

## TOTAL STATION handling guideline

### Data: Auto Recording/Saving Mode

#### Summary Guideline

There are different field conditions while field survey work executed by TOTAL STATION instrument at just starting stage - (say starting station Trv-1) . Mainly as following :-

(a)	Supposing <b>arbitrary coordinate value X Y Z</b> or <b>E N Z of beginning Traverse Station</b> . In this condition it will require to measure orientation - such as <b>compass bearing of starting traverse line</b> or set an <b>arbitrary reference line</b> . <b>These data are not transferable to GIS based digital map.</b>
(b)	<b>Coordinate data</b> of beginning <b>Control Station or Traverse station</b> capturing by <b>pocket handheld GPS</b> , require to measure <b>orientation</b> - such as <b>compass bearing of starting traverse line</b> . Data are <b>transferable to GIS based digital map</b> but not so <b>matching</b> , it depends upon the accuracy of GPS instrument.
(c)	If <b>two nos of already fixed Control Stations</b> are available ( <b>known X, Y, Z or E N Z</b> ) at the nearby working site, then not necessary to measure orientation of Traverse line by compass.
(d)	Find out <b>X, Y, Z (E N Z) coordinates</b> of a station nearby project site by <b>RESECTION method</b> and transfer coordinate to the project site establishing <b>Traverse or Baseline Stations</b> . The <b>North Bearing</b> is transferred from <b>Resection</b> .
(e)	If <b>BASE LINE SURVEY</b> is <b>already conducted</b> along the <b>Control or Traverse alignment</b> , detail survey can be done <b>independently</b> on any area observing any <b>two stations</b> at beginning . It is required to collect all <b>base line data</b> and <b>upload to the instrument</b> . It is principally most preferable way of engineering field survey.

#### NOTES :- Working Principle, Standard norms, Ethical discipline

i	To get <b>higher accuracy</b> in field survey work <b>Overall Traverse Survey</b> is to be completed first comprising with horizontal & vertical control. It is the first principle of survey " <b>Working from whole to the part</b> ". The finally adjusted <b>X Y Z (or NEZ)</b> data of control points are <b>uploaded to the TOTAL STATION</b> or input manually to conduct detail survey. It is <b>importantly recommended to upload</b> the final adjusted data to the <b>TOTAL STATION (Device)</b> . <b>Manually input method may lead to blunder.</b>
ii	Sometimes <b>Traverse work and Detailing</b> can be conducted <b>simultaneously</b> depending on the required accuracy and field condition of the project. In this method the <b>data</b> are <b>recorded both in paper Field Book and instrument memory</b> . <b>Traverse data</b> can be <b>recorded</b> in <b>Paper Field Book</b> manually with <b>Angle and EDM</b> mode. Also the traverse and detailing data can be saved in instrument memory with <b>AutoRecording</b> mode. After production of map, if the orientation of map <b>misleading</b> due to somewhere <b>misinput</b> , it can be <b>verified and adjusted</b> by traverse data of <b>Paper Field Book</b> .
iii	Always keep in mind while performing detail survey by TOTAL STATION instrument : - <b>The telescope should be at Face Left or Vertical/Zenithal Angle at 90 degree face.</b>

Following practice for TOTAL STATION handling is based on field conditions (a) to (e)

Steps	The main procedures to be followed are as below :-
1	Temporary adjustment of the instrument (centering, leveling) on the station <b>OCCUPIED POINT</b> .
2	Open the <b>Data Recording/Saving mode Menu</b> in instrument and <b>create new file or search existing file</b> , set the <b>OCCUPIED</b> station name, ID, INS. HT., NEZ of <b>occupied station</b> and <b>REC</b> (record/save) it.
3	After completion of <b>step-2</b> saving data of <b>OCCUPIED POINT</b> , sight to <b>BACK Sight station (BS)</b> as a reference line, input <b>station name, PCODE, R.HT (reflector height)</b> . Input the value of <b>NEZ of BS (Back Sight) Station</b> manually. <b>If the data of control stations are already saved or uploaded in instrument, search the BS station in LIST or input the station name.</b> After then measure distance to <b>BS (Back Sight) station</b> .
4	Now the instrument is ready to take <b>detail points</b> . The display shows <b>F3: FS/SS (Fore Sight &amp; Sight Shot)</b> . The display automatically shows <b>increment of station number</b> . Now change the <b>station name and number to detail number</b> by inputting manually for first point. Continue to sight detail points, the number will <b>increment automatically</b> .

5	After completion of <b>step-4</b> , <b>shift the instrument to the next station</b> and repeat the work done at <b>step-2 to search the existing file name</b> . The recent <b>occupied point</b> is to be searched in instrument memory. <b>Becareful to search correct name</b> . If the name does not match in case of manual input, it will display <b>point not exist</b> . <b>If the name and data matched to the wrong station, all the traverse orientation and details will be misleded.</b>
6	After completion of <b>step-5 (setup of occupied point)</b> , repeat the work done at <b>step-3 for Back Sight (BS) referncing</b> . In this step <b>Back Sight (BS)</b> station is to searched in memory file.
7	After completion of <b>step-6</b> , repeat the work done at <b>step-4</b> and continue the work forward.

### Data Saving/Recording Guideline for Traverse and Detailing

#### Steps in general

1	Centering and leveling of <b>TOTAL STATION</b> on the beginning Traverse Station, same steps as Theodolite set up
2	Record the <b>instrument height (HI)</b> of instrument station (if required) and <b>reflector height (RH)</b> of Station <b>A &amp; B</b> .
4	Press the <b>Power On</b> key on keypad. Normal mode ( <b>Angle mode</b> ) will display.

#### Steps to follow for Condition (a) to (e)

#### Steps in operation

**Based on TOPCON TOTAL STATION Instrument**

9	<p><b><u>Begins to Data Saving Process</u></b> :- Press <b>Menu</b> key on key pad</p> <p>Option mode will display <b>MENU</b></p> <p><b>{in old version}</b>      <b>F1: DATA COLLECT</b>      1/3 (Page 1 of 3)</p> <p style="padding-left: 100px;"><b>F2: LAYOUT</b></p> <p style="padding-left: 100px;"><b>F3: MEMORY MGR</b>      <b>P</b> (Next Page) ↓</p> <hr/> <p><b>{in recent version}</b>      Press <b>Menu</b> key on key pad      <b>(After merged SOKKIA)</b></p> <p>Option mode will display <b>MENU</b></p> <p style="padding-left: 100px;"><b>F1: TOP FIELD</b>      1/3 (Page 1 of 3)</p> <p style="padding-left: 100px;"><b>F2: DATA COLLECT</b></p> <p style="padding-left: 100px;"><b>F3: LAYOUT</b>      <b>P</b> (Next Page) ↓</p> <hr/> <p><b>{in recent version}</b>      Press <b>Function key F4</b> on key pad for next page</p> <p>Option mode will display <b>MENU</b></p> <p style="padding-left: 100px;"><b>F1: MEMORY MGR</b>      2/3 (Page 2 of 3)</p> <p style="padding-left: 100px;"><b>F2: PROGRAMS</b></p> <p style="padding-left: 100px;"><b>F3: GRID FACTOR</b>      <b>P</b> (Next Page) ↓</p>
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10	<p>Press key <b>F1: DATA COLLECT</b> then <b>SELECT a FILE</b> will displayed <b>{old version}</b></p> <p>Press key <b>F2: DATA COLLECT</b> then <b>SELECT a FILE</b> will displayed <b>{recent version}</b></p>
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11	<p><b><u>Create a New File :- (in instrument memory)</u></b></p> <p>Press function key <b>F1</b> (while <b>SELECT a FILE</b> displayed ) to <b>create a new file</b>, and again press function key <b>F1</b> for alphabetic &amp; numeric input, for example creating a file name as <b>GRP-28</b>. After inputting the file name press function key <b>F4 = ENTER</b> to save the file in internal memory of instrument.</p>
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In the case of opening previously saved file, press function key **F2 = LIST** to search the existing files by scroling up and down on key pad. An arrow will pointing to file while scroling. Point the arrow to the required file name & press function key **F4 = ENTER**, then your file will be selected.

12 After completion of step 11 the screen of **TOTAL STATION** will display as following :-

**DATA COLLECT**

**F1: OCC. PT# INPUT**

**F2: BACKSIGHT**

**F3: FS/SS**

It means creation of new file or searching of existing file is accepted

13 **Setting Occupied Station of instrument = F1 : OCC. PT# INPUT :-**

**data entry or search for the point occupied by the TOTAL STATION.**

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**Condition (a) & (b) =** Press function key **F1: OCC.PT# INPUT**. The screen of instrument will display **OCC PT#, ID, INS HT**. An arrow will pointing to the top row at **PT#** that means ready to input the **station name/number**. Press function key **F1** to input alphabetic and numeric for station name and number. Input the station name for example as **Trv-2** for begining station or search in **LIST** if data is uploaded. Press function key **F4=ENTER**. Now the arrow will pointing to second row **ID** ie for input description of station as wooden peg , boulder, rock, concrete etc. Again press **F4=ENTER**, then arrow will pointing at **INS HT**. Input the value of **INS HT** by numeric key directly, ie no need to toggle **alphanumeric function key F1**.

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Press function key **F4 = OCNEZ**. It means to input **Northing(N), Easting(E) & RL (Z) of occupied station**. Press function key **F3 = NEZ**. Display will show a previous memory **NEZ** value. Do not record this value, so press function key **F3** to reject the value. Then the display will return to **NEZ INPUT** option. Press function key **F1** to input new value. Input directly by numeric key for **N value** and press **F4** for enter. Then the cursor will blink to second row **E** and so on **Z** . Press **F3 to record/save the data**.

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**Condition (c) (d) (e) =** In this case [data of control stations already saved or uploaded] **F1= OCC.PT# INPUT** is searched in memory **LIST** or carefully input **matching station name** ie **saved** in memory file. Change only instrument height **INS HT**.

14 **Sighting to BS (Backsight) Station :-**

After completion of **setting occupied station** as described above in **step-13**, the display again returns to **DATA COLLECT** menu. It means **data recording of occupied station is completed**.

**DATA COLLECT**

**F1: OCC. PT# INPUT**

**F2: BACKSIGHT**

**F3: FS/SS**

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**Condition (a) & (b) =** Now press function key **F2 : for BACKSIGHT (BS)** . Now the display will show input for **BS station name/number, PCODE, R HT (Reflector height)**. Press function key **F4 = BS**. The display will show input or list for **BS** station. At this stage we have no previous **Backsight (BS) station recorded in instrument memory**. So input **BS station name/number, coordinate value**. Press function key **F1** and input **BS** station name and number as **Trv-1** or and so on, **PCODE, RHT** etc.

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Press function key **F3**. The display shows **NE/AZ** at function key **F3**. It means to input **either NEZ value of BS station or provide AZ (Azimuth/Bearing) value of BS line**. In this condition the **NE** value of **BS is unknown**. So it is required to provide **AZ (Azimuth/Bearing)**. Press function key **F3** to input **AZ**. The display will show input **AZ HR = .....** Press function key **F1** and input the **horizontal angle (Bearing)** value by numeric key . **Press F4 to save data**.

15 Now the display will show again **BS** station name, **PCODE, RHT**. Now orient the telescope towards **BS station**. Press function key **F3** to measure distance from **instrument station (OCC PT)** to **BS station** and record/save it. **Now the BS line is defined**.

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In **Condition (c) (d) (e) = BS** is searched in memory file.

16 **Sighting Detail Points FS/SS :-**

After the step 15, the display returns back again to step 12.

**DATA COLLECT**

**F1: OCC. PT# INPUT**

**F2: BS BACKSIGHT**

**F3: FS/SS**

Now It is ready to sight **detail points (Sight Shot)** around the occupied station. Also can be sight to next **Traverse Station** as a **Foresight FS** to check (not compulsory), but keep in mind that the name of sighted FS (measured) station should be **named differently**, it should **not be matched** to the previously saved station name in the instrument memory file.

Press function key **F3** to measure **Detailings FS/SS**. The display will show **FS/SS** point name, **PCODE, RHT** etc. An arrow marker will pointing to top row **FS PT#**. Press function key **F1** and input **FS/SS** Detail name/number **DET-1**. Function key **F1** will toggle alternately for alphabetic and numeric input. After completion of input **DET-1**, press **F4** to **enter**. The arrow marker will pointing to second row **PCODE**. If **PCODE** description not required to input, use function key **F4** to enter or up and down scroling key on keypad. After completion of input, press function key **F3** to measure the sighted point. Immediately **NEZ** value of the sighted point will displayed. **Record/save** it.

**17** **Sighting Detail Points Continue:-** Now the display will show **FS/SS** point name and number automatically incremented as **DET-2**.

Thus not required to input **name/number** of detailings. But if change occurred, input **PCODE, RHT** etc, otherwise not necessary. Sight the several required points by swinging the telescope. **Give an attention to the function key F4**. You will see **ALL** above function **key F4**. It is easier and faster to measure and record/save data using **function key F4 (ALL)** than function key **F3 (MEASURE)**. Now press function **key F4 (ALL)**, the data will **automatically recorded/saved**. The display will show detail number automatically **incremented as DET-3**. Suppose detailing work at this station ended at **DET-76** numbers, press **ESC** key on key pad to return on **ANGLE MODE** and press **power off key**.

It is suggested not to power off during **DATA COLLECT MODE**.

**18** **Occupied and Backsighting known Stations :-** for **Condition (a) & (b)** = After **step-17**,

shift the instrument to station **ST-3** and follow the **steps 9, 10** and **keep notice on step-11**.

At the **step-11**, it was a condition to **create a new file** ie due to begining stage. Now in **step-18**, it is required to open the file name **created** on **step-11**. After pressing **DATA COLLECT** mode the display will show current working file name **GRP-28**. If does not show the required file name, press function key **F2 = LIST** as described in **step-11**.

In **step-18**, the stations both **OCCUPIED (OCC.PT#)** and **BACKSIGHT (BS)** are known (**E, N, Z**) points (**data already saved**). Set up the data of (**OCC.PT#**) and **BS** searching in **memory LIST**.

Same way sight to **BACKSIGHT (BS)** station and set up data as described in **step-14 & 15**.

**Be careful to input correct digit for OCCPT & BS, in case of manually input, verify & conform.**

**In Condition (c) (d) (e) = (OCC.PT#) & BS are searched in memory file.**

**19** **Sighting Detail Points FS/SS :-** as described in **step-16 & 17**.

At previous station the detail number was ended at **DET-76**. Now at this station, input **manually the first detail number as DET-77**, then measure by **F4 (ALL)** function key. The second detail number will incremented automatically as **DET-78**. Proceed the work forward same way.

**Now proceed to OFFICE WORK :-**

- (a) DATA DOWNLOAD/IMPORT from instrument memory
- (b) DATA PROCESSING to interface with different software

After **completion** of total **field survey work**, the **saved data** in **TOTAL STATION memory** is to be **downloaded** in desktop computer or Laptop. For this purpose following steps are to be followed :-

To IMPORT saved DATA from TOPCON TOTAL station of different series :-  
GPT-2000, GPT-1000, GTS-310, GTS-220, GTS-210 follow instructions below

**Steps**

**1** At first, find out the **properties of TOPCON Data Transfer Serial Port** - such as **COM - 2, 4, 7, 19** etc.

To know this connect the **Data Transfer Serial Port to computer** :-  
6. Total Station Handling 2.xlsx



## TOTAL STATION TRAINING

### **OFFICE WORK = DATA UPLOADING**

Data **downloading** and **uploading** facility is a significant feature of TOTAL STATION.  
This facility is operated for following two purposes.

- I According to the **condition (e)** the final adjusted data (**ENZ**) of **base line control stations** are to be **upload** **TOTAL STATION (Device)** to conduct further **detail survey**.
- II After generation of topographic map, required **designed features** are drawn on the map.  
The data (**PCodes**) or (**ENZ**) of major **construction points** and **control stations** are to be **uploaded** to the **TOTAL STATION** to conduct **construction settingout** or **layout on the site**.

**For this purpose following steps are to be followed :-**

- 1 Prepare the **data** in an **EXCEL** format. It should not contain **TEXT** in data row and column.
- 2 In data **downloading** process from TOTAL STATION **instrument (device)** to the computer the data file contains columns with sequence of **Northing, Easting, Elevation (NEZ)**  
**But** in data **uploading** process (**computer to device**) the data file should be prepared containing the columns sequence of **Easting, Northing, Z Elevation (ENZ)**.
- 3 Input **Serial Number** of station and points in **numeric value only**. Remove any **text** in **row** and **column**.
- 4 **Save** the file as **CSV (comma delimited)** in desktop.
- 5 Find out the properties of TOPCON **Data Transfer Serial Port** as guided in **downloading** process **step-1**
- 6 Open the **T-Com** program (**Data upload** software of **TOPCON TOTAL STATION**).
- 7 On **T-Com** window **click** on **right top 9th green icon Upload Coords to GTS-GPT**.  
Next small window **Comm Status** will display.
- 8 **Comm Status**  
Protocol  
O None       Ack/Nak       Read Text file  
Do not select Protocol, **select ACKNAK**, Tick mark on **Read Text file**  
Select **Comm Port** number as found from **step-5**  
Left other status as it is, then click on **Go**
- 9 Next window will appear as **Open File** - **Find the location of CSV file** - select **All Files**, **select** the file or input the name then click on **Open**
- 10 Data will appear in just like **Notepad** - along with a small window - **Points Details** click on **OK**
- 11 Save the file on Desktop - from **File menu** - **Save as** (input the file name)
- 12 **Open** Microsoft **Notepad** ---- **Drag** the saved Desktop file to the **blank Notepad** --- **Save as**  
**Checkout the file Type : Text Documents (\*.txt)**
- 13 The file will be **converted** to a **Txt** file on Desktop.
- 14 Open **TOPCON-Link** and **check** the file for --- **NEZ** value should appear to **ENZ**

**15** Select on **TOPCON-Link** Menu --- **File export to Device** --- double window will appear -- search the required file in **window** Click on **Look in** (ie computer) --- then at **right window** click on **Topcon Total Station** (ie Device) -- double **Add New Station**. A **Create Station** window will appear as shown at **step-16**.

**16** **Create Station**

Name

Note

Port

Model

Input File name, select COM number and Model then

**17** Select the recent **File xxxxx** and double click, **file1.txt** will highlighted, **Waiting to Start** will display on computer, thus it is ready to data upload

**18** In **TOTAL STATION** instrument = **Power on** --- Menu --- **F3 : MEMORY MGR**

Page 3/3 F1: **DATA TRANSFER**, F1: **GTS FORMAT**, F2: **LOAD DATA**, F1: **COORD DATA**

COORD FILE NAME **FN = .....** (Input the name of file) **F4: ENTER**

**LOAD COORD DATA**

**> OK** (YES) (NO)

**19** Click **Start** on computer ----- click **Yes** keypad on **TOPCON** instrument

**20** **View** for check the uploaded data in **TOPCON instrument** -- **MENU**

**F1: DATA COLLECT** or **F2: LAYOUT** --- File name **FN = .....**

**Input** the file name by **ALP NUM** key or **LIST** by up and down scrolling key

After selection of file name **F4 : ENTER**

**F1: OCC. PT INPUT**  
**F2: LIST**

Uploaded data point will displayed → 1, 2, 3 .....etc.

**F1: VIEW**

**PT# 1**

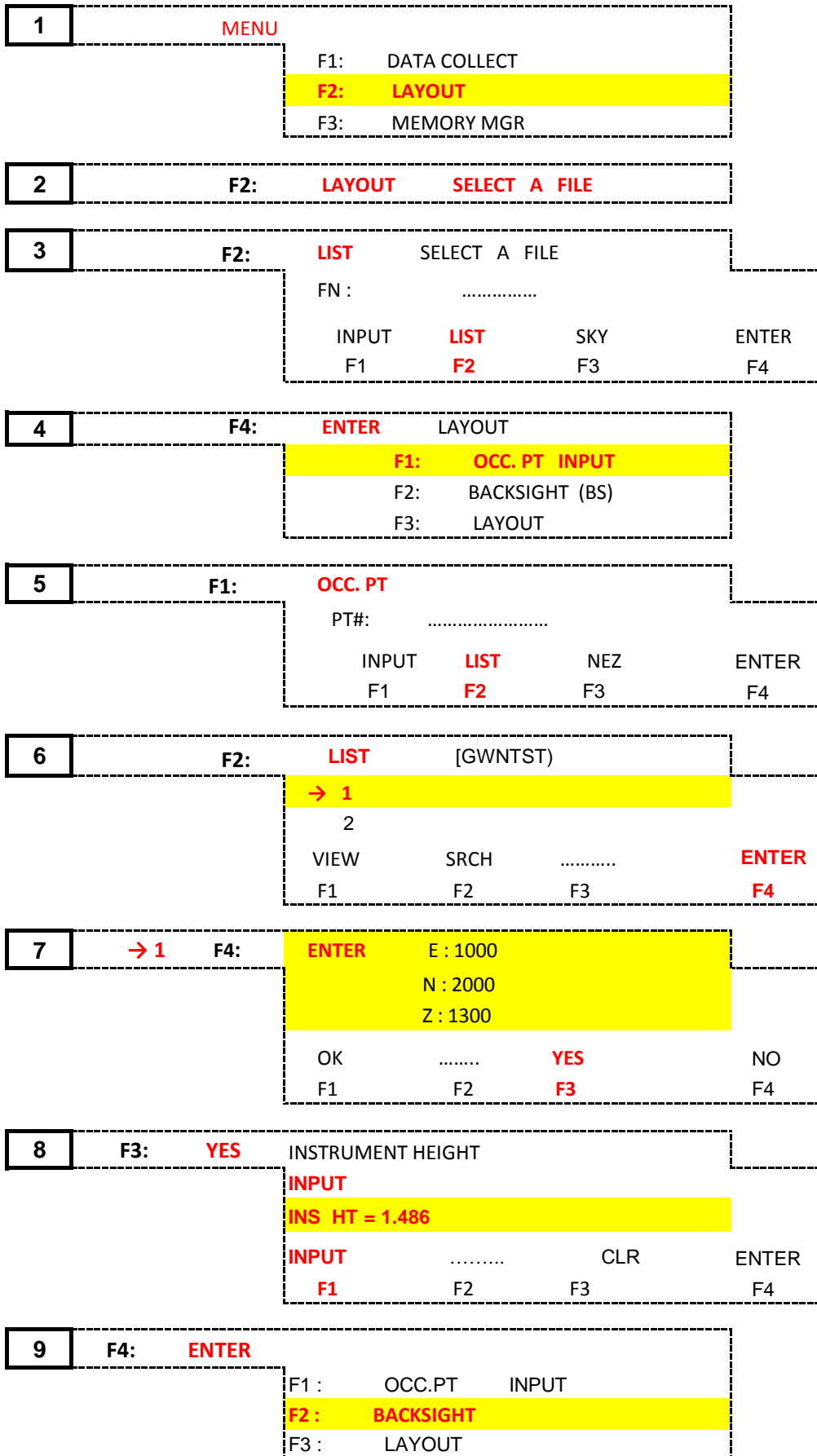
**E 1000.000**  
**N 2040.000**  
**Z 300.000**



## FIELD WORK = CONSTRUCTION LAYOUT/SETTINGOUT

Data in coordinate format (ENZ) of **Primary** and **Secondary Control Stations** along with detailed **constru points** can be **uploaded** to the **TOTAL STATION** instrument then construction settingout work can be conducted at site.

### OPERATING STEPS



**10**    **F2: BACKSIGHT**    **PT# .....**

INPUT	<b>LIST</b>	CLR	ENTER
F1	<b>F2</b>	F3	F4

**11**    **F2: LIST**    **[GWNTST]**

1

**→ 2**

VIEW	SRCH	.....	<b>ENTER</b>
F1	F2	F3	<b>F4</b>

**12**    **→ 2**    **F4 ENTER**

E: 988.706  
N: 1995.658  
Z: 1299.987

>OK	.....	<b>YES</b>	NO
F1	F2	<b>F3</b>	F4

**13**    **F3: YES**    **BACKSIGHT**

H (B) = 196° 35' 40"

>SIGHT	.....	<b>YES</b>	NO
F1	F2	<b>F3</b>	F4

**14**    **F3: YES**

F1 : OCC.PT    INPUT

F2 : BACKSIGHT

**F3 : LAYOUT**

**15**    **F3: LAYOUT**

**LAYOUT**

**PT# : .....**

INPUT	<b>LIST</b>	NEZ	ENTER
F1	<b>F2</b>	F3	F4

**16**    **F2: LIST**    1    **[GWNTST]**

2

**→ 3**

VIEW	SRCH	.....	<b>ENTER</b>
F1	F2	F3	<b>F4</b>

**17**    **→ 3**    **F4: ENTER**

E: 987.514  
N: 2003.743  
Z: 1299.981

>OK	.....	<b>YES</b>	NO
F1	F2	<b>F3</b>	F4

**18**    **F3: YES**    **REFLECTOR HEIGHT**

INPUT

**R. HT = 1.400**

INPUT	.....	CLR	<b>ENTER</b>
F1	F2	F3	<b>F4</b>



<b>19</b>	<b>F4 : ENTER</b>	<b>CALCULATED</b>		
		HR = 106°35' 40" HD = 13.035 m		
		<b>ANGLE</b>	<b>DIST</b>	.....
		<b>F1</b>	<b>F2</b>	<b>F3</b> <b>F4</b>

<b>20</b>	<b>F1 : ANGLE</b>	<b>PT# : 3</b>		
		HR : 106° 35' 40" dHR : -06° 05' 35"		
		<b>DIST</b>	.....	<b>NEZ</b>
		<b>F1</b>	<b>F2</b>	<b>F3</b> <b>F4</b>

<b>21</b>	<b>F1 : ANGLE</b>	<b>PT# : 3</b>		
		HR : 106° 35' 40" dHR : 00° 00' 00"		
		<b>DIST</b>	.....	<b>NEZ</b>
		<b>F1</b>	<b>F2</b>	<b>F3</b> <b>F4</b>

<b>22</b>	<b>F1 : DIST</b>	<b>PT# : 3</b>		
		HD : 13.035 m dHD : -01.324 m		
		<b>DIST</b>	.....	<b>NEZ</b>
		<b>F1</b>	<b>F2</b>	<b>F3</b> <b>F4</b>

<b>23</b>	<b>F1 : DIST</b>	<b>PT# : 3</b>		
		HD : 13.035 m dHD : 00.000 m		
		<b>DIST</b>	.....	<b>NEZ</b> <b>ENTER</b>
		<b>F1</b>	<b>F2</b>	<b>F3</b> <b>F4</b>

