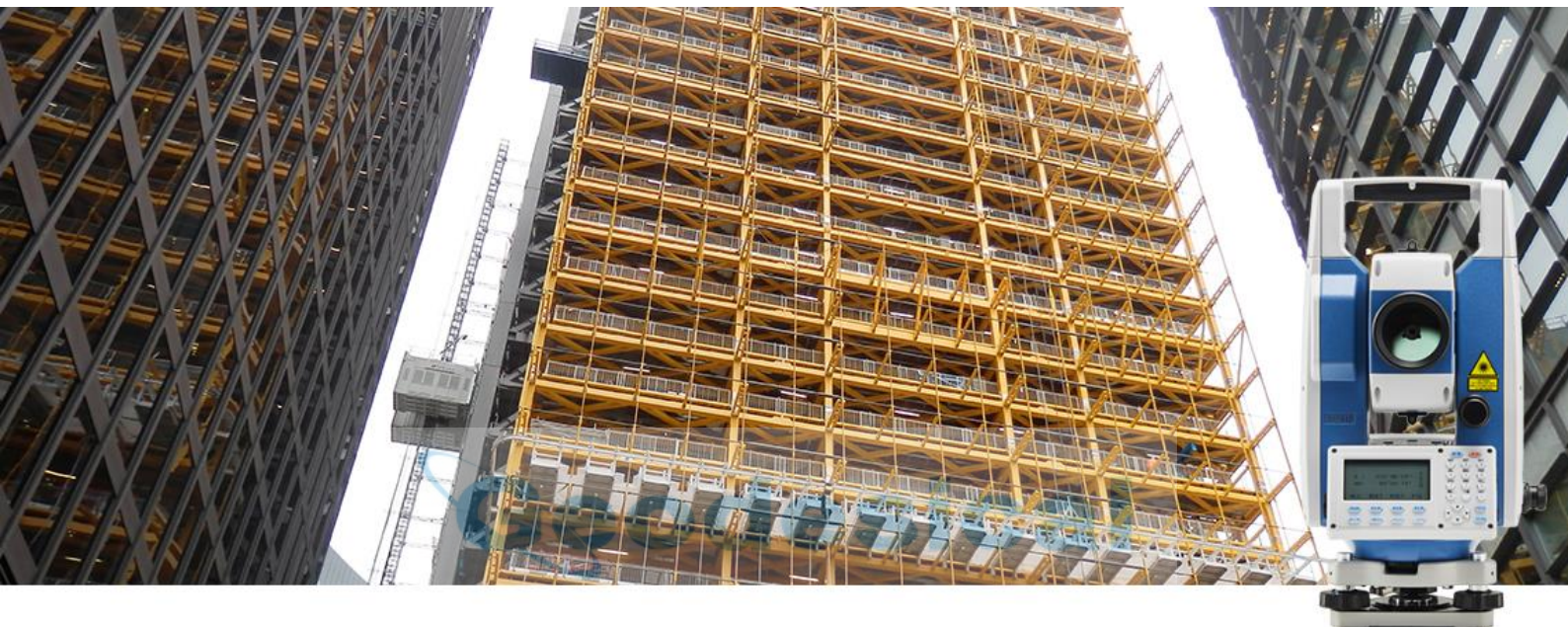# CHC CTS-112R4
Quick Guide

Version 1.0
English

Make your work more efficient

Table of content

1. Important information about instrument

This manual contains important safety directions as well as instructions for setting up the product and operating it.

Intended use
- Measuring horizontal and vertical angles
- Measuring distances
- Recording measurements
- Visualizing the aiming direction and vertical axis

Environment

Suitable for use in an atmosphere appropriate for permanent human habitation: not suitable for use in aggressive or explosive environments.

Laser products

The instruments contain the following laser products:

Laser product	Laser class
Electronic Distance Measurement module (EDM) • measurements with prism • reflectorless measurements	Class 1 Class 3R
Laser plummet	Class 2

⚠️ **CAUTION**

From a safety perspective, class 3R laser products should be treated as potentially hazardous. Precautions:
1) Prevent direct eye exposure to the beam.
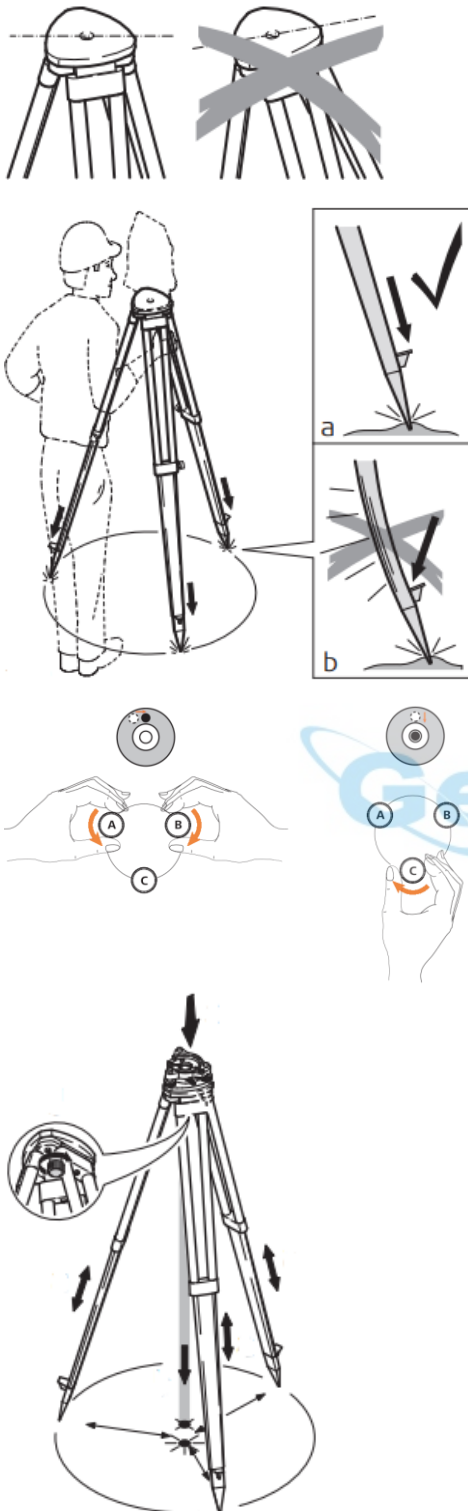2) Do not direct the beam at other people.

⚠️ **CAUTION**

From a safety perspective, class 2 laser products are not inherently safe for the eyes. Precautions:
1) Avoid staring into the beam.
2) Avoid pointing the beam at other people.
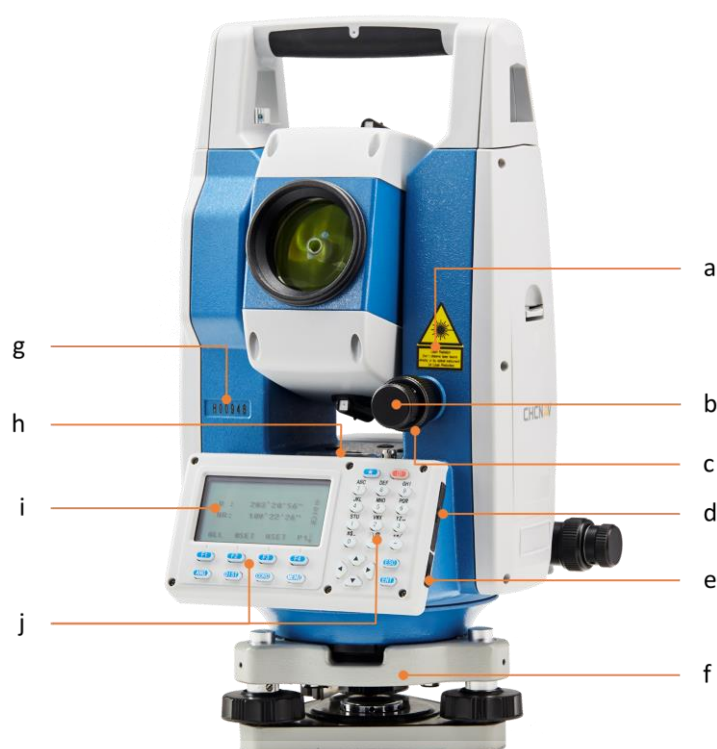
2. Total station setup

This topic describes an instrument setup over a marked ground point using the laser plummet. It is always possible to set up the instrument without the need for a marked ground point.

1) Extend the legs of the tripod as far as required and tighten the screws firmly. Set up the tripod so that the tripod plate is as horizontal as possible, and the legs of the tripod are firm in the ground.

2) To guarantee a firm foothold sufficiently press the tripod legs into the ground (a). When pressing the legs into the ground note that the force must be applied along the legs (b).

3) It is always recommended to shield the instrument from direct sunlight and avoid uneven temperatures around the instrument.

4) Remove the instrument from the transport container. Place the total station on the tripod so that the base of the total station is centered on the center of the tripod and secure it with the central fixing screw.

5) After setting up the instrument, level it up approximately with the bull's-eye bubble. Turn two of the foot screws together in opposite directions. The index finger of your right hand indicates the direction in which the bubble should move. Now use the third foot screw to center the bubble.

6) Turn the instrument's laser plummet by power on total station and click on star button to do centering and leveling. Laser plummet laser will light when the device power on, use direction button to adjust laser light brightness.

7) Move the tripod legs and use the tribrach foot screws to center the plummet over the ground point.

8) Adjust the tripod legs to level the circular level.

9) By using the bull's-eye bubble, turn the tribrach foot screws to precisely level the instrument.

10) Slightly loos the central fixing screw, hold the base with both hands, and move the instrument on the head so that the laser is accurately aligned over the ground point.

11) Repeat steps 9) and 10) until the required accuracy is achieved.

3. Description of the instrument

Instrument components

a) Laser class label
b) Vertical drive
c) Vertical clamp
d) SD card port
e) Mini-USB interface
f) Tribrach
g) Instrument serial number
h) Bubble level
i) I Face display
j) I Face keyboard
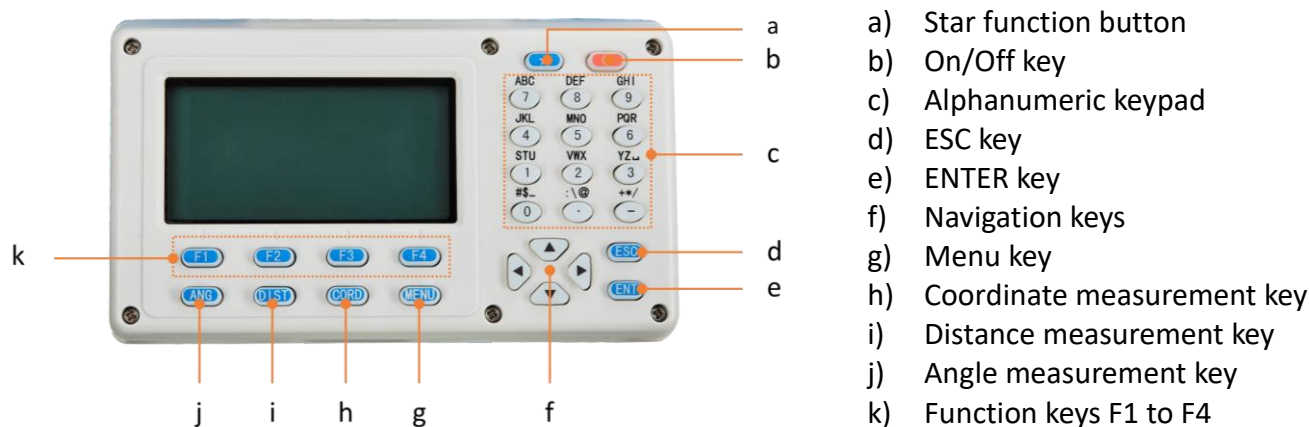

k) Carrying handle with mounting screw
l) Optical sight
m) Objective with integrated EDM
n) II Face display
o) II Face keyboard
p) Laser plummet
q) Battery cover
r) Horizontal clamp
s) Horizontal drive
t) Leveling screw

4. User interface

4.1. Keyboard description

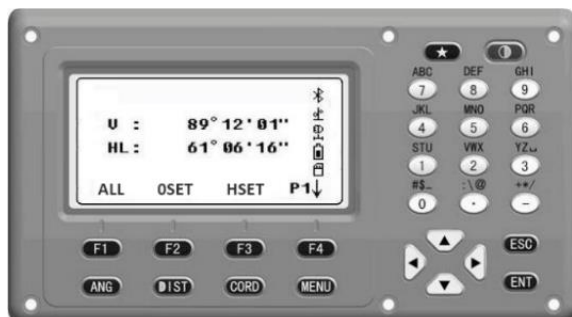When total station power on, it will show angel measurement mode screen (three-page menu).

a) Star function button
b) On/Off key
c) Alphanumeric keypad
d) ESC key
e) ENTER key
f) Navigation keys
g) Menu key
h) Coordinate measurement key
i) Distance measurement key
j) Angle measurement key
k) Function keys F1 to F4

Keys

Device	Description
	On / Off button. Switches the instrument on or off.
	Star function button. Choose reflector type, plummet intensity, crosshair and display illumination.
ANG	Angle measurement key. Angle measurement mode functionality.
DIST	Distance measurement key. Distance measurement mode functionality.
CORD	Coordinate measurement key. Coordinates mode functionality.
MENU	Menu key. Including manage known points, stakeout, storage manage, device version and settings.
	Navigation keys.
ESC	Esc key. Exit from the current interface.
ENT	Enter key. Confirms an entry and continues to the next field.
F1 F2 F3 F4	Function keys that are assigned the variable functions displayed at the bottom of the screen.
	Alphanumeric keypad for entry of text and numerical values.

4.2. Centering & leveling, measurements settings

1) Power on the total station and click on star button [★] to go to centering and leveling menu. Also, laser plummet will automatically light when the device power on. Use direction button to choose reflector type or adjust laser light brightness, adjust screen contrast and crosshair brightness. When you click on [ESC] and exit this interface, total station will turn off laser plummet.
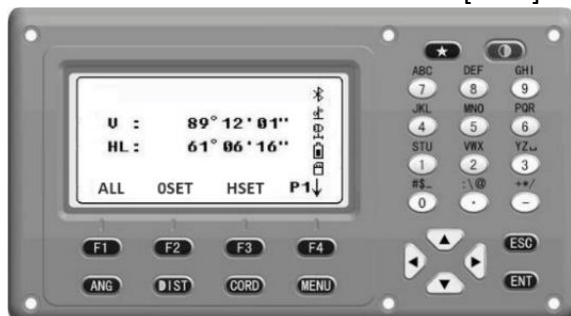
2) Press on [F3] can let laser plummet keep on light.

3) Press on [F4] can set environment parameters and prism parameters. (Usually set as default).

4) Press on [ESC] to back to main interface.
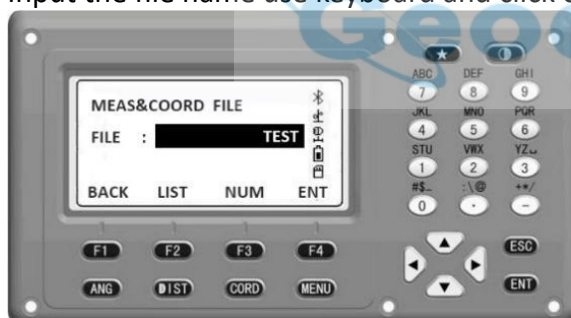
5. Measurements

5.1. Angle measurement

1) Power on total station and click on [ANG].

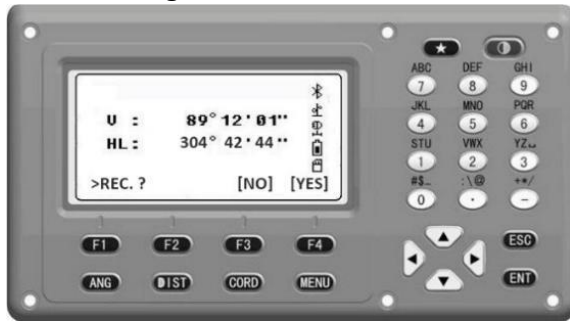2) Click on [F4] two times and click on FILE [F3] to create a new file.

3) Input the file name use keyboard and click on ENT [F4] to confirm.

4) Click on [F4] to go back to page1, HL means total station disk left, aim to target and lock Horizontal and vertical clamping screws. Click on 0SET [F2] to set HZ angle at 0. Click on YES [F4] to confirm.
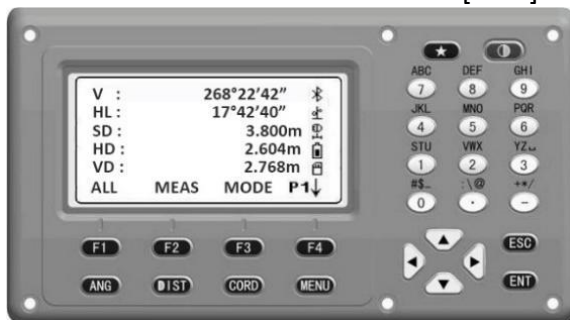
5) Loosen the horizontal and vertical clamping screws and aim to the next target. Click on >REC.? [F1] to record angle.
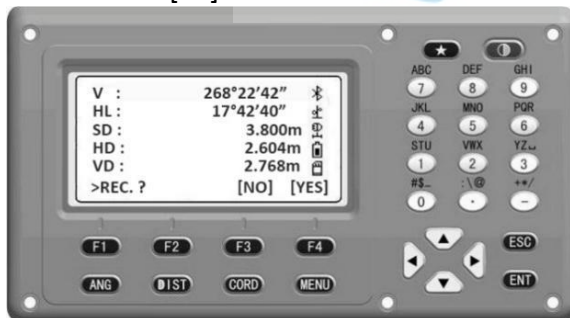

5.2. Distance measurement

1) Power on total station and click on [DIST].

2) To create a new file, please refer to paragraph 4.1 (2) otherwise, data will be stored to last project.
3) Aim to target and click MEAS [F2] to survey the distance.
4) Click >REC.? [F1] to record the distance data. Chose YES [F4] to confirm.

5) You can press MODE [F3] and choose different survey mode. There are 4 measurement options: measure 1 time, measure 3 times, repeat survey, taking.
6) Click on [F4] to use distance offset and distance stakeout function.
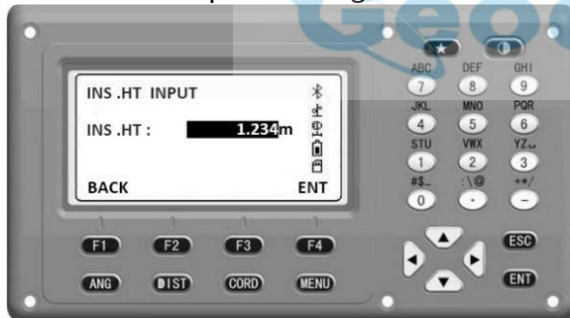
5.3. Coordinate measurement

1) Click on [CORD] and press [F4] to go to page2. To set Back sight point go to BS [F2]. HT [F1] to set total station height and prism height. OCC. is set total station coordinate.
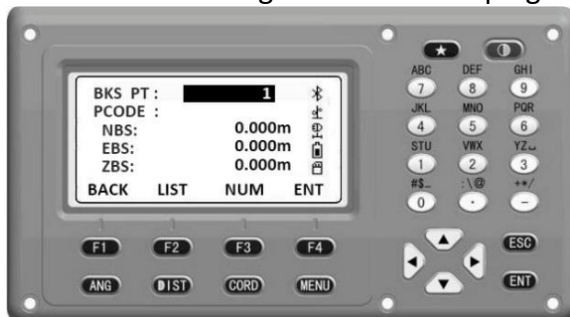

2) First, we need to input total station point coordinate. Point can be input from list, click on LIST [F2] and choose needed point coordinate. Also coordinate can be input manually.

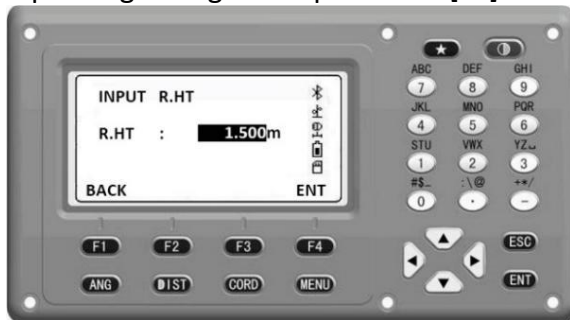3) Measure and input the height of total station. Then press ENT [F4] to confirm.

4) The next page will remind you to set Back sight, input known BS coordinate and click on ENT [F4] to confirm. Aim on target and lock clamping screws.
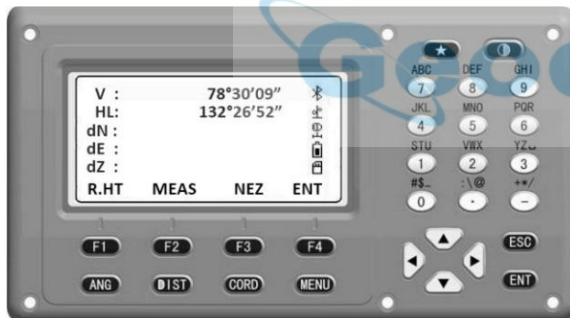
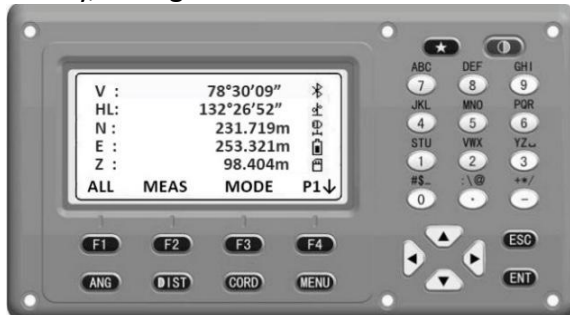5) Set Back sight point angle and chose YES [F4] to confirm. Check target in telescope, click on [F4] again.

6) Input target height and press ENT [F4].

7) Check survey Back sight point coordinate error with input Back sight point coordinates. Click on [F4] to measure coordinates.

8) Back to page1 and click MEAS [F2] to measure point coordinates. Click ALL [F1] to record this point. MODE is same to distance measurement options, include: measure 1 time, measure 3 times, repeat survey, taking.
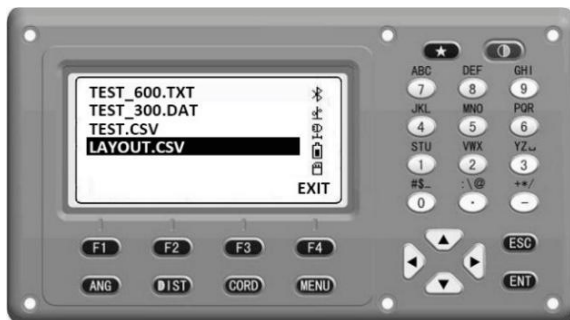
6. Stakeout

6.1. Distance measurement

1) Power on and click on [MENU] button, then click on keyboard [2] to choose Stakeout function.
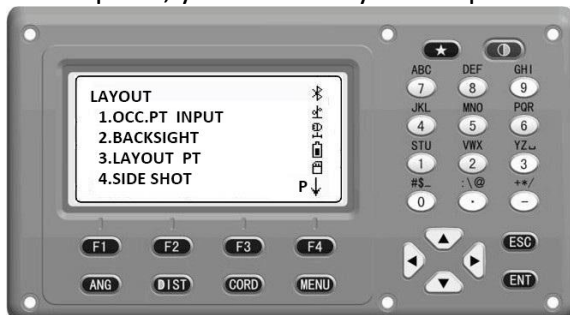

2) Load a coordinates file, click IMP. [F2] to choose an exist file at the list. Use navigation keys to choose file you need.
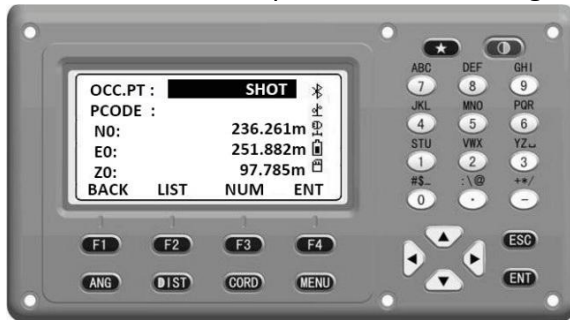

3) You could also import points from SD card. Click IMP. [F2] to import points from another selected file. Press [ENT] to confirm. Then points will be imported into files list. Click on [ENT] to choose needed file.

4) The total station will show Layout options at interface. OCC.PT INPUT is inputting total station coordinate. Through BACKSIGHT to determine direction. Then stakeout point. If you need to survey a Shot point, you can survey a Shot point and move total station to that point.
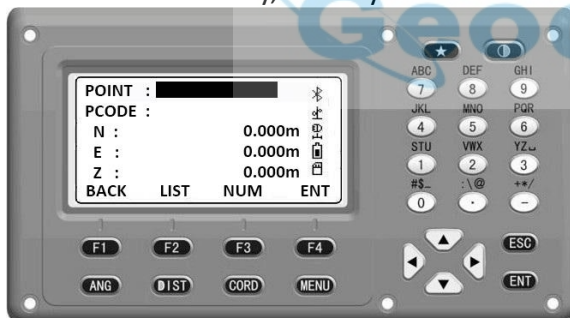
5) Press [1] to choose total station coordinates. Input known point coordinates or choose point from list. Press [ENT] to input total station height and choose whether need to set Back sight.
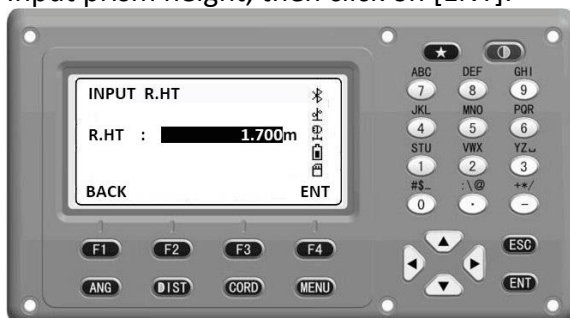

6) Back sight will follow last time direction, if need to set a new direction, click YES [F4] to do Back sight calibration again.
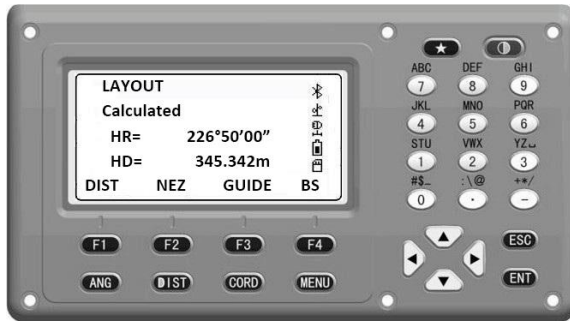

7) Click on [3] to stake known points. There are two options to input coordinate. One is input coordinate manually, use keyboard. Another is to click LIST [F2] and select points from file.
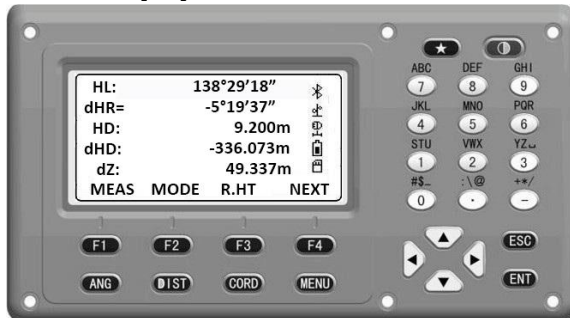

8) Input prism height, then click on [ENT].

9) Interface will show stakeout calculated result of needed staked point compared to current position. Chose DIST[F1] or NEZ [F2] to switch between distance stakeout and NEZ stakeout interfaces.

10) Press MEAS [F1] to measure and get the distance between staked point and aim point. Same to click on MODE [F2] to NEZ stakeout interface. Click on [ESC] back to step9 interface.
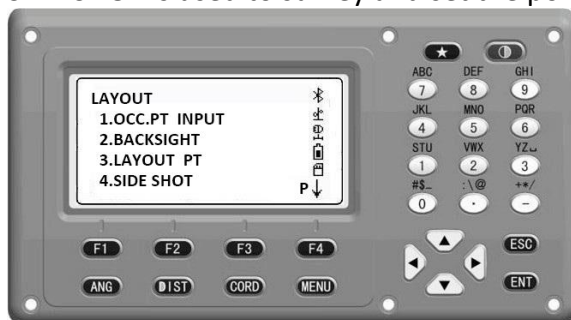

11) Click on GUIDE [F3] at step9 interface, enter stakeout guide mode. The interface can help surveyor rotate total station to aim on target, press MEAS [F1] to measure location between current position and staked point coordinates. Finally find layout point. Then click on NEXT [F4] back to step7 and choose another point for stakeout.
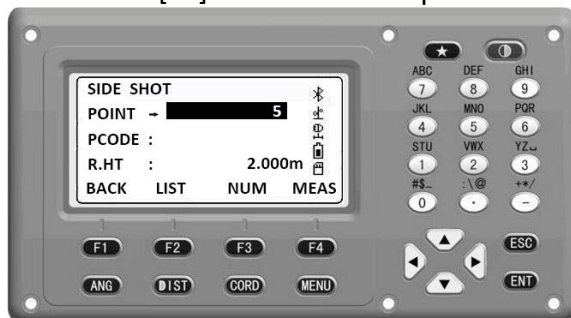
6.2. Side shot

1) SIDE SHOT is used to survey and set the point as Reference point.

```
LAYOUT
   1.OCC.PT INPUT
   2.BACKSIGHT
   3.LAYOUT  PT
   4.SIDE SHOT
```

2) Click MEAS [F4] to measure the point and record it.

```
SIDE  SHOT
POINT  →          5
PCODE :
R.HT   :        2.000m
BACK    LIST    NUM    MEAS
```
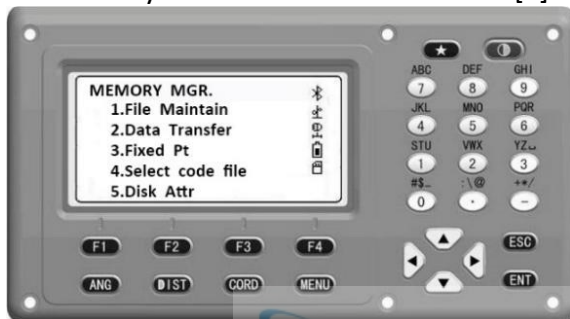
7. Data management

7.1. Data import and export

1) Power on and click on [MENU] button, then click on keyboard [3] to choose MEMORY MGR. and access to data management function.

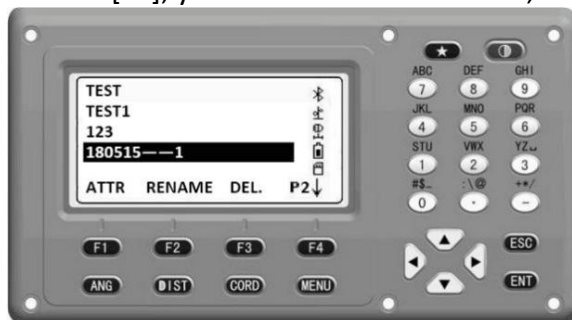2) Click on keyboard File Maintain button [1] to choose file type.

3) Click on [1] to choose an existing file or create a new one. Click NEW [F1] to create a new file, input file name and press [F4] to confirm.

4) Click IMP. [F2] to choose file which need to be imported. CTS-112R4 support .TXT .DAT and .CSV files format. Choose one file and press on [ENT], device will import data. The SD card must be inserted.
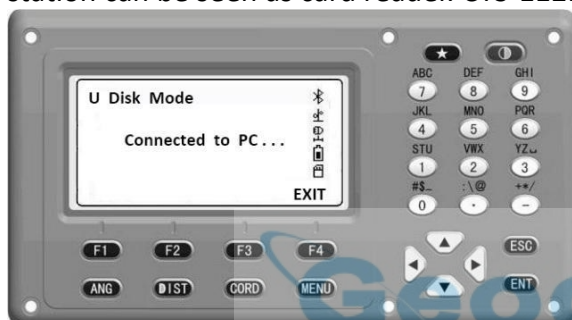
5) Click on EXP. [F3] to export data, it will automatically create four files on SD card. Name_600.TXT, Name_300.TXT, Name.DAT, Name.CSV.

6) Choose [F4], you can view file attributes, rename file and delete file.

7.2. Data import and export to PC

1) Connect total station to PC through mini-USB port and using mini-USB cable (this cable is including in total station transport container). Click on keyboard button [5] to connect total station to PC. Total station can be seen as card reader. CTS-112R4 support import and export data to PC directly.

8. Care and transport

8.1. Transport

Transport in the field

When transporting the equipment in the field, always make sure that you

- Either carry the product in its original transport container,
- Or carry the tripod with its legs splayed across your shoulder, keeping the attached product upright

Transport in a road vehicle

Never carry the product loose in a road vehicle, as it can be affected by shock and vibration. Always carry the product in its transport container and secure it.

Shipping

When transporting the product by rail, air or sea, always use the complete original CHC packaging, transport container and cardboard box, or its equivalent, to protect against shock and vibration.

8.2. Storage

Respect the temperature limits when storing the equipment, particularly in summer if the equipment is inside a vehicle. Refer to "CTS-112R4 instrument Data Sheet" for information about temperature limits.