Lesson 6

Intersections

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

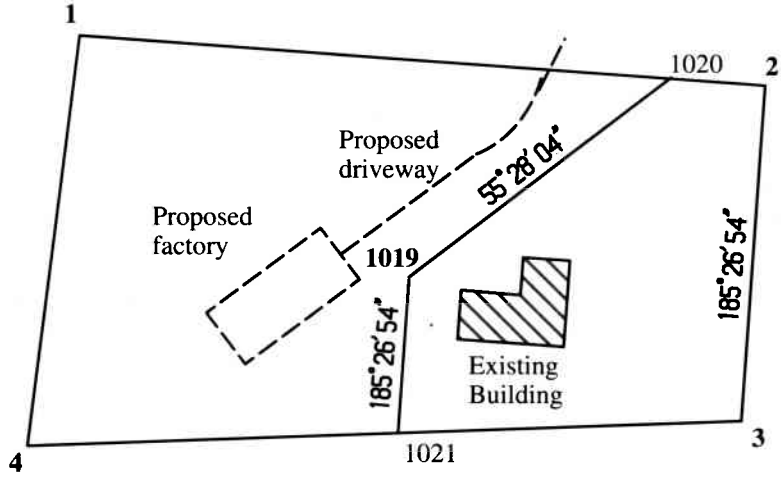
In this lesson you will:

Calculate boundary coordinates by entering coordinates and azimuths.

Computing the unknown azimuth

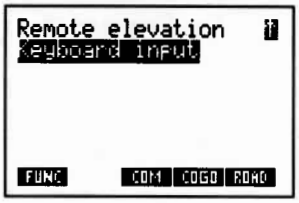
Calculating the intersection.

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:

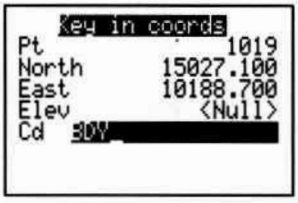
1. Select the ***"Keyboard input"*** option to specify the coordinate values for point 1019.



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.)

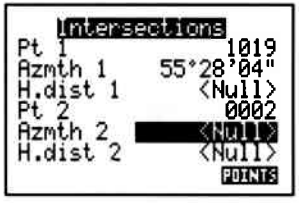
8. Type the following in the ***"Azimuth 1"*** field.

55.2804 <ENTER>

Follow these steps to compute the unknown azimuth:

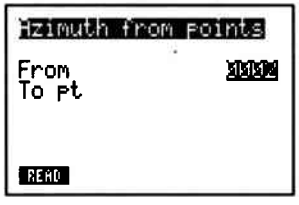
1. Specify this point number in the ***"Pt 2"*** field:

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:

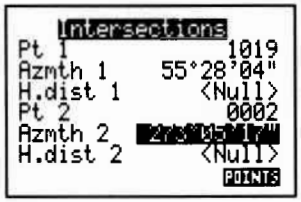


The ***"From"*** field defaults to point number 2 (the starting point for the azimuth).

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

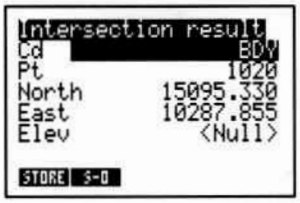
1 <ENTER>

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.

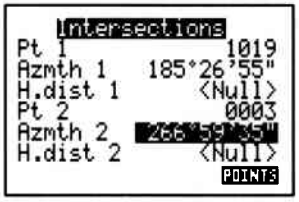
1. Highlight the ***"Azmth 1"*** field.

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

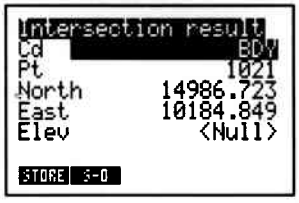
2 <ENTER>
3 <ENTER>

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

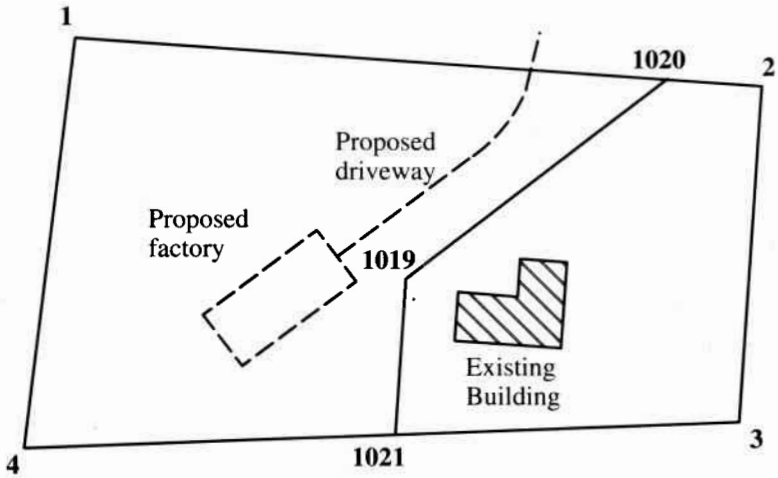
Areas

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.

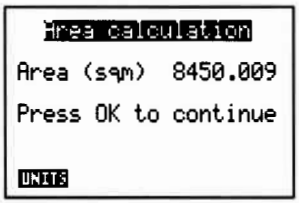
The following screen displays:

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:

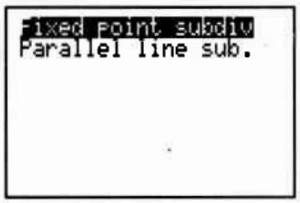


Note: The **<UNITS>** softkey is used to change the units of areas.

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.

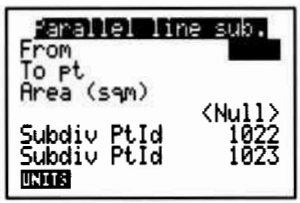
Follow these steps to adjust the area:

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

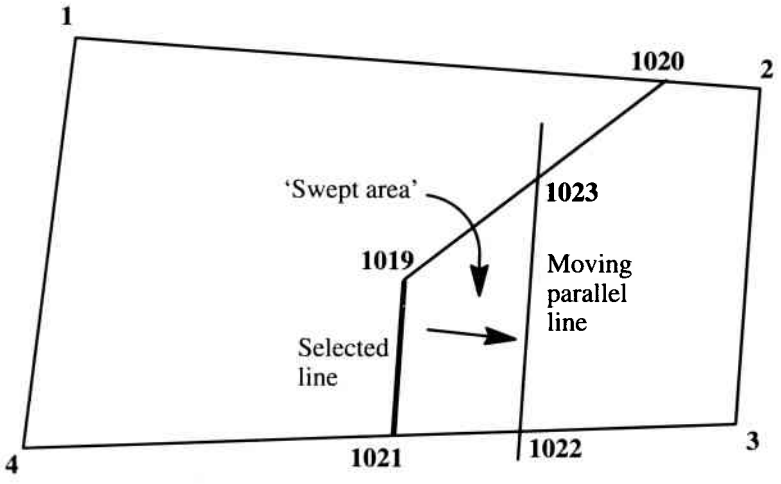


We will adjust the area by moving a line parallel to the boundary line defined by points 1019 and 1021.

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



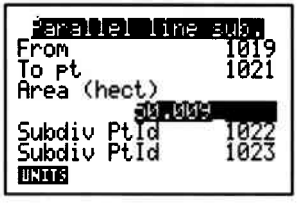
To make the adjustment, a line parallel to the selected line is moved across the area until the space covered by the moving line equals the specified area.



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.

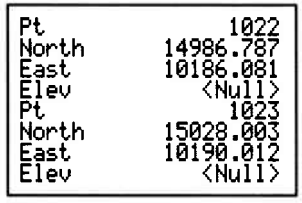
3. Enter the following point numbers and specified area:

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

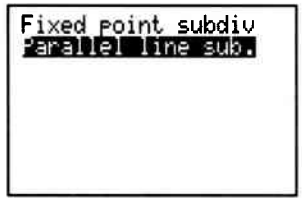


The point numbers in the two ***"Subdiv PtId"*** fields are the point numbers of the points created by the adjusted position of the boundary line.

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.

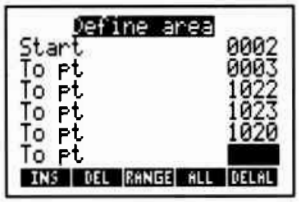
Follow these steps to verify the adjustment:

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

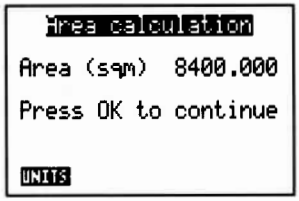
1022

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>

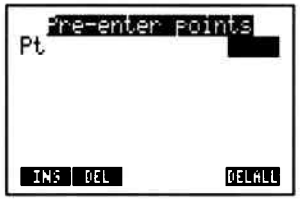
The SDR33 searches its database to determine whether it is able to directly calculate the coordinates for point 0005. As there have been no observations to 0005 in previous tutorials, it is unable to do so. We will be allowed to proceed with the resection.

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>**

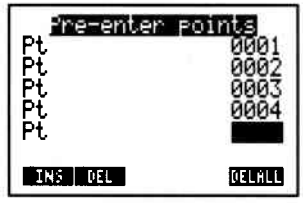
The SDR33 analyzes the existing sets in the database, and then permits us to pre–enter any points that we wish to observe from point 0005.



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:

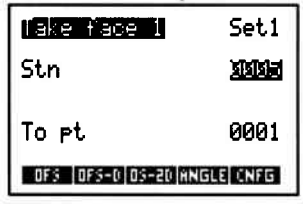
1 <ENTER> 2 <ENTER> 3 <ENTER> 4 <ENTER>



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

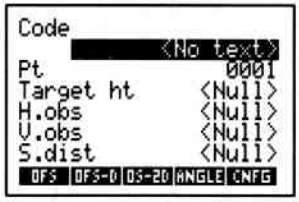
8.2 Resection observation

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



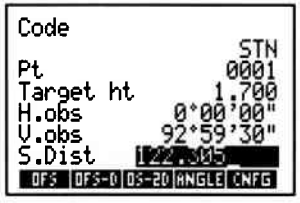
Follow these steps to make the observation:

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



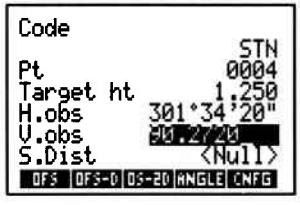
2. Type in the following data:

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>**



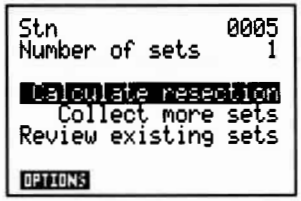
4. Press the **<ANGLE>** softkey to initiate the angles–only observation to 0004 after turning over the instrument's face.

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>**

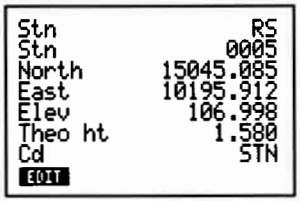
8.3 Resection calculation

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:



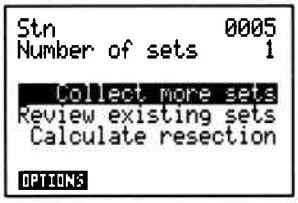
Follow these steps to calculate the resection:

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.

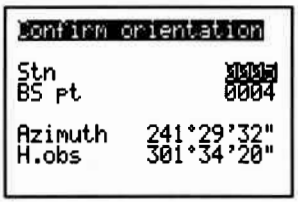
9.2 Setting up

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:



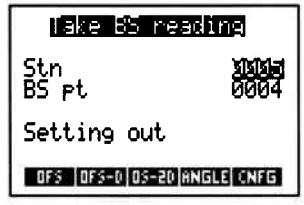
We will set up our instrument on station 0005 (as the SDR33 has anticipated!) and use station 0004 as our backsight. The SDR33 has

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 :

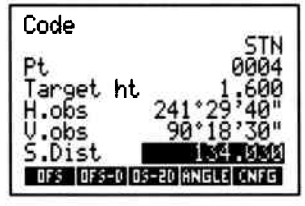
4 <ENTER>

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:

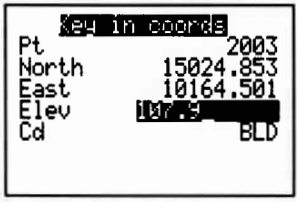
2. Number the corners of the building as points 2000 to 2003.

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:

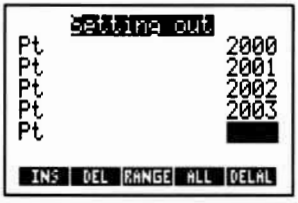
Pt	North	East	Elv	Cd	
2000	15017.392	10169.534	107.9	BLD	**<OK>**
2001	15007.327	10154.611	107.9	BLD	**<OK>**
2002	15014.788	10149.579	107.9	BLD	**<OK>**
2003	15024.853	10164.501	107.9	BLD	



9.4 Setting out list of points

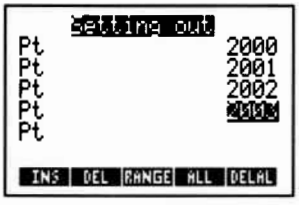
Follow these steps to set out points:

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

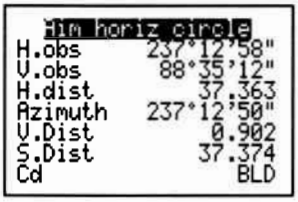


The first point we will set out is point 2003.

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



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

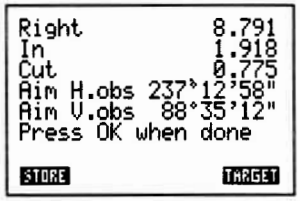


The SDR33 is giving you all the data required to set out this point. In practice the total station would now be turned to the given H.obs, and you would take a reading.

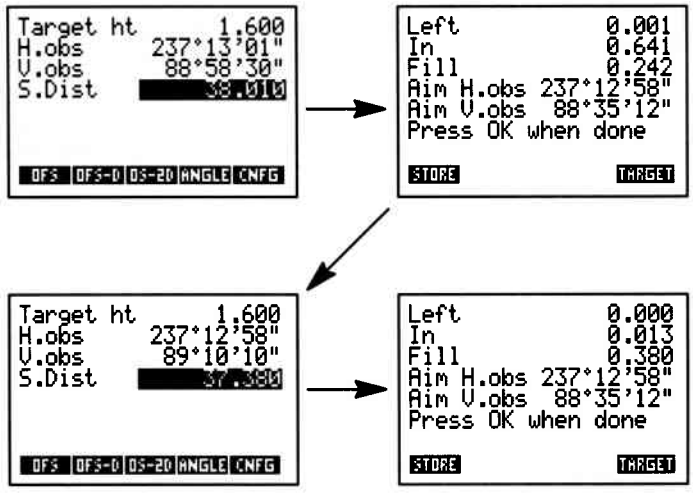
4. Press the **<READ>** key. The total station would now be initiated and values would automatically be entered into the next screen. For our purposes enter the following data:

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:

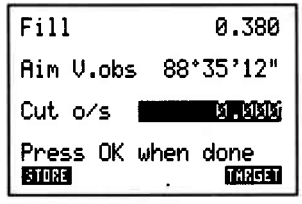


From here, you can direct the person holding the rod and then press **<READ>** to measure again and refine the horizontal positing. (Pressing **<Clear>** will return you to the ***"Aim H.circle"*** screen).



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.

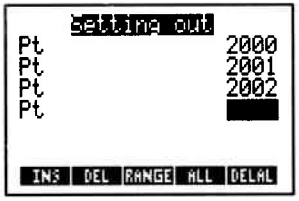
   Note: The ***"Cut o/s"*** field will not be discussed in this guide. Please refer to Chapter 18 of the **SDR33 Reference Manual** for a detailed explanation of this feature.

   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.

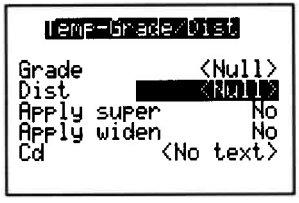
The following screen appears:

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:

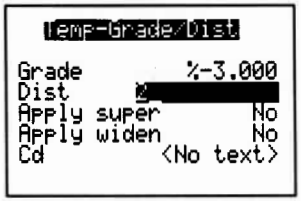


5. Type the actual value of the grade (ie., –3%)

For Grade, type: **–3 <ENTER>**

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

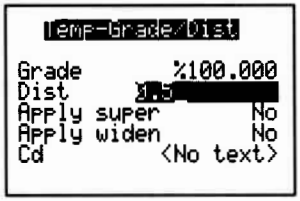
For Dist, type: **2 <OK>**



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:

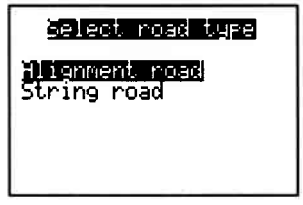
2. Type the following:

FACTORY SITE <ENTER>

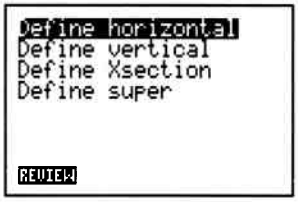
(We will leave the scale factor at 1.00000000)

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

The following screen will appear:



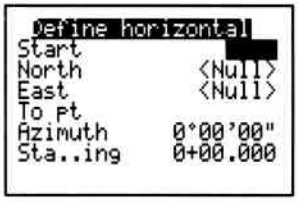
4. Press **<ENTER>** to select an alignment road. The following screen will appear:



10.2.1 Horizontal road geometry

Follow these steps to create the horizontal definition:

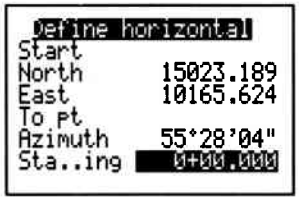
1. Press **<ENTER>** to select ***"Define horizontal"***; and the following screen appears:



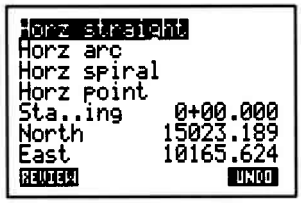
2. Press the **<ENTER>** (or **<⇓>** key) to avoid the Start point (for more details see Chapter 28 in the **SDR33 Reference Manual**).

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.

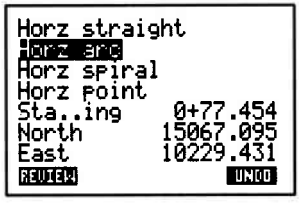
5. Press **<ENTER>** with the ***"Horz straight"*** entry of the menu highlighted, and you will see the following screen:

6. Type this information:

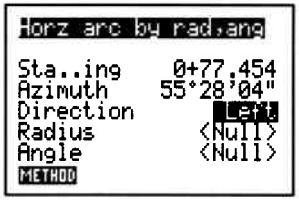
77.454 <ENTER>

We will now define an arc.

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



The following screen appears:



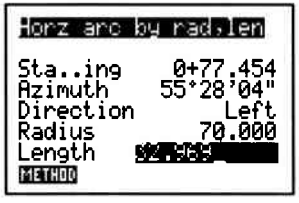
By pressing the **<METHOD>** softkey, you can change the method of arc entry.

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:

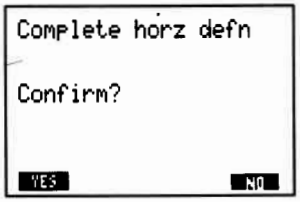
For Dist, type: **14.766**

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

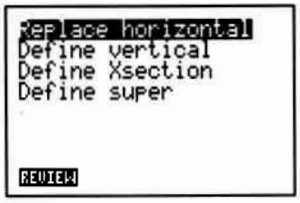
14. Press the **<REVIEW>** softkey to view the database.

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:

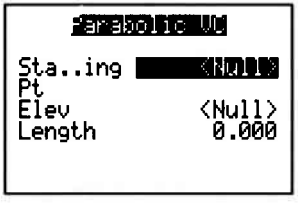
2. Press **<ENTER>** **<ENTER>** (or **<⇓>** **<⇓>**) to move the cursor to the ***"Elev"*** field, and type:

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:

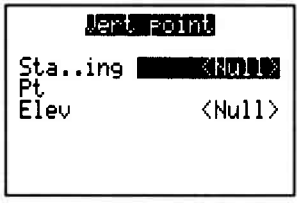


4. Enter the following data:

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:

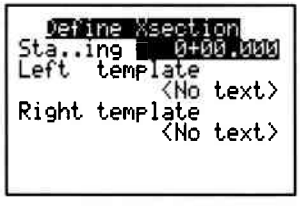
For Sta..ing,	type:	**108.21 <ENTER>**
For Pt,	type:	**<ENTER>**
For Elev,	type:	**102.295 <ENTER>**

You will be back at the road definition screen.

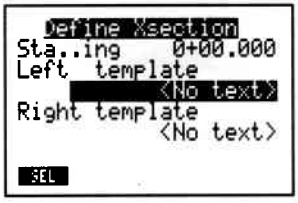
10.3 Cross section definition

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>

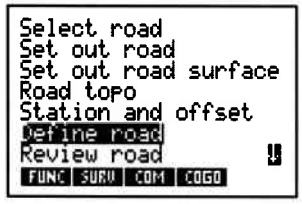
7. Press **<CLEAR>** to exit.

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

10.4 Setting out the road

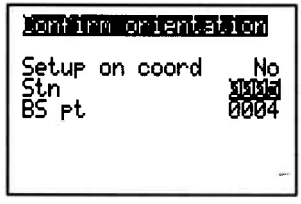
Follow these steps to set out the centerline and side slopes of one cross section:

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

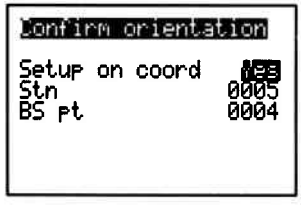


2. Select the ***"Set out Road"*** entry.

   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:



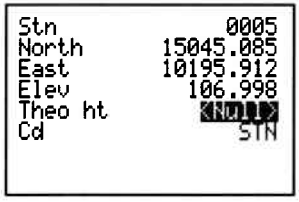
3. Move to the ***"Setup on coord"*** field and press the **<⇒>** (or **<⇐>**) key.



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

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

The next screen shows the coordinates for station 5.



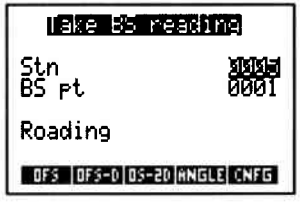
5. Highlight the ***"Theo Ht"*** field and enter:

1.6 <ENTER> <OK>

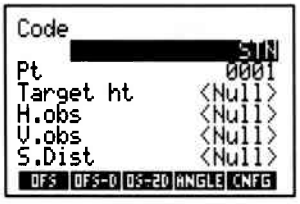
6. Move the highlight to the ***"Bs pt"*** field, type:

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>**

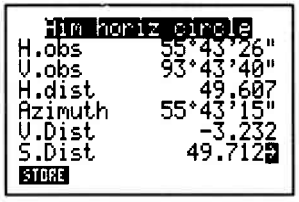
The following screen appears:

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.

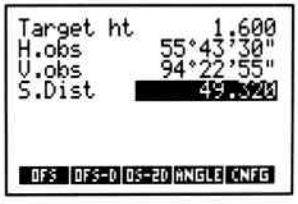
11. Press the **<OK>** key and the following screen will appear:



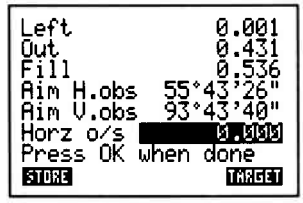
This screen gives you all the information you will need to set out this point.

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:

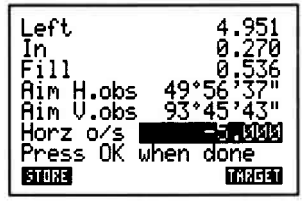


This screen indicates where the prism pole is in relation to the instrument, the road definition and the instrument's horizontal circle. The highlight has positioned itself automatically at the ***"Horz o/s"*** field. This field is useful if you wish to offset the defined point to a new location. We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

14. Type:

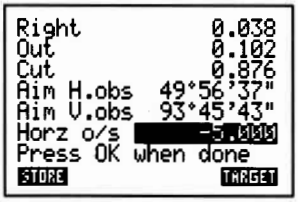
For Horz o/s, type: **–5 <ENTER>**

This changes the values on the screen.

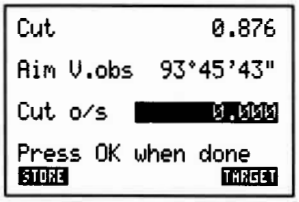


Take another reading, this time to the offset point, type:

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:



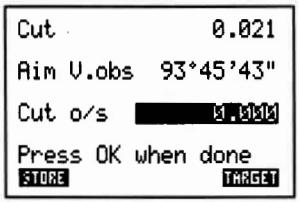
Changing the value in the ***"Cut o/s"*** field (which will be highlighted) will change the value of the field called ***"Aim for V.obs."***

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

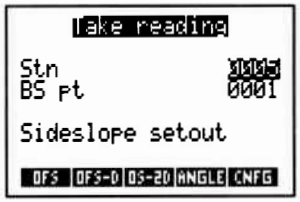
Follow these steps to set out the side slope points:

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

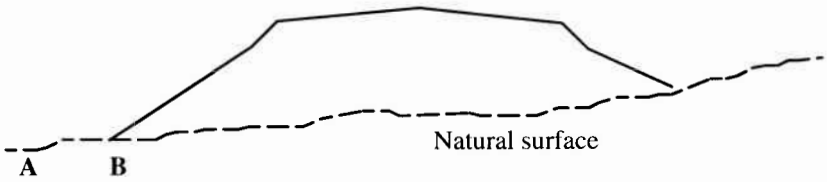
2. Move to the ***"Horz o/s"*** field (by pressing **<⇓>** key), and reset the value of the horizontal offset to zero by entering:

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

The following screen appears:

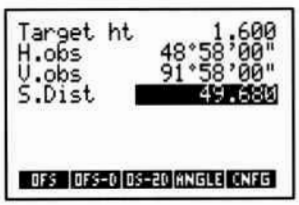


3. Press the **<READ>** key to take an initial approximate reading to where the sideslope meets the natural surface (point A in the following diagram).



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**

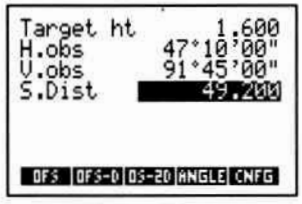


5. Press **<OK>**, and the screen illustrated below appears:

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:

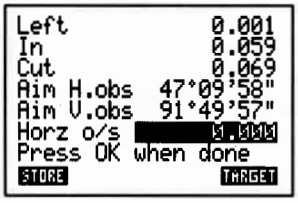
For Target ht,	type:	**<ENTER>**
For H.obs,	type:	**47.10 <ENTER>**
For V.obs,	type:	**91.45 <ENTER>**
For S.Dist,	type:	**49.20**



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

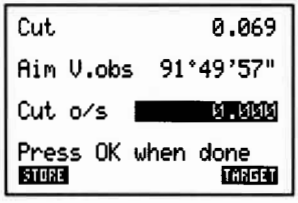
The *"Cut"* field and the *"D.sta"* field are now both close enough to zero for our needs.

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.

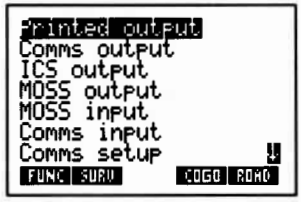
In this lesson you will:

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.

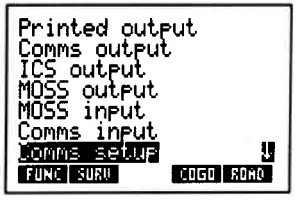
2. Make sure the ***"Current view"*** is set to ***"Yes"*** and that the rest of the entries are set to ***"No."*** Press **<OK>** to return to the previous menu.

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.

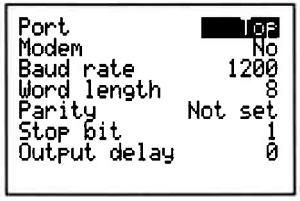
11.2 Communications setup

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

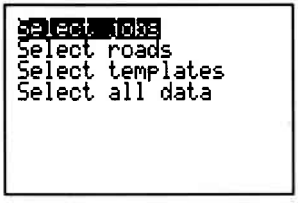
1. Connect the SDR33 to a computer (described in detail in Chapter 30 of the **SDR33 Reference Manual**), then select the ***"Comms setup."***



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		

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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		

Appendix A: Tutorial database

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 **

Appendix A: Tutorial database

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Symbols

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