

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

NOTES :- Working Principle, Standard norms, Ethical discipline

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

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

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

Data Saving/Recording Guideline for Traverse and Detailing

Steps in general

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

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

Steps in operation Based on TOPCON TOTAL STATION Instrument

9	<p>Begins to Data Saving Process :- Press Menu key on key pad</p> <p>Option mode will display MENU</p> <p>{in old version} F1: DATA COLLECT 1/3 (Page 1 of 3)</p> <p style="padding-left: 100px;">F2: LAYOUT</p> <p style="padding-left: 100px;">F3: MEMORY MGR P (Next Page) ↓</p> <hr/> <p>{in recent version} Press Menu key on key pad (After merged SOKKIA)</p> <p>Option mode will display MENU</p> <p style="padding-left: 100px;">F1: TOP FIELD 1/3 (Page 1 of 3)</p> <p style="padding-left: 100px;">F2: DATA COLLECT</p> <p style="padding-left: 100px;">F3: LAYOUT P (Next Page) ↓</p> <hr/> <p>{in recent version} Press Function key F4 on key pad for next page</p> <p>Option mode will display MENU</p> <p style="padding-left: 100px;">F1: MEMORY MGR 2/3 (Page 2 of 3)</p> <p style="padding-left: 100px;">F2: PROGRAMS</p> <p style="padding-left: 100px;">F3: GRID FACTOR P (Next Page) ↓</p>
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10	<p>Press key F1: DATA COLLECT then SELECT a FILE will displayed {old version}</p> <p>Press key F2: DATA COLLECT then SELECT a FILE will displayed {recent version}</p>
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11	<p>Create a New File :- (in instrument memory)</p> <p>Press function key F1 (while SELECT a FILE displayed) to create a new file, and again press function key F1 for alphabetic & numeric input, for example creating a file name as GRP-28. After inputting the file name press function key F4 = ENTER 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.

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**.

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**.

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

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.

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**.

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

- a. \Rightarrow Select & right click on the **My Computer Icon** on desktop window
- b. \Rightarrow Double click on **Manage**
- c. \Rightarrow Double click on **Device Manager**
- d. \Rightarrow Window screen appears in two columns --- Left and Right column
- e. \Rightarrow Double click on **right column of window at -- Port (COM & LPT)**
- f. \Rightarrow Then you will see \Rightarrow **Prolific USB - to - Serial Com Port (COM - 2, 3, 4 or any digit will display)**

Now you have to note the **Port number (COM - 2 or - 3 or - 4 orso on....)**

Notes

If you always use same **Data Transfer Serial Port** to **same slot in computer**, the instruction given in **step-1** **is used first once**, only the **COM** number is **remembered**.

But if you use **different Data Transfer Serial Port** to **different computer and slot**, you have to follow the instructions given in **step-1** frequently in each data transfer.

2 Computer should be ready installed with **TOPCON LINK** (Data Transfer Driver)

- a. Open **TOPCON LINK** icon \Rightarrow **Import from Device** \Rightarrow
- b. TOPCON TS \Rightarrow Add new station \Rightarrow Double click
- c. **Create Station** window will appear input Name \Rightarrow **Survey-065**
Select **Port** \Rightarrow **COM 3 or 5 or 17**
Select **Model** \Rightarrow **GTS-220**
- d. Double click on name **Survey-065** \Rightarrow **file1.txt** will appear
- e. Double click on **file1.txt** or click on \gg then \Rightarrow **waiting for start window will appear**
- f. Now press **SEND** key on TOTAL STATION instrument & click on **Start** button at computer screen

3 Before pressing the **SEND** key (f.), **power on** the **TOTAL STATION** & follow the following steps :-

Power on \Rightarrow Menu \Rightarrow F3 : Memory Mngr \Rightarrow 1/3 F4 to P3 \Rightarrow : DATA TRANSFER
 \Rightarrow F1 : GTS FORMAT \Rightarrow F3 : COMM Parameters \Rightarrow F2 : BAUD RATE \Rightarrow ~~F4 : MODEM] ENTER~~
 \Rightarrow ESC - 2 times \Rightarrow DATA TRANSFER \Rightarrow F1 : SEND DATA \Rightarrow F1: MEAS. DATA \Rightarrow
 \Rightarrow Select a file \Rightarrow FN : GRP-28 \Rightarrow ENTER \Rightarrow SEND COORD DATA \Rightarrow

SEND COORD DATA OK YES = F3 NO = F4

Waiting for Start will display on computer

While **Step-2 (f)** is ready = press **SEND [YES]** key on instrument & click on **Start** button at computer screen

SENDING DATA will display on computer, after **SENDING** completed, a file with data as **Excell** format will display on monitor, then **Control-A, Control-C & Control-V** to copy in an excel file and **immediately rename** it to corresponding reference file name.

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 **uploade 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 contain 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, 3etc.

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

1	MENU	F1: DATA COLLECT F2: LAYOUT F3: MEMORY MGR
2	F2: LAYOUT	SELECT A FILE
3	F2: LIST	SELECT A FILE FN : INPUT LIST SKY ENTER F1 F2 F3 F4
4	F4: ENTER	LAYOUT F1: OCC. PT INPUT F2: BACKSIGHT (BS) F3: LAYOUT
5	F1: OCC. PT	PT#: INPUT LIST NEZ ENTER F1 F2 F3 F4
6	F2: LIST	[GWNTST) → 1 2 VIEW SRCH ENTER F1 F2 F3 F4
7	→ 1 F4: ENTER	E : 1000 N : 2000 Z : 1300 OK YES NO F1 F2 F3 F4
8	F3: YES	INSTRUMENT HEIGHT INPUT INS HT = 1.486 INPUT CLR ENTER F1 F2 F3 F4
9	F4: ENTER	F1 : OCC.PT INPUT F2 : BACKSIGHT F3 : LAYOUT

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

INPUT	LIST	CLR	ENTER
F1	F2	F3	F4

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

1

→ 2

VIEW	SRCH	.....	ENTER
F1	F2	F3	F4

12 **→ 2** **F4 ENTER**

E: 988.706
N: 1995.658
Z: 1299.987

>OK	.....	YES	NO
F1	F2	F3	F4

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

H (B) = 196° 35' 40"

>SIGHT	.....	YES	NO
F1	F2	F3	F4

14 **F3: YES**

F1 : OCC.PT INPUT

F2 : BACKSIGHT

F3 : LAYOUT

15 **F3: LAYOUT**

LAYOUT

PT# :

INPUT	LIST	NEZ	ENTER
F1	F2	F3	F4

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

2

→ 3

VIEW	SRCH	.....	ENTER
F1	F2	F3	F4

17 **→ 3** **F4: ENTER**

E: 987.514
N: 2003.743
Z: 1299.981

>OK	.....	YES	NO
F1	F2	F3	F4

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

INPUT

R. HT = 1.400

INPUT	.....	CLR	ENTER
F1	F2	F3	F4

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

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

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

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

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

