PENTAX | R-400VDN Series *Visio*

CAPTURE THE FULL PICTURE!

3.1 MEGA PIXELS

- 400m reflectorless EDM range

- Effective 3.1 MP camera

- Easy transfer to a PC via USB, SD connection

- Dual axis compensator 3" and 5" models

- Adjustable laser plummet

2=1 *DUAL FUNCTION*

SD

80th PENTAX SURVEYING **SINCE 1933** TI Asahi Co., Ltd. *anniversary*

PENTAX | **R-400VDN**

2=1 DUAL FUNCTION

Communicate and collaborate without ambiguity

Data measurements can be misinterpreted by anyone, from office team members to clients. And changes due to poor communication become exponentially more expensive with each step in the project's development. The R-400VDN total station combines a non-prism total station with an advanced 3.1-megapixel digital camera, enabling you to visualise the points measured. Detailed pictures made with the Pentax Visio Total Station enable all to accurately review the actual situation at the time of measurement – helping catch possible mistakes in the process. Detailed pictures provide immediate visual feedback.

NO SPECIALISED TRAINING REQUIRED!
EASY TO USE

SIMPLY MEASURING

▶ MEASURE
Rectangular and polar data can easily be recorded at the same time. All data is saved to the SD card in CSV format, ready to use on your PC.

▶ CAPTURE
The point mark can easily be placed on the measured point, just like operating a digital camera.
The colour of the point mark can be changed depending on the image to increase its visibility.

▶ ANALYSE & COMPARE
The point attributes and the measurement values can be superimposed as a layer on the image captured.
All recorded data is now shown on one image, combining the imaging and measuring functionalities of the R-400VDN.

PN B7845   CODE KB-07   STN T553   AZM +0317.16.20

HA +0136.03.00   VA +0089.46.20   SD 00249.5790
X +0000455.4150   Y +0000497.9549   Z +0000036.7459

PENTAX | R-400VDN applications

VERIFIABILITY
with geotagged photo of the target

Accident Investigation

Archaeology & Palaeontology

Architecture & Cultural Heritage

Forensic &
Crime Scene Investigation

Geology

Surveying

Infrastructure &
Road construction

General Construction

The R-400VDN goes one step beyond the competition for verifiable results: each location capture results in a digital image that displays exactly what the user was viewing and targeting at the time of measurement. This provides an extra level of verification and eliminates potential confusion over data and their associated targets.
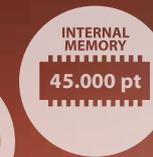
Quarrying

Stockpiles

KEY FEATURES

3.1 MEGA PIXELS

SD

ALPHANUMERIC KEYBOARD

3x DIG ZOOM

INTERNAL MEMORY 45.000 pt

SUPERIMPOSE FUNCTION

USER-FRIENDLY ON-BOARD SOFTWARE POWER TOPO LITE

Technical Specifications Digital Camera R-400VDN Series

Model		R-423VDN	R-425VDN
Digital Camera(DSC)	Sensor	CMOS 3.1 megapixels	
	Image resolution	2048x1536 / 1600x1200 / 1280x960 / 640x480	
	LCD	1.5" Color TFT 34mm x 24 mm (502x240 dot.)	
	EV compensation	-2EV~+2EV (0.5EV step)	
	WhiteBlance	Auto/Daylight/Light Bulb/Fluorescent/Cloudy	
	ISO Sensitivity	100/200/400	
	File format	JPEG (FQ:1/4, NQ:1/8, EQ:1/16)	
	File management	DCF(Ver1.0) / FAT16	
	Digital zoom	1x / 2x / 3x	
	Play back function	Yes	
	External memory	SD (up to 1GB)	
	Focus length	50mm	
	Focus range	20m ~ ∞ (fixed focus length)	
	Field of view	8.8°	
	Effective Diameter	f/5.6	
	I/F	USB 2.0	
	Power	Internal (Supplied from TS battery)	

Model		R-423VDN	R-425VDN
Telescope	Magnification	30 x	
	Effective aperture	45mm (EDM45mm)	
	Resolving power	3.0"	
	Field of view	2.6 % (1° 30')	
	Minimum focus	1.0 m	
	Focus	Manual	
Distance measurement	Laser Class	Visible laser: Class III a (3R) (Reflectorless) / Class II (2) (Prism, sheet)	
Measurement range	Reflectorless **(*1)**	1.5 ~ 400 m	
(Good conditions) (*3)	Reflector sheet **(*2)**	1.5 ~ 600 m (800 m)	
	Mini Prism	1.5 ~ 1,600 m (2,000 m)	
	1 P	1.5 ~ 5,500 m (7,000 m)	
	3 P	1.5 ~ 7,000 m (9,000 m)	
Accuracy	Prism / Reflector sheet	1.5 ~ 10 m: ± (3 + 2 ppm x D) mm / 10 m ~: ± (2 + 2 ppm x D) mm, Quick: ± (3+2ppm×D) mm **(*5)**	
	Reflectorless	1.5 ~ 300 m: ± (5 + 2 ppm x D) mm / 300 m ~: ± (7 + 10 ppm x D) mm	
	Minimum count	0.1 mm (Fine mode) / 1 mm (Normal mode) / 10mm (Track mode)	
Meassuring time (*4)	Repeat meas. Normal (1 mm)	Prism / Reflector sheet 2.0 sec - Reflectorless 2.0 sec	
	Quick (1 mm)	Prism / Reflector sheet 1.2 sec **(*5)**	
	Track (10 mm)	Prism / Reflector sheet 0.4 sec - Reflectorless 0.4 sec	
	Initial meas. Normal (1 mm)	Prism / Reflector sheet 2.5 sec - Reflectorless 2.4 sec	
	Quick (1 mm)	Prism / Reflector sheet 1.7 sec **(*5)**	
	Track (10 mm)	Prism / Reflector sheet 2.5 sec - Reflectorless 2.5 sec	
Angle measurement	Measurement method	Absolute rotary encoder	
	Direction method	Vertical / Horizontal angle: 2 sides	Vertical / Horizontal angle: 1 side
	Minimum count	1" / 5" selectable	
	Accuracy (ISO 17123-3)	3"	5"
Compensator	Axis	2 Axis	
	Range	± 3'	
Target screw		1 speed	
Sensitivity of vials	Plate level	30" / 2 mm	
	Circular level	8' / 2 mm	
Plummet		Laser Plummet (Optical Pummet is optional)	
Base		Detachable	
Dust & water resistance		IP56 (instrument only)	
Ambient temperature		-20°C ~ +50°C / -4°F ~ 122°F (working range)	
Tripod thread		5/8" x 11	
Dimensions / Weight	Dimensions	180 (W) x 342 (H) x 177 (L) mm	
	Weight (incl. battery)	5.5 kg	
	Carrying case	250 (W) x 365 (H) x 425 (L) mm	
Battery pack	Power source	Ni-MH 4300 mAh (rechargeable) DC 6.0 V	
	Operation time	Approx. 7.0 hrs (ETH + EDM) / 15hrs (ETH) with approx. 2.2 hrs of charging time	
	Weight	380 g	
Battery charger	Input Voltage	AC 100 ~ 240 V	
and AC adapter	Output Voltage	DC 7.5 V	
	Weight	280 g	
Data Process	Data recording method	Internal Memory	
	Coordinates data **(*6)**	45,000	
	Special function	PowerTopoLite + DSC	
	I / F	RS-232C or Bluetooth(Optional), SD CARD, USB	
Display / keyboard	Display type	Graphic LCD / 20 characters x 8 lines / 240 x 96 pixels	
	Quantity	1 (2nd optional)	
	Keys	22 each(12 numeric / 5 function / 5 special)	
	Display back light	Intensity settings: 10 steps	
Laser Pointer		Yes	
Date clock		Yes	

*1 The measurement range and accuracy of reflectorless, and time required to measure may vary by the shape, size of surface area and reflection rate of the target and its environment. The measurement range of reflectorless is determined by the white side of the Kodak Gray Card. (KODAK is a trademark of Eastman Kodak Company)
*2 Reflector sheet: PENTAX genuine Reflector sheet
*3 The measurement range may vary by conditions of the environment.
  Normal conditions: 20km visibility with slight shimmer
  Good conditions: 40km visibility, overcast, no heat, no shimmer and moderate wind.
*4 EDM measuring time is determined in good conditions. It may takes longer than usual to measure the distance exceeding 4000m in prism mode and 300m in reflectorless mode. Also the measurement time in reflectorless mode is influenced by the share, size and surface area and reflection rate of the target and its environment.
*5 Quick mode, which functions with prism and reflector sheet, is effective only under normal mode(1mm) and up to 500m.
*6 Number of points to be recorded may vary by usage.
  Maximum number of point to be recorded per job site: 3000 points
  Maximum number of job file to be recorded: 50 job files
  Maximum data points to be sent from PC to the instrument: 3000 points

You should be able to use any SD card in your camera.
While Pentax does not guarantee compatibility with any particular manufacturer or model, we have seen consistent compatibility with SD cards from Panasonic (1GB), SanDisk (1GB), and Toshiba (1GB)

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DANGER
LASER RADIATION - DO NOT STARE INTO BEAM OR VIEW DIRECTLY WITH OPTICAL INSTRUMENT INTO SUNLIGHT
620-690 nm/4.75mW max.
CLASS IIIa LASER PRODUCT
Laserclass IIIa, conform FDA 21 CFR Ch. 1 § 1040

CAUTION
LASER RADIATION - DO NOT STARE INTO BEAM
620-690 nm/0.95mW max.
CLASS II LASER PRODUCT
Laserclass II, conform FDA 21 CFR Ch. 1 § 1040

Your Official Pentax Dealer

CE
The CE marking assures that this product complies with the requirements of the EC directive for safety.

ISO
ISO 9001:2008

JSIMA
Japan Surveying Instruments Manufacturers' Association
Member symbol of the Japan Surveying Instruments Manufacturers' Association representing the high quality surveying products.

TOTAL STATION
R-400VDN SERIES

QUICK REFERENCE GUIDE

BASIC PROCEDURES AND POWERTOPOLITE OPERATIONS

FOR R-400VDN SERIES

R-423VDN
R-425VDN

PENTAX

PENTAX

Electronic Total Station

Quick Reference Guide Basic Procedures for R-400VDN and PowerTopoLite

R-423VDN, R-425VDN

TI Asahi Co., Ltd.

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CONTENTS

CONTENTS

Instruction Manuals

Quick Reference Guide is intended to provide a quick reference in the field. For ease of use in the field, the following Quick Reference Guide booklets are provided in the carrying case.

    1. Basic procedure
    2. PowerTopoLite for R-400VDN series, Operating procedure

The complete instruction manuals are contained on the CD-ROM that is attached to each R-400VDN.

This guide uses the symbol " *xN*" as an expression of repeating times of key operation. For example. " **ESC** x2" means that [ESC] key is pressed two times.

The symbol "+" expresses that multiple keys are pressed simultaneously.

The numbers, 0-9 shown in this Quick Reference Guide means that you use the 10 keys on the alphanumeric keyboard.

PRECAUTIONS REGARDING SAFETY

Before using this product, be sure that you have **thoroughly read and understood the instruction manual** that is included in the attached CD-ROM to ensure proper operation.

⚠ WARNING

Solar Observation

    Never view the sun directly using the telescope as this may result in loss of sight.

⚠ Laser Safety

    R-400VDN is a class-IIIa (3R) Laser product. Avoid direct eye exposure.

Electro-Magnetic Compatibility (EMC)

    This instrument complies with the protection requirement for residential and commercial areas. If this instrument is used close to industrial areas or transmitters, the equipment can be influenced by electromagnetic fields.

Risk of Explosion

Do not use this product in a location where there is coal dust, or near flammable material as there is a risk of explosion.

USAGE PRECAUTIONS

Target Constant

Confirm the Target Constant of the instrument before measurement.

Reflectorless and Reflector Sheet

The reflectorless measurement range may vary depending on the target and surrounding brightness.

In case the reflectorless measurement results in low accuracy, perform the distance measurement by Reflector sheet or Prism.

Battery & Charger

Use the battery charger that is suitable to the battery you are using.

If water should happen to splash on the instrument or the battery, wipe it off immediately and allow it to dry in a dry location.

OPERATIONAL PROCEDURE

The operational procedure in this guide is described based on the default software parameter settings (preferences). Changing preferences may cause a different operational procedure. For further detail of preferences, please refer to the instruction manual of PowerTopoLite.

1. Basic Operation

1.1 Removing the Battery

(1) Rotate the knob above the battery pack counter-clockwise.
(2) Lift up the battery pack and remove it from the instrument.

1.2 Attaching the Battery

(1) Place the channel on the bottom of the battery pack, onto the protrusion of the instrument and push the battery pack down into place.
(2) Turn the knob clockwise.

1.3 Turning the Power On and Off

To set power on ： ⓪

To shut down ： ⓪

NOTE: The power is automatically turned off after 10 minutes of inactivity (Factory default setting).

1.4 Centering and Leveling

(1) While watching the circular vial and the plate level, level the instrument by using leveling screw and the tripod.

(2) You can confirm the instrument is leveled by using the laser plummet

To activate laser 🔆 ➡ **PLUM.ADJ**
LASER   **F4**

To ● **ESC**

1.5 Target Sighting (Focusing)

1.5.1 Manual focus

Rotate the focus ring manually: 🔄

1.6 Angle Measurement

1.6.1 Horizontal Angle
Set the screen MODE A : (**I**)   MODE A screen

Control keys for measuring horizontal angle:

To set the angle to 0 : **0 SET / F3** ➜ **0 SET / F3**

To hold the angle : **MODE / F5** ➜ **HOLD / F3** ➜ **HOLD / F3**

To release HOLD : **HOLD / F3**

To input an angle : **MODE / F5** ➜ **ANG SET / F2** ➜ **↓ / F4** ➜ **SELECT / F5** ➜

input value by using: **← / F1** , **→ / F2** , **0 – 9** , **.** ➜ **ENT**

To read clockwise angle : **MODE / F5** ➜ **ANG SET / F2** ➜ **↓ / F4** x2 ➜ **SELECT / F5**

1.6.2 Vertical angle
To display vertical angle : **DISP / F4**

To change permanently the combination of values displayed in MODE A:

☼ + **ESC** ➜ **▼ / F2** x2 ➜ **SELECT / F5** ➜ **↓ / F4** x2 ➜ **SELECT / F5** ➜

➜ Select by **↑ / F3** or **↓ / F4** ➜ **ENT** x3

To read the slope % : **MODE / F5** ➜ **ANG SET / F2** ➜ **SELECT / F5**

1.7 Distance Measurement

Set the screen MODE A: (**I**) ➜ MODE A screen

1.7.1 Select your target

Select target type (measurement mode):

(Reflecting sheet) **TARGET F2** → (Prism) **TARGET F2** → (Reflectorless)

TARGET F2

NOTE: The selected target is maintained until next time you change.

1.7.2 Distance Measurement

For a single shot measurement: **MEAS F1**

For tracking measurement : **MEAS F1** → **MEAS F1**

NOTE: The number of shots can be defined. The default is "1 time". The measuring modes activated by the above operations can also be changed.

NOTE: Quick mode is the function to shorten the initial measurement time using prism and reflector sheet. To set the mode, use direct command number [0][0][7][5][0][1] and select "1mm/ON". When the **MEAS** key is pressed during quick mode, "<-- -->" is displayed on the screen.

1.7.3 Changing Target Constants

The default constants are:

Reflecting sheet	: 0mm
Prism	: -30mm
Reflectorless	: always 0mm

Before changing the constants, set Target Constant in the Initial Setting to "INPUT" mode:

⚬ + **ESC** → **↓ F4** → **SELECT F5** x2 → **↓ F4** x2 → **ENT** x3

To change Prism constant:

MODE F5 → **CORR F4** → **SELECT F5** → **↓ F4** → **SELECT F5** →

→ input value by using : **← F1** , **→ F2** , ⓪ -⑨ , ⊙ → **ENT** x2

5
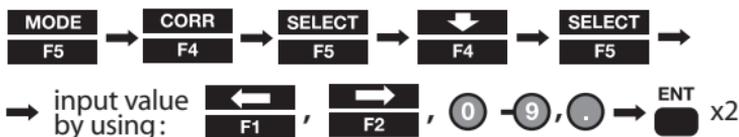
To change Sheet Constant:

$$\boxed{\frac{\text{MODE}}{\text{F5}}} \rightarrow \boxed{\frac{\text{CORR}}{\text{F4}}} \rightarrow \boxed{\frac{\downarrow}{\text{F4}}} \rightarrow \boxed{\frac{\text{SELECT}}{\text{F5}}} \rightarrow$$

$\rightarrow$ input value by using: $\boxed{\frac{\leftarrow}{\text{F1}}}$, $\boxed{\frac{\rightarrow}{\text{F2}}}$, $\boxed{0} - \boxed{9}, \boxed{.} \rightarrow \boxed{\text{ENT}}$ x2
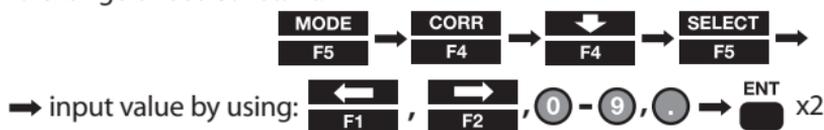
1.7.4 Input Temperature and Atmospheric Pressure

The default atmospheric correction mode is "Automatic".
Before manual input, change the default mode to "ATM INPUT" :

$$\boxed{\underset{\circ}{\cdot}} + \boxed{\underset{\text{ESC}}{\bullet}} \rightarrow \boxed{\frac{\downarrow}{\text{F4}}} \text{ x2} \boxed{\frac{\text{SELECT}}{\text{F5}}} \rightarrow \boxed{\frac{\uparrow}{\text{F3}}} , \boxed{\frac{\downarrow}{\text{F4}}} \rightarrow \boxed{\text{ENT}} \text{ x2}$$

To Input Temperature $\boxed{\frac{\text{MODE}}{\text{F5}}} \rightarrow \boxed{\frac{\text{CORR}}{\text{F4}}} \rightarrow \boxed{\frac{\downarrow}{\text{F4}}} \text{ x2} \boxed{\frac{\text{SELECT}}{\text{F5}}} \rightarrow$

$\rightarrow$ input value by using: $\boxed{\frac{\leftarrow}{\text{F1}}}$, $\boxed{\frac{\rightarrow}{\text{F2}}}$, $\boxed{0} - \boxed{9}, \boxed{.} \rightarrow \boxed{\text{ENT}}$ x2

To Input Atmospheric Pressure:

$$\boxed{\frac{\text{MODE}}{\text{F5}}} \rightarrow \boxed{\frac{\text{CORR}}{\text{F4}}} \rightarrow \boxed{\frac{\downarrow}{\text{F4}}} \text{ x3} \boxed{\frac{\text{SELECT}}{\text{F5}}} \rightarrow$$

$\rightarrow$ input value by using: $\boxed{\frac{\leftarrow}{\text{F1}}}$, $\boxed{\frac{\rightarrow}{\text{F2}}}$, $\boxed{0} - \boxed{9}, \boxed{.} \rightarrow \boxed{\text{ENT}}$ x2

1.7.5 Laser Pointer

To activate Laser Pointer : $\boxed{\underset{\text{LASER}}{\ast}} \rightarrow \boxed{\frac{\text{RED MARK}}{\text{F2}}}$

To quit Laser Pointer : $\boxed{\underset{\text{LASER}}{\ast}} \rightarrow \boxed{\frac{\text{RED MARK}}{\text{F2}}}$

NOTE: The laser pointer is kept activated until it is deactivated by the above procedure.

1.7.6 Adjusting Laser Plummet brightness

$$\boxed{\underset{\text{LASER}}{\ast}} \rightarrow \boxed{\frac{\text{PLUM.ADJ}}{\text{F4}}} \rightarrow \boxed{\frac{\leftarrow}{\text{F1}}} \text{ or } \boxed{\frac{\rightarrow}{\text{F2}}} \rightarrow \boxed{\text{ENT}}$$

1.7.7 Adjusting LCD contrast

$$\boxed{\underset{\circ}{\cdot}} + \boxed{\frac{\text{LCD}}{\text{F4}}} \rightarrow \boxed{\frac{\leftarrow}{\text{F1}}} \text{ or } \boxed{\frac{\rightarrow}{\text{F2}}} \rightarrow \boxed{\text{ENT}}$$

1.7.8 Adjusting Illumination brightness

☼ + **ILLU F5** for LCD **RECTICLE F3** (for Reticle) ➡ **⬅ F1** or **➡ F2** ➡ **ENT**

2. Changing Instrument settings

You can change the instrument settings by "HELP" menu or by inputting "007" code.

2.1 Help menu

While the screen is in MODE A or MODE B,
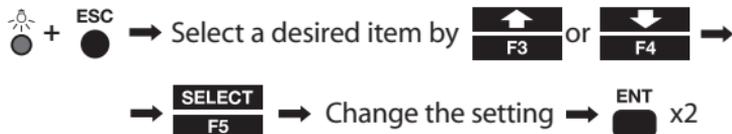
☼ + **ESC** ➡ Select a desired item by **⬆ F3** or **⬇ F4** ➡

➡ **SELECT F5** ➡ Change the setting ➡ **ENT** x2

> **NOTE:** Some items have sub-menus where the selecting procedure, by using F1 - F4, is again repeated.

2.2 "007" code

While the screen is in MODE A or MODE B,
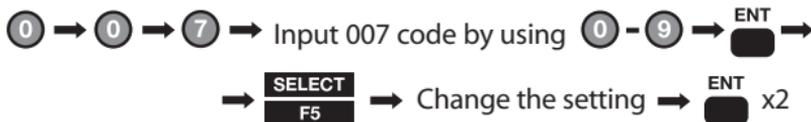
0 ➡ **0** ➡ **7** ➡ Input 007 code by using **0** - **9** ➡ **ENT** ➡

➡ **SELECT F5** ➡ Change the setting ➡ **ENT** x2

> **NOTE:** Some items have sub-menus where the selecting procedure, by using F1 - F4, is again repeated.

2.3 Instrument setting items

See chart on page 11

2.4 Setting of the calender and data (Data model only)

1. Turn the power on while pushing F3 key at the same time.

   ⏻ + **F3**

2. Release the finger from the power supply button first.

3. Then, release the fingers from F3 key.

4. Select [1. DATE] by using F3 or F4 key, then press F5 key (SELECT)

   F3 , **F4** → **ENT**

5. Move the cursor by using F1 and F2 key, and input time with the ten key, then push ENT key.

   F1 , **F2** , ⓪ – ⑨ → **ENT**

6. Select [2. TIME] by using F3 key or F key, then press F5 key (SELECT)

   F3 , **F4** → **SELECT F5**

7. Move the cursor by using F1 and F2 key, and input date with ten key, then press ENT key.

   F1 , **F2** , ⓪ – ⑨ → **ENT**

8. Select [3. DAY] by using F3 or F4 key, then press ENT key.

   F3 , **F4** → **SELECT F5**

9. Select day by using F3 or F4 key, then press ENT key.

   F3 , **F4** → **ENT**

10. Turn the power off. ⏻

007 code	HELP menu list		Default	Other options
401	TARGET CONST	PRISM CONST	-30mm	0mm, INPUT
		SHEET CONST	0mm	0mm, INPUT
402	ATM CORR		ATM INPUT	ATM INPUT,ppm INPUT, NIL
501	EDM MIN DISP/QUICK		1mm/OFF	1mm/ON, 0.1mm
502	SHOT CONST	SHOT CONST	1 time	3 times, 5 times, INPUT
		SHOT INPUT	01 times	(input)
503	CRV/REF CORR		0.14	0.2, NIL
504	MIN UNIT ANG.		FINE	COARSE
505	V.ANG. STYLE		Z.0	H.0, COMPAS
508	DIST.BUZ		ON	OFF
509	QUAD BUZ		OFF	ON
510	AUTO OFF		10 MIN	20 MIN, 30 MIN, NIL
511	EDM OFF		3 MIN	5 MIN, 10 MIN, NIL
512	ILLU.OFF		3 MIN	5 MIN, 10 MIN, NIL
514	MEAS. SIGNAL		MARK	VALUE
515	PRIORITY SELECT	PRIM.MEAS KEY	MEAS SHOT	MEAS CONT, TRACK SHOT, TRACK CONT
		SEC.MEAS KEY	TRACK CONT	TRACK CONT, MEAS CONT, MEAS SHOT
		PRIORITY DISP	HA/HD/VD	HA/VA/SD, HA/VA/HD/SD/VD
517	COMP AXIS		2AXIS	1AXIS, NIL
521	LONG RANGE MEAS.		ON (when Range is Ref.less)	OFF
523	ATM CORR DISP		ON	OFF
701	ATM UNIT	TEMP.UNIT	℃	℉
		PRESS UNIT	hPa	mmHg, inchHg
702	DIST.UNIT		M	ft, ft+inch
703	ANG.UNIT		DEG	DEC, GRD, MIL
801	SET UP COM.	BAUD RATE	1200	2400, 4800, 9600
		DATA LENGTH	8	
		PARITY BITS	NIL	EVEN, ODD
		STOP BITS	1	2
		SIGNAL CONTROL	ON	OFF
		XON/XOFF	ON	OFF
		THROUGH COMMAND	NIL	a, b, c, d, e,f

3. Basic Field Checking Procedures

Checks and Adjustments should be performed before and during measurement.

3.1 Laser Plummet

To activate the laser plummet: (①) ➡ **PLUM.ADJ F4**

To deactivate: **ESC** ●

Check if the laser spot on the ground stays at the same position when rotating the instrument around the vertical axis.
To adjust the laser plummet: Contact your local dealer

3.2 Laser Pointer

To activate the laser pointer: 🔆 LASER ➡ **RED MARK F3**

To deactivate: **ESC** ●

Check if the projected laser spot points are at the same position that is aimed by the center of the cross-hair line of the telescope.
To adjust the laser pointer: Consult your local dealer.

3.3 Warning and Error Messages

Warning Message	Meaning	What to do
Out of tilt range	Displayed when the instrument is tilted beyond the vertical compensation range (±3') in case 1 axis or 2 axis automatic compensation is selected. This message may be temporarily displayed if the instrument is turned too fast.	Re-level the instrument. Repair is needed if the message is displayed when it is properly leveled.
Excess data	The input data exceeds the allowable range.	Press the [ESC] key and enter the correct data.
Out of range (When blinking)	This message is displayed if a long distance, is far beyond measurable distance of R-400VDN series, is measured with a wrong target mode. Please select a correct target then measure. If a wrong target is selected, a correct distance cannot be measured.	Select the correct target mode.
Out of range (When lighting)	• The measurement distance is less than 1.5m in Reflector sheet mode. • The measurement distance is less than 1.5m in Prism mode.	Select a longer point, or use a tape measure.
Unsuitable Condition	• Under too strong sun light. • Unstable light value owing to shimmer or obstacles. • Reflector sheet, Target and Prism do not face the instrument. • Reflector sheet, Target and Prism are not correctly sighted. • Measurement range is over in Reflectorless mode. • Sufficient signal does not return by sighting sharp edge etc. at Reflectorless mode.	Change the object that has much better reflectivity, or use a reflecting sheet, or wait until the sun activity has weakened.
Li-batt.voltage is low.	• The Date Clock is powered by the built-in lithium battery. • The lithium battery needs to be replaced in five years.	Have the lithium battery replaced by the dealer from whom the instrument was purchased.

Error Message	Meaning	What to do
ERROR!! EDM ERROR 04 -05, 34-39, 50-53	Distance measurement system problem	Turn the power off, and then turn on again. Repair is needed when the message appears consistently.
ERROR!! ETH ERROR 70-76	Angle measurement system problem	
ERROR!! MEMORY ERROR 19	Memory problem	
ERROR PS DATA of EDM ERROR P DATA of EDM	Problem of the internal EDM parameters	
ERROR ETH DATA	Problem of the internal ETH parameters	

3.4 Atmospheric Correction

The speed at which light travels through the air varies depending on the temperature and atmospheric pressure. The R-400VDN series is designed to measure distances at the speed of light. In order to measure accurately, atmospheric correction needs to be used. The instrument is designed to correct for weather conditions automatically if the temperature and pressure are input. Correction is then carried out based on the following formula.

Calculation formula:

$$K = (276.26713 - \frac{78.565271 \cdot P}{273.14941 + t}) \times 10^{-6}$$

K: Atmospheric Correction Constant
P: Atmospheric pressure (hPa)
t: Temperature(℃)
Distance after Atmospheric Correction D = Ds (1+K)
Ds: Measured distance when no Atmospheric Correction is used.

4. Digital Camera

4.1 Turning the camera On and Off

To set the camera On: **LASER** ➡ **CAMERA ON / F4**

To set the camera Off: | View 1/3 Screen | ➡ **CAMERA OFF / F4**

NOTE: The part of function key assignment for the display panel will be changed depending on power ON/OFF of the camera.

4.2 Taking pictures

Take a picture in the View mode, which is the first display when the camera is activated.

4.2.1 Taking pictures and measuring distance at the same time
Sight the target by the telescope.

To measure the distance: **MEAS / F1**

4.2.2 Taking pictures without measuring distance
Aim the target when using the telescope or the camera display.

To take a shot: **MEAS / F1**

NOTE: A Point mark can be displayed on each image. This function can be pre-set by selecting ON/OFF from the setting menu.

4.3 Playing back images

"View 1/3 screen" can be checked by ReView mode.

| View 1/3 Screen | ➡ **LASER** ➡ **REVIEW / F5**
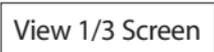
To cancel ReView mode: **ESC** ●

> **NOTE:** In the event that the aimed point and the Point Mark do not coincide. Please refer the chapter of "basic procedures" on the instruction manual for adjusting camera axis using Correct Center Mode.

4.4 Adjusting the camera settings

LASER ✳ → **SETTING** **F3**

Snap and photo conditions are defined in the Setting menu in the camera settings.

4.5 Output of image data

The image data and the survey information are stored in the memory. The information stored in memory can be output to a computer by using following interface:

4.5.1 Remove the SD card from Digital Camera

Confirm the camera power is off, and take the SD card from the camera slot.
An SD card with the capacity up to 1GB can be used.
Make sure that the camera power is off before taking the card from the slot.

4.5.2 Connecting Digital Camera to a computer by USB cable

Confirm the digital camera power is off and connect the camera to a computer by a USB cable.
Make sure that the camera power is off when disconnecting the USB cable.

5. Specifications

	R-423VDN	R-425VDN
Telescope		
Magnification	30 x	
Effective aperture	45mm(EDM45mm)	
Resolving power	3"	
Field of view	2.6% (1°30')	
Minimum focus	1.0m	
Focus	Manual	
Distance measurement		
Laser Class	Visible Laser : Class IIIR(Reflectorless), ClassII (Prism,Sheet)	
Measurement range (Good condition) ❸		
Reflectorless ❶	1.5 ~ 400m	
Reflector Sheet ❷	1.5 ~ 600m(800m)	
Mini Prizm	1.5 ~ 1600m(2000m)	
1P	5500m(7000m)	
3P	7000m(9000m)	
Accuracy		
Prism / Reflector Sheet	1.5m ~ 10m : ±(3+2ppm x D)mm	
	10m ~ : ±(2+2ppm x D)mm	
Reflectorless	1.5m ~ 300m : ±(5+2ppm x D)mm	
	300m ~ : ±(7+10ppm x D)mm	
Measuring time ❹		
Repeat meas. Normal(1mm) :	Prism / Ref.sheet 2.0sec. Ref.less 2.0sec.	
Quick(1mm) :	Prism / Ref.sheet 1.2sec. ❺	
Track(10mm) :	Prism / Ref.sheet 0.4sec. Ref.less 0.4sec.	
Initial meas. Normal(1mm) :	Prism / Ref.sheet 2.5sec. Ref.less 2.4sec.	
Quick(1mm) :	Prism / Ref.sheet 1.7sec. ❺	
Track(10mm) :	Prism / Ref.sheet 2.5sec. Ref.less 2.5sec.	
Angle measurement		
Measuring system	Absolute rotary encoder	
Detection method	Vertical / Horizontal angle	Vertical / Horizontal angle
	: 2 sides	: 1 side
Minimum count	5" / 1"	
Accuracy(ISO17123-3)	3"	5"
Compensator	2 Axis	
Target Screw	1 Speed	
Sensitivity of vials		
Plate level	30"/2mm	
Circular level	8'/2mm	
Plummet	Laser Plummet	
Base	Detachable	
Dust and Water Protection	IP56	
Ambient temperature	-20℃ ~ +50℃ / -4°F ~122°F	
Tripod thread	5/8"x11	

	R-423VDN	R-425VDN
Dimensions/Weight		
Dimension	180(W) x 342(H) x 177(L)mm	
Weight (incl. Battery)	5.7 kg	
Carrying case	250(W) x 365(H) x 425(L)mm	
Battery pack BP02		
Power source	Ni-MH 4300mAh (Rechargeable) DC6.0V	
Operation time	Continuous approx.4.5hrs(ETH+EDM),	
	15hrs(ETH) with approx., 2.2hrs of charging time	
Weight	380g	
Battery Charger BC03 and AC adapter AC01		
Input voltage(AC01)	AC 100~240V	
Output voltage(BC03)	DC7.5V	
Weight	280g	
Degital Camera(DSC)		
Sensor	CMOS 3.1 megapixels	
Image resolution	2048x1536 / 1600x1200 / 1280x960 / 640x480	
LCD	1.5" Color TFT 34mm x 24 mm (502x240 dot.)	
EV compensation	-2EV~+2EV（0.5EV step）	
WhiteBlance	Auto/Daylight/Light Bulb/Fluorescent/Cloudy	
ISO Sensitivity	100/200/400	
File format	JPEG (FQ:1/4, NQ:1/8, EQ:1/16)	
File management	DCF(Ver1.0) / FAT16	
Digital zoom	1x / 2x / 3x	
Play back function	Yes	
External memory	SD (up to 1GB)	
Focus length	50mm	
Focus range	20m ~ ∞ (fixed focus length)	
Field of view	8.8°	
Effective Diameter	f/5.6	
I/F	USB 2.0	
Power	Internal (Supplied from TS battery)	
Data Process (TS)		
Data recording method	Internal Memory	
Internal Memory ⑥	45,000 point	
Special function	PowerTopoLite + DSC	
I/F	RS-232C, SD CARD, USB	
Display / Keyboard		
Display type	Graphic LCD / 20 characters x 8 lines /	
	240 x 96 pixels	
Quantity	1 (2nd optional)	
Keys	22 each(12 numeric / 5 function / 5 special)	
Display back light	Intensity settings: 10 steps	
Laser Pointer	Yes	
Data Clock	Yes	

❶ The measurement range and accuracy of reflectorless, and time required to measure may vary by the shape, size of surface area and reflection rate of the target and its environment. The measurement range of reflectorless is determined by the white side of the Kodak Gray Card. (KODAK is a trademark of Eastman Kodak Company)

❷ Reflector sheet: PENTAX genuine Reflector sheet

❸ The measurement range may vary by conditions of the environment.
Normal conditions: 20km visibility with slight shimmer
Good conditions: 40km visibility, overcast, no heat, no shimmer and moderate wind.

❹ EDM measuring time is determined in good conditions. It may takes longer than usual to measure the distance exceeding 4000m in prism mode and 300m in reflectorless mode.
Also the measurement time in reflectorless mode is influenced by the share, size and surface area and reflection rate of the target and its environment.

❺ Quick mode, which functions with prism and reflector sheet, is effective only under normal mode(1mm) and up to 500m.

❻ Number of points to be recorded may vary by usage.
Maximum number of point to be recorded per job site: 3000 points
Maximum number of job file to be recorded: 50 job files
Maximum data points to be sent from PC to the instrument: 3000 points

NOTICE TO THE USER OF THIS PRODUCT

To assure compliance with the Safety standard 21 CFR, Chapter 1. Subchapter J., the U.S. Bureau of Radiological Health requires the following information to be provided to user.:

It can be dangerous to look into the beam with optical equipment such as binoculars and telescopes.

1. Specifications of Laser Radiation

A) The EDM module of the R-400VDN produces a visible light beam, which is emitted from the telescope objective lens and the center hole of the instrument base plate. The R-400VDN is designed and built to have a laser diode radiating at 620-690nm.

B) Radiant power
The R-400VDN is designed and built to radiate a maximum average radiant power of 4.75mW from the telescope, and 0.95mW from the center hole of the base plate. The user may be subject to this radiation as the beam continues operating until such time that the instrument is turned off.

2. The following labels are affixed to and must remain attached to this laser product.

A) "This laser product is complied with the provisions of 21 CFR 1040. 10 and 1040.11. For a Class IIIa laser product."

B) Caution label is located near the exit aperture:
"AVOID EXPOSURE. Laser radiation is emitted from this aperture."

C) Warning logotype is located on the surface of the telescope:
"LASER RADIATION AVOID DIRECT EXPOSURE BEAM"
"DANGER LASER RADIATION AVOID DIRECT EYE EXPOSURE"

D) Warning label is Located near the exit aperture.

3. Caution to maintain the safety in compliance with the standard

A) To maintain the safety standard, refrain from any operation, maintenance, or adjustment other than described in this Quick Reference Guide.

B) Operation, maintenance or adjustment other than those specified in this Quick Reference Guide may result in hazardous radiation exposure.

C) Maintenance and repair not covered in this Quick Reference Guide must be done by an authorized Pentax dealer.

D) The Laser beam emission by the Distance measurement can be terminated by pressing ⦿ᴱˢᶜ key.

E) Pressing [LASER] ➡ [RED MARK / F2] keys can terminate the laser beam emission by the laser pointer.

F) Pressing ESC key on the RED MARK & LD PLUM. Setting screen terminates the laser beam emission.

II PowerTopoLite Operating Procedures

1. Starting Special Function

⏻ ➡ | MODE A SCREEN | ➡ **MODE / F5** ➡ **S. FUNC / F1** ➡ | POWER TOPO LITE MAIN MENU |

2. Camera function

The Camera is available in each function of PowerTopoLite.

2.1 Auto snap

When using the function in PowerTopoLite while measuring the distance, the camera can be activated automatically and takes a picture during the survey task. To use this function, the following setting must be set to ON beforehand.
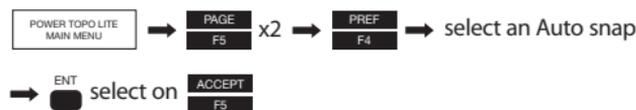
| POWER TOPO LITE MAIN MENU | ➡ **PAGE / F5** x2 ➡ **PREF / F4** ➡ select an Auto snap

➡ **ENT** select on **ACCEPT / F5**

> **NOTE:** The part of function key assinment for the display panel will be changed depending on power ON/OFF of the camera. Chapter of "PowerTopoLite Operating procedures" explains the operation in case of the camera power is OFF.

2.2 Auto snap

To active Camera: | POWER TOPO LITE MAIN MENU | ➡ **☀ LASER** ➡ **CAMERA ON / F4**

Except for a few screens, the Camera can be activated in all screens of PowerTopoLite.

To turn the Camera off: **☀ LASER** ➡ **CAMERA OFF / F4**

3. Creating / Selecting a Job File

To create a new job file:

`POWER TOPO LITE MAIN MENU` ➡ `FILE F1` ➡ `⬇ F4` ➡ `ENT` ➡ input a new job name by using

`⬅ F1` – `TO 123 F5` , `0` – `9 DEF`, `.`, `±` ➡ `ENT`

Or to select a job file:

`POWER TOPO LITE MAIN MENU` ➡ `FILE F1` ➡ `⬇ F4` x2 ➡ `ENT` x2 ➡ select a job file by

`⬆ F1` – `⬇ F4` `ENT` or `SELECT F5`
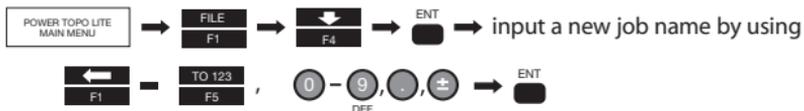
> **NOTE:** Once a job file is created or selected, it is effective until a new job file is created or another job file is selected. The default job file "PENTAX" is provided permanently so that data is stored even when no user defined job file exists.

4. Input a Known Point Coordinate

To input and store a known point coordinate;

`POWER TOPO LITE MAIN MENU` ➡ `VIEW F3` ➡ `⬇ F4` ➡ `ENT` x2 ➡ input a Point Name by using

`⬅ F1` – `TO 123 F5` , `0` – `9 DEF`, `.`, `±` ➡ `ENT` ➡ repeat to input value ➡

➡ `ESC` to quit ➡ `SAVE F1` ➡ `ESC` x2

↘ input PC (point code) ➡ `ENT` ↗
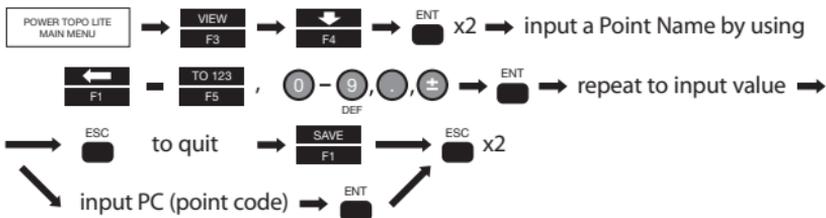
> **NOTE:** There are other functions in VIEW menu; Graphical View, Edit Rectangular Data, and Edit Polar Data. For detail of these functions, please refer to the instruction manual of PowerTopoLite.

To input PC (point code):

move cursor to PC ➡ [ENT] ➡ select a PC from the list by [▲ F1] − [▼ F4] ➡ [ENT]

➡ [ENT] ➡ input a new PC by [⬅ F1] − [TO 123 F5] [0] − [9 DEF], [.], [±] ➡
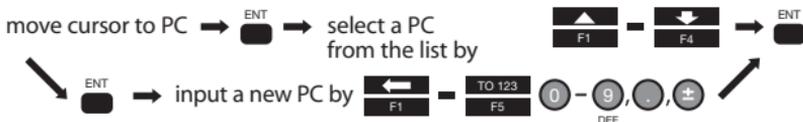
NOTE: PC list is displayed only when point codes are stored in the job named "PointCodeList". "PointCodeList" job can be created by the procedure described in the section 2, and PC can be stored by inputting PN and PC as a point coordinate data. PC list can also be transferred from a computer. For more detail, refer to the instruction manual of PowerTopoLite.

A new point code can be input and memorized as a point coordinate data, but it is not stored as the data of "PointCodeList". If a new PC needs to be added to the list, select "PointCodeList" job and add a PC as a new Rect.Coord.Data.

5. Output a Known Point Coordinate to SD Card

To store a known point coordinate to SD card.

[POWER TOPO LITE MAIN MENU] ➡ [PAGE F5] x2 ➡ [I/O F3] ➡ [FILE F2] ➡ [ENT] (or [▼ F4] ➡ [ENT])

➡ [SELECT F5] ➡ [▲ F1] − [▼ F4] select the format ➡ [ENT] ➡ [▼ F4] ➡ [SELECT F5]

➡ [▼ F4] ➡ [ENT] x2 ➡ [▲ F1] − [▼ F4] select the job file ➡ [ENT]
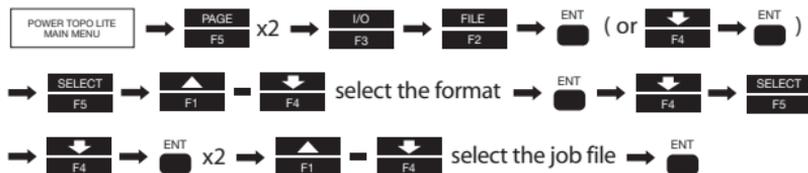
NOTE: When recorded points reach the maximum, capacity can be secured by deleting already recorded site files in line with the above mentioned procedures.

NOTE: The file stored on the SD card can be viewed with the personal computer.

For more details, refer to the PowerTopoLite manual.

6. Rectangular Coordinate Measurement

POWER TOPO LITE MAIN MENU → MEAS / F2 → ENT → STATION POINT SETUP

6.1 Station Point Setup

To select from the memory:

→ LIST / F2 → select the point by FIND PN / F2 — ↓ / F4 → ENT → ACCEPT / F5 → H. ANGLE SETUP

Or to input the station point information:
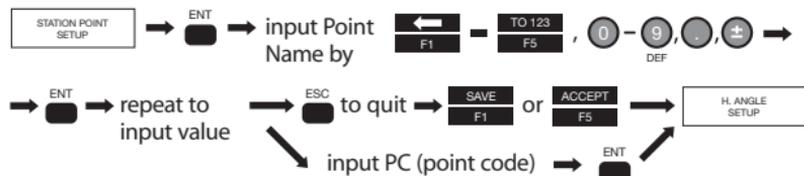
STATION POINT SETUP → ENT → input Point Name by ← / F1 — TO 123 / F5 , 0 – 9 DEF, •, ± →

→ ENT → repeat to input value → ESC to quit → SAVE / F1 or ACCEPT / F5 → H. ANGLE SETUP

input PC (point code) → ENT

NOTE: The input item (cursor position) may be selected by
↑ / F3 , ↓ / F4 → ENT

To input PC (point code):

move cursor to PC → ENT → select a PC from the list by ↑ / F1 — ↓ / F4 → ENT

ENT → input a new PC by using ← / F1 — TO 123 / F5

, 0 – 9 DEF, •, ±
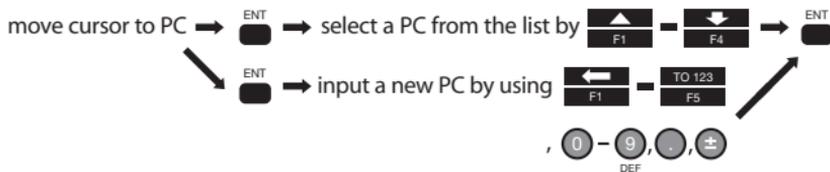
NOTE: Input items are PN (point name), X, Y, Z, IH (instrument height), and PC (point code).
If the input PN already exists in the memory, then the corresponding point information (coordinate & point code) is displayed in the screen.
The result of Free Station, prior to stakeout, is automatically set in each field of Station Setup.

6.2 Orientation (Station Point H.Angle Setup)

To input a given angle:

➡ INPUT F2 ➡ input value by using ⓪ – ⑨ DEF, ◯, ⊕ ➡ ENT ⚫ x2 ➡ MULTIPLE ORIENTATION

Or to set the angle 0°:

➡ 0 SET F1 x2 ➡ ENT ⚫ ➡ MULTIPLE ORIENTATION

Or to calculate by the Back Sight Point:

➡ BSP F5 ➡ input value or select from the list LIST F2 ➡ ENT ⚫ ➡ ACCEPT F5 ➡

➡ aim Back Sight Point ➡ ENT ⚫ ➡ MULTIPLE ORIENTATION

6.3 Measurement

To select the Target type:

➡ PAGE F5 x2 ➡ repeat TARGET F2 until the desired target type is selected ➡ PAGE F5 ➡
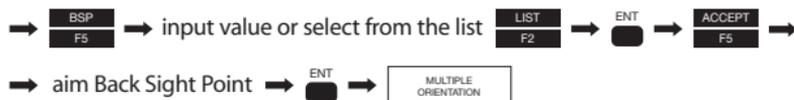
NOTE: You can check the selected target type at the left side of the Battery mark in the top line of the screen.

To measure: ➡ MEAS F1 ➡

Or to start tracking: ➡ MEAS F1 x2 ➡

NOTE: EDM measurement mode can be changed by PAGE F5 x2 ➡
➡ EDM F1 ➡ select and change the EDM mode

To input the point information:

EDIT F4 ➡ move cursor by ▲ F1 , ▼ F4 , ENT ⚫ ➡

➡ input values by using ⬅ F1 – TO 123 F5 , ⓪ – ⑨ DEF, ◯, ⊕ ➡

➡ ENT ⚫ ➡ repeat to input value ➡ ESC ⚫ to quit ➡ ACCEPT F5 ➡ RETURN TO THE MEASUREMENT SCREEN

➡ input point code ➡ ENT ⚫

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To save the point information:

➡ **SAVE / F2** ➡ (next measurement)

Or to measure and save:

➡ **ME/SAVE / F3** ➡ (next measurement)

NOTE: the Point Number is automatically incremented or decremented to make rapid continuous measurements possible.

6.4 Offset Measurement

For Radial Offset (the horizontal distance offset along the line of measurement):

MEASUREMENT SCREEN ➡ **PAGE / F5** ➡ **OFFSET / F2** ➡ **ENT** ➡ input value by using **0 – 9 DEF, . , ±** ➡

➡ **ENT** ➡ **ESC** ➡ **ACCEPT / F5** ➡ RETURN TO THE MEASUREMENT SCREEN

For Tangential Offset:

MEASUREMENT SCREEN ➡ **PAGE / F5** ➡ **OFFSET / F2** ➡ **▼ / F4** x3 ➡ **ENT** ➡

➡ input value by using , **0 – 9 DEF, . , ±** ➡ **ENT** ➡ RETURN TO THE MEASUREMENT SCREEN

For Distance Offset (slope distance):

MEASUREMENT SCREEN ➡ **PAGE / F5** ➡ **OFFSET / F2** ➡ **▼ / F4** x2 ➡ **ENT** ➡

➡ input value by using , **0 – 9 DEF, . , ±** ➡ **ENT** ➡ **ESC** ➡ **ACCEPT / F5** ➡ RETURN TO THE MEASUREMENT SCREEN

NOTE: The Offset values are cleared once the measurement is saved.

6.5 Remote measurement

To enter the Remote mode:

MEASUREMENT SCREEN ➡ **PAGE / F5** ➡ **REMOTE / F1** x2 ➡ **PAGE / F5** x2 ➡ **MEAS / F1** ➡ RETURN TO THE MEASUREMENT VALUES ARE UPDATED BY TURNING THE TELESCOPE ➡

➡ **EDIT / F4** ➡ Input PN, PH ➡ **ESC** ➡ **ACCEPT / F5** ➡ **SAVE / F2** ➡ (next measurement)

input PC ➡ **ENT**

or
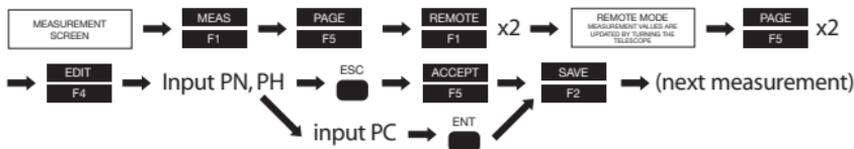
NOTE: Remote values are calculated based on the assumption of the reference plane. Three types of reference planes are available in PowerTopoLite; Cylindrical surface, Fixed plane (default) and Rotated plane.

To change the reference plane type:

To quit the Remote mode:

6.6 Back Sight Point Reset

To input the point information:
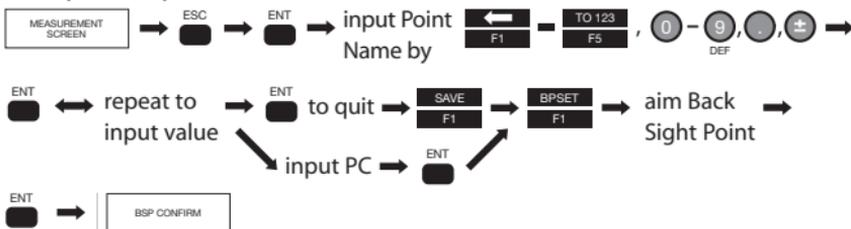
7. Polar Coordinate Measurement

7.1 Station Point Setup

To input the point information:

➡ [ENT ⬛] ➡ input Point Name by [⬅ F1] – [TO 123 F5] , [0] – [9 DEF],[.],[±] ➡ [ENT ⬛] ➡

➡ repeat to input value ➡ [ESC] to quit ➡ [SAVE F1]

or confirm "ppm" ➡ [ENT ⬛] ➡ | H. ANGLE SETUP |
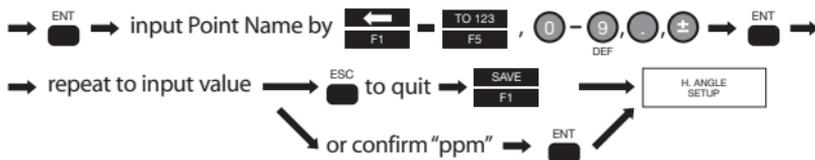
NOTE: Input items are PN (point name), IH (instrument height), PC (point code), TEMP (temperature), PRESS (atmospheric pressure) and ppm. "TEMP" and "PRESS" can be input only when "Atmospheric Correction" is set to "ATM INPUT". "ppm" can be input only when "Atmospheric Correction" is set to "ppm INPUT". The input item (cursor position) may be selected by

[⬆ F3] , [⬇ F4] ➡ [ENT ⬛]

7.2 Orientation (Station Point H. Angle Setup)

Only when the orientation of the horizontal angle is required, proceed according to the following procedure.
Otherwise, just pass this step by [ENT ⬛]
To input a given angle:

➡ [INPUT F2] ➡ input value by using [0] – [9 DEF],[.],[±] ➡ [ENT ⬛] x2 ➡ | MULTIPLE ORIENTATION |

Or to set the angle 0°:

➡ [0 SET F1] x2 ➡ [ENT ⬛] ➡ | MULTIPLE ORIENTATION |

Or to calculate by Inverse:

➡ [INVERS F5] ➡ [ENT ⬛] ➡ [LIST F2] select Start Point from the List ➡ [ENT ⬛] ➡ [ACCEPT F5]

➡ [LIST F2] select End Point from the List ➡ [ENT ⬛] ➡ [ACCEPT F5] ➡ [ENT ⬛] x2 ➡ | MULTIPLE ORIENTATION |

7.3 Measurement

To select the Target type:

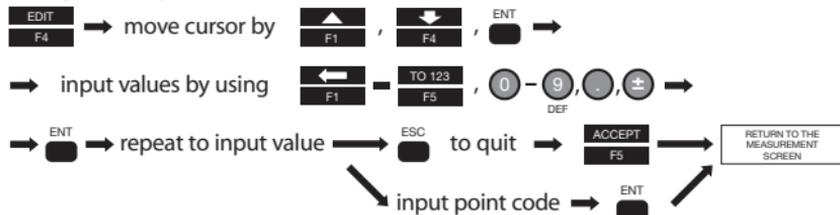➡️ `PAGE F5` x2 ➡️ repeat `TARGET F2` until the desired target type is selected ➡️ `PAGE F5` ➡️

NOTE: You can check the selected target type just at the left of the Battery mark in the top line of the screen.
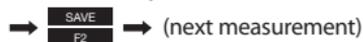
To measure: ➡️ `MEAS F1` ➡️

Or to start tracking: ➡️ `MEAS F1` x2 ➡️

NOTE: EDM measurement mode can be changed by
`PAGE F5` x2 ➡️ `EDM F1` ➡️ select and change the EDM mode

To input the point information:

➡️ `EDIT F4` ➡️ `ENT` ➡️ input Point Name by `⬅️ F1` – `TO 123 F5`, `0` – `9 DEF`, `.`, `± ` ➡️ `ENT`

➡️ repeat to input value ➡️ `ESC` to quit ➡️ `ACCEPT F5` ➡️ RETURN TO THE MEASUREMENT SCREEN

↘️ Input PC (point code) ➡️ `ENT` ↗️

To save the point information:

➡️ `SAVE F2` ➡️ (next measurement)

Or to measure and save:

➡️ `ME/SAVE F3` ➡️ (next measurement)
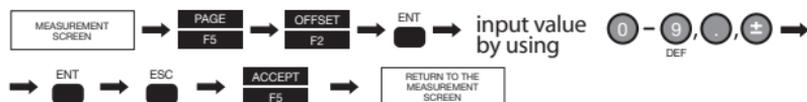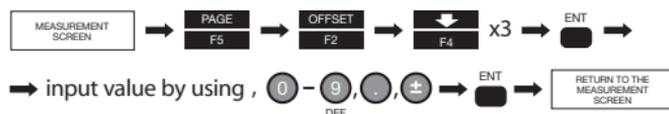
NOTE: The point number is automatically incremented or decremented for rapid continuous measurements.

7.4 Offset measurement

For Radial Offset (horizontal distance offset along with the line of measurement):

MEASUREMENT SCREEN → PAGE F5 → OFFSET F2 → ENT → input value by using 0 – 9, ., ± DEF →

→ ENT → ESC → ACCEPT F5 → RETURN TO THE MEASUREMENT SCREEN
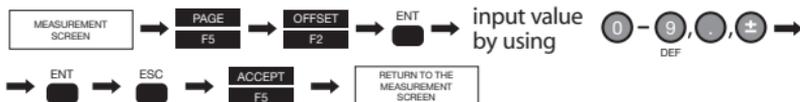
For Distance Offset (slope distance offset):

MEASUREMENT SCREEN → PAGE F5 → OFFSET F2 → ↓ F4 → ENT → input value by using

→ 0 – 9, ., ± DEF → ENT → ESC → ACCEPT F5 → RETURN TO THE MEASUREMENT SCREEN

NOTE: The Offset values are cleared once the measurement is saved.

8. Free Stationing
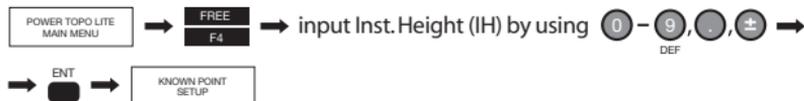
POWER TOPO LITE MAIN MENU → FREE F4 → input Inst. Height (IH) by using 0 – 9, ., ± DEF →

→ ENT → KNOWN POINT SETUP

8.1 Known Point Setup

Select the point from the stored data:

→ LIST F2 → select the point by FIND PN F2 – ↓ F4 → ENT → ACCEPT F5 → MEASUREMENT SCREEN

Or input PN which is already stored in memory to call and display the known coordinate.

8.2 Measurement

Select the target type and measure:

→ repeat TARGET F2 until the desired target type is selected → MEAS F1 →

> **NOTE:** You can check the selected target type just at the left of the
> Battery mark in the top line of the screen.

To proceed to the next point:

➡ **ENT** ➡ **ADD / F1** ➡ KNOWN POINT SETUP

Repeat "7.1 Known Point Setup" and "7.2 Measurement" for all known points.

8.3 Calculation

MEASUREMENT SCREEN ➡ **ENT** ➡ **CALC / F5** ➡ **ACCEPT / F5** ➡ **ENT** ➡ input Point Name ➡ **ENT** ➡

➡ **ESC** to quit ➡ **SAVE / F1** ➡ RETURN TO POWER TOPO LITE MAIN MENU

↘ Input PC (point code) ➡ **ENT**

> **NOTE:** The result of Free Station is automatically carried
> forward to the station setup of Rectangular coordinate
> measurement and stakeout.

9. Stakeout

POWER TOPO LITE MAIN MENU ➡ **PAGE / F5** ➡ **STAK / F1** ➡ **ENT** ➡ STATION POINT SETUP

9.1 Station Point Setup

Select from the stored data:

➡ **LIST / F2** ➡ select the point by **FIND PN / F2** - **⬇ / F4** ➡ **ENT** ➡ **ACCEPT / F5** ➡ H. ANGLE SETUP

Or input PN which is already stored in the memory to call and display
the known coordinate.

> **NOTE:** The result of Free Station, prior to stakeout, is
> automatically set in each field of Station Setup.

9.2 Orientation (Station Point H.Angle Setup)

To input a given angle:

➡ `INPUT F2` ➡ input the value ➡ `ENT` x2 ➡ `STAKEOUT COORD. SETUP`

Or to set the angle 0°:

➡ `0 SET F1` x2 ➡ `ENT` ➡ `STAKEOUT COORD. SETUP`

Or to calculate by the Back Sight Point:

➡ `BSP F5` ➡ `LIST F2` ➡ select the point by `FIND PN F2` - `⬇ F4` ➡ `ENT` ➡ `ACCEPT F5` ➡

➡ `ENT` ➡ `STAKEOUT COORD. SETUP`

9.3 Stakeout Point Setup

Select the point from the stored data:

➡ `LIST F2` ➡ select the point by `FIND PN F2` - `⬇ F4` ➡ `ENT` ➡ `ACCEPT F5` ➡ `STAKEOUT MEASUREMENT`

9.4 Stakeout Measurement

Check the designed value. If "COMPARE METHOD" is set to "LARGE CHARACTER" press `SCROLL F3` to proceed to the Stakeout screen

Turn the instrument until "DH. Angle" reads to "0".
Select the Target type:

➡ repeat `TARGET F2` until the desired target type is selected ➡

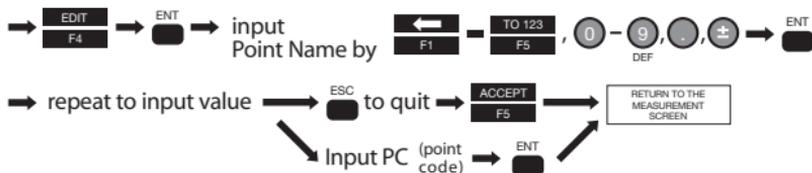**NOTE:** You can check the selected target type just at the left of the Battery mark in the top line of the screen.

To measure in Tracking mode:

`MEAS F1` x2 ➡ (move the target until "DH.dist" reads "0") ➡

➡ To quit measurement `MEAS F1` ➡ (position the target accurately) ➡

To confirm the position of the stake:

➡️ PAGE F5 ➡️ RECT. M F1 ➡️ MEAS F1 ➡️ EDIT F4 → Input PN, PH and PC ➡️

➡️ SAVE F2 ➡️ ESC ➡️ RETURN TO STAKE-OUT MEASUREMENT SCREEN

To proceed to the next point:
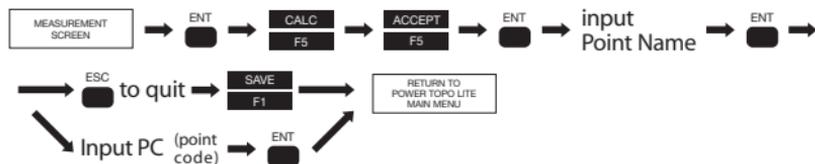
STAKEOUT MEASUREMENT ➡️ NEXT F4 ➡️ (repeat from "Stakeout Point Setup)

10. Stakeout (Point to Line)

"Point to Line" gives the distances between SOP and Int.P, A and Int.P, B and Int.P.

POWER TOPO LITE MAIN MENU ➡️ PAGE F5 ➡️ STAK F1 ➡️ ⬇️ F4 ➡️ ENT ➡️ STATION POINT SETUP

10.1 Station Point Setup

Select the point from the stored data:

➡️ LIST F2 ➡️ select the point by FIND PN F2 – ⬇️ F4 ➡️ ENT ➡️ ACCEPT F5 ➡️ H. ANGLE SETUP

NOTE: The result of Free Station, prior to stakeout, is automatically set in each field of Station Setup.

10.2 Orientation (Station Point H.Angle Setup)

To input a given angle:

➡️ INPUT F2 ➡️ input the value ➡️ ENT x2 ➡️ POINT A SETUP

Or to set the angle 0°:

➡️ 0 SET F1 x2 ➡️ ENT ➡️ POINT A SETUP

Or to calculate by the Back Sight Point:

➡ BSP / F5 ➡ LIST / F2 ➡ select the point by FIND PN / F2 – ⬇ / F4 ➡ ENT ➡ ACCEPT / F5 ➡

➡ ENT ➡ POINT A SETUP

10.3 Point A Setup

To input values:

➡ ENT ➡ input Point Name by ⬅ / F1 – TO 123 / F5 , 0 – 9 DEF , ⊙ , ± ➡ ENT ➡

➡ repeat to input value ➡ ESC to quit ➡ SAVE / F1 or ACCEPT / F5 ➡ POINT B SETUP

↘ Input PC (Point Code) ➡ ENT ↗

Or to select from the memory:

➡ LIST / F2 ➡ select the point by FIND PN / F2 – ⬇ / F4 ➡ ENT ➡ ACCEPT / F5 ➡ POINT B SETUP
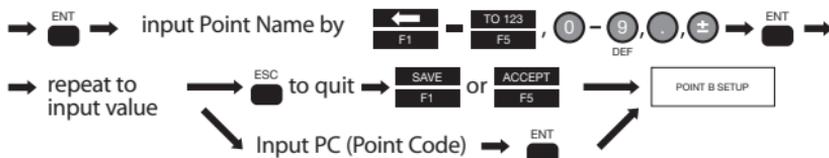
10.4 Point B Setup

To input values:

➡ ENT ➡ input Point Name by ⬅ / F1 – TO 123 / F5 , 0 – 9 DEF , ⊙ , ± ➡ ENT ➡

➡ repeat to input value ➡ ESC to quit ➡ SAVE / F1 or ACCEPT / F5 ➡ MEASUREMENT

↘ Input PC (Point Code) ➡ ENT ↗

Or to select from the memory:

➡ LIST / F2 ➡ select the point by FIND PN / F2 – ⬇ / F4 ➡ ENT ➡ ACCEPT / F5 ➡ MEASUREMENT
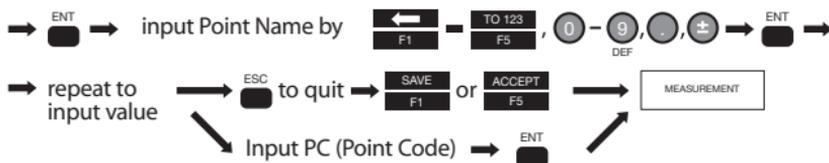
10.5 Point To Line Measurement

To select the Target type:

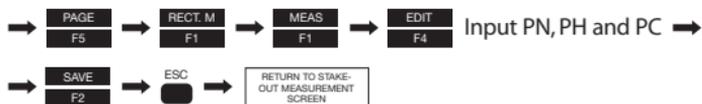➡ repeat TARGET / F2 until the desired target type is selected ➡

> **NOTE:** You can check the selected target type just at the left of the Battery mark in the top line of the screen.

To measure in Tracking mode:

`MEAS F1` x2 ➡ (move the target to the desired position) ➡

➡ To quit measurement `MEAS F1` ➡ (position the target accurately) ➡

To confirm the position of the stake:

➡ `PAGE F5` ➡ `RECT. M F1` ➡ `MEAS F1` ➡ Input PN, PH and PC by `EDIT F4` ➡ `ACCEPT F5` ➡

➡ `SAVE F2` ➡ `ESC` x2 ➡ `RETURN TO POINT TO LINE`

11. Traverse Measurement

Traverse Measurement is based on the following assumptions:
- The current station is the foresight point of the previous station.
- The back sight point of current station is the previous station.

Limitations are:
- More than one traverse route can not be measured at the same time.
- Do not store other data while you are measuring the traverse route.
- When one traverse route is finished, perform the traverse calculation before you store other data.
- Do not turn the power supply off until the measurement at one start point or at one corner point is completed.
- Do not escape from the MEASURE screen.
- The same PN should not be used in one Job. And the PN can not be overwritten in the traverse.
- The same traverse route can not be calculated again.
- Polar coordinates data of back sight and station points can not be seen in the POLAR EDIT function, but are sent properly in SEND POLAR DATA function.

To start Traverse:

POWER TOPO LITE MAIN MENU ➡ PAGE F5 x2 ➡ TRAV F1 ➡ TRAVERSE MENU
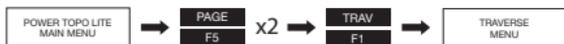
11.1 Measurement at the Start Point

Start the traverse from the start point measurement.

TRAVERSE MENU ➡ ENT ➡ STATION SETUP

Station Setup:

➡ ENT ➡ input Point Name by ⬅ F1 – TO 123 F5 , 0 – 9 DEF , . , ± ➡ ENT ➡

➡ repeat to input value ➡ ESC to quit ➡ ACCEPT F5 ➡ H. ANGLE SETUP

or confirm "ppm" ➡ ACCEPT F5

Orientation (Station Point Setup):

➡ INPUT F2 ➡ input value by using 0 – 9 DEF , . , ± ➡ ENT x2 ➡ SIDE SHOTS

or to set the angle 0°:

➡ 0 SET F1 x2 ➡ ENT ➡ SIDE SHOTS
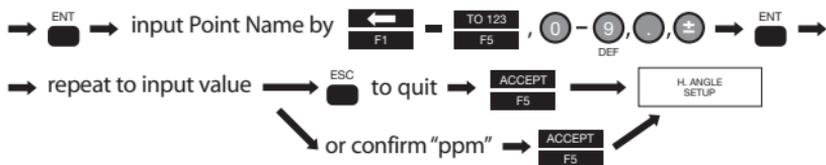
or to calculate by the known points (Start point and End point):

➡ INVERS F5 ➡ ENT ➡ LIST F2 select Start Point from the List ➡ ENT ➡ ACCEPT F5

➡ LIST F2 select End Point from the List ➡ ENT ➡ ACCEPT F5 ➡ ENT x2 ➡ SIDE SHOTS

Side shot measurement:

➡ repeat MEAS F1 , EDIT F4 , SAVE F2 for all side shots ➡

➡ finish measurements by MEAS F1 , EDIT F4 , ENT at the Corner Point ➡ ESC ➡ TRAVERSE MENU

NOTE: The corner point is the foresight of the traverse, which is the next instrument point and must be ended by [ENT]

If required, select the target by [PAGE F5] x2 → [TARGET F2] before each measurement.

11.2 Measurement at a Corner Point

[TRAVERSE MENU] → [↓ F4] → [ENT] →

Station Setup:

→ (the last corner point is displayed as Station) → [ACCEPT F5] →

NOTE: Input Instrument Height (IH), if necessary.

Orientation:

→ (sight the back sight point) → [ENT] →

Side shot:

→ repeat [MEAS F1] , [EDIT F4] , [SAVE F2] for all side shots →

→ finish measurements by [MEAS F1] , [EDIT F4] , [ENT] at the Corner Point → [ESC] → [TRAVERSE MENU]

NOTE: The corner point is the foresight of the traverse, which is the next instrument point and must be ended by [ENT] .

If required, select the target by [PAGE F5] → [TARGET F2] before each measurement.

11.3 To Finish the Traverse Measurement

Fixed traverse: Measure the known point and press $\blacksquare$ ENT at the last corner point.

Closed traverse: Measure the start point and press $\blacksquare$ ENT at the last corner point with the different Point Name.

NOTE: Use a different point name (PN) when you measure the start point as the last corner point. For example, change "T1" to "T1-1" etc.

Open traverse: The closing errors are not calculated. No need to end the measurement by pressing $\blacksquare$ ENT.

11.4 Traverse Calculation

To Start Fixed traverse calculation:

TRAVERSE MENU ➡ ⬇ x2 F4 ➡ ENT ➡

NOTE: To select CLOSE TRAVERSE CALC.:   ⬇ x3 F4

To select OPEN TRAVERSE CALC.:   ⬇ x4 F4

Start Point Coordinate setup:

➡ LIST F2 ➡ select the point by FIND PN F2 − ⬇ F4 ➡ ENT ➡ ACCEPT F5 ➡ END POINT SETUP

or to input the known coordinate;

➡ ENT ➡ input Point Name by ⬅ F1 − TO 123 F5 , ⓪ − ⑨ , ○ , ± DEF ➡ ENT ➡

➡ input the next value or ESC to quit ➡ ACCEPT F5 ➡ END POINT SETUP

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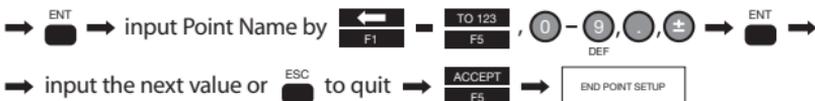
End Point Coordinate setup: the same operation as in the above.

> **NOTE:** The End Point Coordinate Setup is required only in the fixed traverse.

Result of Traverse Calculation:

To see the result of each corner point: [F1 ▲] or [F2 ▼]

To see all points in order: [F3 ▲] or [F4 ▼]

To save all results: [ACCEPT F5] ➡ [TRAVERSE MENU]

12. Cogo

To access COGO menu and select calculation type:

[POWER TOPO LITE MAIN MENU] ➡ [PAGE F5] ➡ [CALC F2] ➡ [ENT] ➡ select calc. type by [F3 ▲] or [F4 ▼] ➡

➡ [ENT] ➡
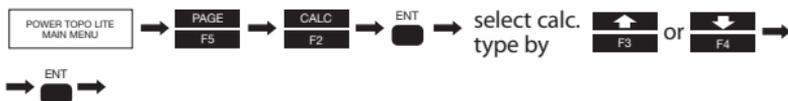
Input required parameters:

➡ [ENT] ➡ input parameters by [ACCEPT F5] or [ENT] each time ➡ [RESULT SCREEN]

Save the result:

➡ [ENT] ➡ input point name and point code ➡ [ACCEPT F5] ➡ [RETURN TO PARAMETER SCREEN]

The required calculation parameters and the output are as follows (page 39):

1	Inverse	SP (Start Point) EP (End Point)	Direction Angle (SP->EP) H, V, S Distance
2	Point Coordinate	CO (Known point coordinate) DI (Distance to the unknown point) BE (Direction Angle to the unknown point)	Coordinate of the unknown point
3	Circle Radius	Coordinates of three points (P1, P2, P3)	Coordinate of centerpoint of the arc, Radius of the arc
4	Line-Arc Intersection	SP (Start point of the line) EP (End point of the line) CP (Center point of the circle) R (Radius of the circle)	Coordinates of intersect points (P1, P2)
5	Line-Line Intersection	S1 (Start point of the 1st line) E1 (End point of the 1st line) S2 (Start point of the 2nd line) E2 (End point of the 2nd line)	Coordinate of the intersect point
6	Arc-Arc Intersection	C1 (Center Point of the 1st circle) R1 (Radius of the 1st circle) C2 (Center Point of the 2nd circle) R2 (Radius of the 2nd circle)	Coordinates of intersect points (P1, P2)
7	Distance Offset	SP (Start point of the line) EP (End point of the line) OP (Offset Point)	Coordinate of the intersect point of the line and a perpendicular line from the offset point. Distance of the intersect point from the SP of the line
8	Point Distance Offset	SP (Start point of the line) EP (End point of the line) DI (Distance on the line from SP) OD (Offset distance from the line)	Coordinate of the offset point
9	ARC Distance Offset	SP (Start Point of the arc) EP (End point of the arc) R (Radius of the arc) DI (Distance on the arc from SP) OD (Offset distance from the arc)	Coordinate of the offset point

13. Area Calculation

To start area calculation:

POWER TOPO LITE MAIN MENU ➡ PAGE F5 ➡ CALC F2 ➡ ⬇ F4 ➡ ENT ➡

➡ select points of the polygon by repeating select (⬆ F3 or ⬇ F4) and ENT ➡

➡ ACCEPT F1 ➡ RESULT SCREEN

To return to the calculation menu screen:

RESULT SCREEN ➡ ESC x2 ➡ CALCULATION MENU SCREEN

> **NOTE:** This function calculates the length of 2D and 3D contour of a polygon, and the 2D surface (area) of the polygon.
> The polygon is defined by selecting points in such a way that the contour segments of the polygon do not intersect.
> The last selected point is automatically tied to the first selected point to form the closed figure.
> There are several function keys for point selection, such as "ALL", "FIND PN", "FROM", "TO", and "ORDER". Refer to the instruction manual on the CD-ROM.

14. 3D Surface and Volume Calculation

To start Volume calculation:

POWER TOPO LITE MAIN MENU ➡ PAGE F5 ➡ CALC F2 ➡ ⬇ F4 x2 ➡ ENT ➡

➡ select points of the polygon by repeating select (⬆ F3 or ⬇ F4) and ENT ➡

➡ ACCEPT F1 ➡ input the reference height by 0 − 9 DEF , . , ± ➡ ENT ➡

➡ RESULT SCREEN CONTOUR SURFACE AREA ➡ ENT ➡ RESULT SCREEN VOLUME

To return to the calculation menu screen:
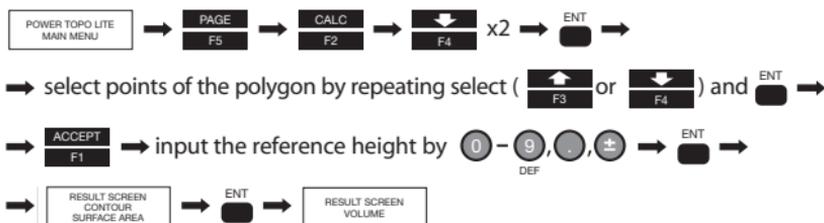
RESULT SCREEN ➡ ESC ■ x2 ➡ CALCULATION MENU SCREEN

NOTE: This function calculates the contour, the 2D and 3D surface area, and the volumes (positive, negative and total.)
The order of point selection is not important. The number of points must be less than 350. The 3D polygon is automatically defined by the element triangles that are formed by connecting neighboring points. The positive and negative volumes are calculated based on the reference height.

15. REM (Remote Element Measurement)

To start REM:

POWER TOPO LITE MAIN MENU ➡ PAGE F5 ➡ CALC F2 ➡ ⬇ F4 x3 ➡ ENT ■ ➡

Measure the Reference point:

➡ EDIT F3 ➡ input prism (or reference) height ➡ ENT ■ ➡ MEAS F1

Measure the elevation of the remote point:

➡ ENT ■ ➡ aim the point to be measured ➡ REM VALUE IS DISPLAYED AT THE BOTTOM OF THE SCREEN
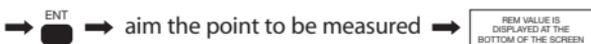
To return to Calculation menu:

➡ ESC ■ x2 ➡ CALCULATION MENU SCREEN

16. RDM (Remote Distance Measurement)

To start RDM:

```
POWER TOPO LITE    PAGE    RDM    MEASURE THE
MAIN MENU          F5      F4     REFERENCE POINT
```

Measure the Reference point:

```
→  EDIT  →  input the target height by  0 – 9 , . , ±  →  ENT  →
   F4                                         DEF

→  (select target if necessary)  →  MEAS  →
                                     F1
```

Measure the 2nd point (Target Point):

```
→  MEAS  →  RESULT SCREEN        →
   F1       DISTANCE FROM THE
            REFERENCE POINT
```

Measure the 3rd point (Target Point):

```
→  MEAS  →  RESULT SCREEN       →  DI SP  →  RESULT SCREEN
   F1       DISTANCE FROM THE      F5        DISTANCE FROM THE
            REFERENCE POINT                  PREVIOUS TARGET POINT
```

To change the reference to the present point:

```
RESULT SCREEN          →  ENT  x2  →  (repeat reference point measurement)
DISTANCE FROM THE
PREVIOUS TARGET POINT
```

To return to PowerTopoLite Main menu:

```
RESULT SCREEN  →  ESC  →  POWER TOPO LITE
                          MAIN MENU
```

17. VPM (Virtual Plane Measurement)

To start VPM:

```
POWER TOPO LITE    PAGE    VPM    STATION POINT
MAIN MENU          F5      F3     SETUP
```

Station point setup:

```
→  LIST  select the   FIND PN  –  ↓  →  ENT  →  ACCEPT  →  H. ANGLE
   F2    point by     F2          F4            F5         SETUP
```

H.angle setup:
To input a given angle:

→ | INPUT / F2 | → input the value by ⓪ – ⑨(DEF), ◯, ⊕ → ● ENT x2 → | THREE POINTS MEASUREMENT |

Or to set the angle 0°:

→ | 0 SET / F1 | x2 → ● ENT → | THREE POINTS MEASUREMENT |

Or to calculate by the Back Sight Point:

→ | BSP / F5 | → Input value or select from the List | LIST / F2 | → | SAVE / F1 | or | ACCEPT / F5 | →

→ ● ENT → | THREE POINTS MEASUREMENT |
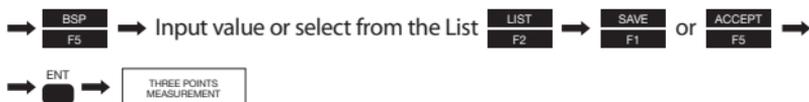
Measure three points to define the plane:

→ | MEAS / F1 | → if necessary, | SAVE / F2 | → ● ENT → (repeat measurements of remaining two points) → | VPM SCREEN |

Virtual plane measurement:

→ aim a point on the plane → if necessary, | SAVE / F2 |

To return to PowerTopoLite Main menu:
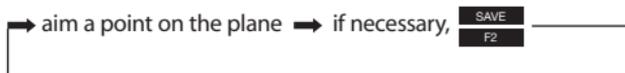
| VPM SCREEN | → ● ESC → | POWER TOPO LITE MAIN MENU |

18. Changing Preference

To access Preference menu:

| POWER TOPO LITE MAIN MENU | → | PAGE / F5 | x2 → | PREF / F4 | → select an item by | ▲ | or | ▼ |

→ ● ENT → select an option by | ▲ / F3 | or | ▼ / F4 | → ● ENT → | ACCEPT / F5 | → | POWER TOPO LITE MAIN MENU |

Preference List (page 44)

	Item		Default	Options	Remark
1	Language		ENGLISH	Your Language	
2	COORD. AXIS	DISP:1 NAME	X	Any alphanumeric character	Axis labels that are displayed in 1st line, 2nd line, and 3rd line.
		DISP2 NAME	Y	Any alphanumeric character	
		DISP3 NAME	Z	Any alphanumeric character	
		DISP:1 AXIS	BASE DIRECTION	RIGHT ANGLE, HEIGHT	Orientation direction of each axis.
		DISP2 AXIS	RIGHT ANGLE	BASE DIRECTION, HEIGHT	
		DISP3 AXIS	HEIGHT	BASE DIRECTION, RIGHT ANGLE	
		ROTATION	CW	CCW	Direction of H.angle measurement
3	INPUT METHOD		10 KEY SYSTEM (ABC)	10 KEY SYSTEM (123), FULL TEMPLATE, DIVIDED TEMPLATE, MATRIX SYSTEM	
4	ACTION METHOD		PROCESS TYPE	STRUCTURE TYPE	Operational procedure type
5	REMOTE METHOD		FIXED PLANE	CYLINDER FACE, ROTATED PLATE	
6	COMPARE METHOD		ALL IN ONE INFO.	LARGE CHARACTER	Stakeout screen
7	REQUEST AIMING		OFF	ON	"AIM" message ON/OFF
8	EDM SETTINGS	PRIM.MEAS KEY	MEAS SHOT	MEAS CONT, TRACK SHOT, TRACK CONT	Dist. Meas.mode for 1st MEAS key
		SEC. MEAS KEY	TRACK CONT	TRACK SHOT, MEAS CONT, MEAS SHOT	Dist. Meas.mode for 2nd MEAS key
		EDM MIN DISP/QUICK	1mm/OFF	1mm/ON, 0.1mm	More fine angle view is necessary, select 0.1mm; besides that, select 1mm/OFF. When using Quick Mode, select 1mm/ON.
		SHOT COUNT	1 time	3 times, 5 times, INPUT	
		SHOT INPUT	01 times	01-99 times	
9	ELEV.FACTOR	AVE.ELEV.	0m	-9999.998m - +9999.998m	
		SCALE FACT.	1.0	0.00000001 - 1.99999998	
10	DUPLICATE PN CHK		OFF	ON	
11	MEAS DISPLAY		POLAR DATA	RECT. DATA	
12	BOTH FACES MEAS.		OFF	ON	

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Warning label

Laser beam is transmitted from this aperture

Identification label

Aperture label

AVOID EXPOSURE
Laser radiation
is emitted from
this aperture

PENTAX

AVOID EXPOSURE
Laser radiation
is emitted from
this aperture

Aperture label

Laser beam is transmitted from this aperture

Printed in Belgium

The CE marking assures that
this product complies with
the requirements of the EC
directive for safety.

ISO
ISO 9001:2000
ISO 14001:2004

JSIMA
Japan Surveying Instruments Manufacturers' Association

*Member symbol of the Japan Surveying
Instruments Manufacturers'
Association representing the high quality
surveying products.*

PENTAX

TS01403