OS	86.000 94–11'00"	288–22'10"	OS 0.900
NOTE OS	Dirn v		

POS TP 1018	North 15019.833	East 10213.061	Elev 109.105
	Code BLD		
POS KI 1019	North 10527.100	East 10188.700	Elev <Null>
	Code BDY		
POS KI 1019	North 15027.100	East 10188.700	Elev <Null>
	Code BDY		
POS IX 1020	North 15095.330	East 10287.855	Elev <Null>
	Code BDY		
POS IX 1021	North 14986.723	East 10184.849	Elev <Null>
	Code BDY		
NOTE AR	Area (sqm): 8450.009	Boundary= 0002, 000	3, 1021, 1019,
NOTE AR	1020.		
NOTE AR	Parallel line sub. A	rea (sqm): 50.009	
POS AR 1022	North 14986.787	East 10186.081	Elev <Null>
POS AR 1023	North 15028.003	East 10190.012	Elev <Null>
STN RS 0005	North <Null>	East <Null>	Elev <Null>
	Theo ht 1.580	Code STN	
SET SC 0005	Set # 1	Point count 8	
TARGET	Target ht 1.700		
OBS F1 0005–0001	S.Dist 122.305	V.obs 92–59'30"	H.obs 0–00'00"
	Code STN		
TARGET	Target ht 1.680		
OBS F1 0005–0002	S.Dist 119.821	V.obs 91–50'20"	H.obs 125–45'40"
	Code STN		
TARGET	Target ht 1.200		
OBS F1 0005–0003	S.Dist <Null>	V.obs 85–39'35"	H.obs 177–57'00"
	Code STN		
TARGET	Target ht 1.250		
OBS F1 0005–0004	S.Dist <Null>	V.obs 90–27'20"	H.obs 301–34'20"
	Code STN		
OBS F2 0005–0004	S.Dist <Null>	V.obs 269–32'45"	H.obs 121–34'23"
	Code STN		
TARGET	Target ht 1.200		
OBS F2 0005–0003	S.Dist <Null>	V.obs 274–20'10"	H.obs 357–57'03"
	Code STN		
TARGET	Target ht 1.680		
OBS F2 0005–0002	S.Dist 119.820	V.obs 268–09'35"	H.obs 305–45'32"
	Code STN		
TARGET	Target ht 1.700		
OBS F2 0005–0001	S.Dist 122.303	V.obs 267–00'30"	H.obs 180–00'04"
	Code STN		

NOTE RS	The following MCs are derived from set(s) 1.			
OBS MC 0005–0001	S.Dist 122.310		V.ang <Null>	Azimuth 299–55'08"
	Code STN			
OBS MC 0005–0002	S.Dist 119.824		V.ang <Null>	Azimuth 65–40'42"
	Code STN			
OBS MC 0005–0003	S.Dist <Null>		V.ang 85–39'43"	Azimuth 117–52'07"
	Code STN			
OBS MC 0005–0004	S.Dist <Null>		V.ang 90–27'18"	Azimuth 241–29'27"
	Code STN			
NOTE RS	0001	DValues 0.001	0–00'08"	0–00'05"
NOTE RS	0002	DValues 0.009	0–00'04"	0–00'05"
NOTE RS	0003	DValues <Null>	<Null>	0–00'05"
NOTE RS	0004	DValues <Null>	<Null>	0–00'05"
STN RS 0005	North 15045.085		East 10195.912	Elev 106.998
	Theo ht 1.580		Code STN	
BKB RS 0005–0004	Azimuth 241–29'32"		H.obs 301–34'20"	
BKB TP 0005–0004	Azimuth 241–29'32"		H.obs 241–29'40"	
TARGET	Target ht 1.600			
OBS F1 0005–0004	S.Dist 134.030		V.obs 90–18'30"	H.obs 241–29'40"
	Code STN			
POS KI 2000	North 15017.392		East 10169.534	Elev 107.900
	Code BLD			
POS KI 2001	North 15007.327		East 10154.611	Elev 107.900
	Code BLD			
POS KI 2002	North 15014.788		East 10149.579	Elev 107.900
	Code BLD			
POS KI 2003	North 15024.853		East 10164.501	Elev 107.900
	Code BLD			
POS TP 1024	North 15024.846		East 10164.490	Elev 107.520
	Code 2003			
NOTE SO	Fill 0.380		D.North 0.007	D.East 0.011
NOTE TS	12–May–92 15:49			
POS TP 1025	North 15014.791		East 10149.582	Elev 108.630
	Code 2002			
NOTE SO	Cut 0.730		D.North –0.003	D.East –0.003
POS TP 1026	North 15007.328		East 10154.612	Elev 108.110
	Code 2001			
NOTE SO	Cut 0.210		D.North –0.001	D.East –0.001
POS TP 1027	North 15017.388		East 10169.531	Elev 107.840
	Code 2000			

Appendix A: Tutorial database

NOTE SO	Fill 0.060	D.North 0.004	D.East 0.003
ROAD	ID FACTORY SITE		
SCALE	S.F. 1.00000000		
NOTE TS	14–May–92 09:08		
HORZ ALIGN	Start Sta 0.000	End Sta 124.916	Azimuth 55–28'04"
	North 15023.189	East 10165.624	
HORZ STRAIGHT	Sta..ing 0.000	Azimuth 55–28'04"	Dist 77.454
HORZ ARC	Sta..ing 77.454	Dist 32.696	Radius –70.000
HORZ STRAIGHT	Sta..ing 110.150	Azimuth 28–42'21"	Dist 14.766
VERT ALIGN	Sta..ing 0.000	Elev 107.800	
PARABOLIC VC	Sta..ing 62.000	Elev 105.500	Length 50.000
VERT POINT	Sta..ing 108.210	Elev 102.295	
X SECTION	Sta..ing 0.000	Lt. Template INTERLOT	Rt. Template INTERLOT
X SECTION	Sta..ing 124.916	Lt. Template INTERLOT	Rt. Template INTERLOT
TEMPLATE	ID INTERLOT		
NOTE TS	14–May–92 09:06		
NOTE RO	Temp element	Grade %–3.000	H.dist 2.000
NOTE RO	V.Dist –0.060	Offset 2.000	
NOTE RO	HtDiff –0.060	Apply super No	Apply widen No
NOTE RO	Cd <No text>		
NOTE RO	Temp element	Grade %100.000	H.dist 0.500
NOTE RO	V.Dist 0.500	Offset 2.500	
NOTE RO	HtDiff 0.440	Apply super No	Apply widen No
NOTE RO	Cd <No text>		
NOTE RO	Templ–Sideslope	Cut %25.000	Fill %25.000
NOTE RO	Set out road FACTORY		SITE
ROAD STN RO 0005	Sta..ing 37.364	Offset –0.869	
	North 15045.085	East 10195.912	Elev 106.998
	Road	FACTORY SITE	Theo ht 1.600
	Cd STN		
BKB RO 0005–0001	Azimuth 299–55'03"	H.obs 299–55'14"	
TARGET	Target ht 1.600		
OBS F1 0005–0001	S.Dist <Null>	V.obs <Null>	H.obs 299–55'14"
	Code STN		
NOTE RO	Horz o/s –5.000		
ROAD POS RO 1028	Sta..ing 86.831	Offset –5.000	
	North 15076.629	East 10233.389	Elev 103.787
	Cd Centre		
NOTE RO	Cut 0.021	D.North 0.092	D.East 0.145
NOTE RO	Design sideslope Cut		
NOTE RO	Horz o/s 0.000		

ROAD CHK RO 1029	Sta..ing 87.000	D.Sta 0.059	Offset –7.382
	D.Offset 0.000	Elev 105.496	D.Elev 0.069
	Cd L Sideslope		
NOTE RO	Cut 0.069	D.North –0.040	D.East –0.044

** End of report **

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Symbols

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