FHWA L-LINE PROGRAM

Developed by Chris Conrad

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Loading The Program

- **Infrared**
  - **On The Source Calculator**

1. Press [→] then press [I/O]

2. Select "Send to HP 48" press [OK]

3. Press [α] twice and type L.LIN as the name and press [ENTER]

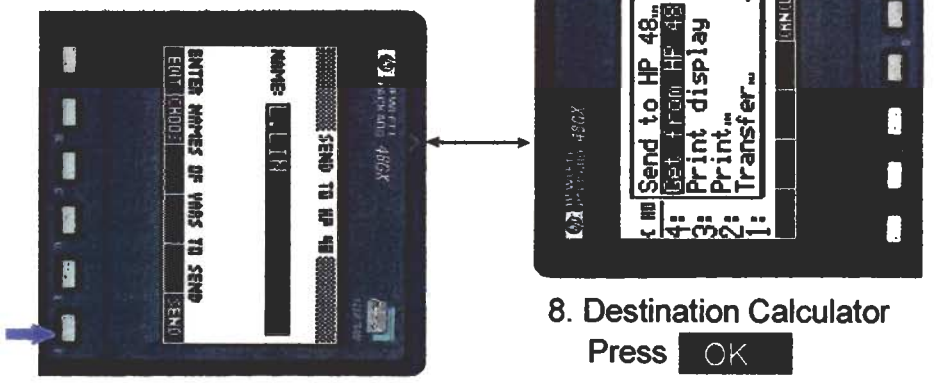
– On The Destination Calculator

4. Press ⇨ then press I/O

5. Select "Get from HP 48" and press OK

6. Line up the arrows at the top of each calculator

7. Source Calculator
   Press SEND



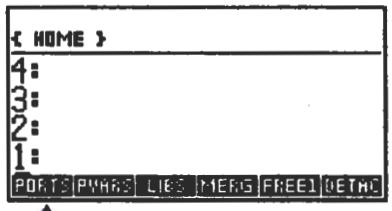
8. Destination Calculator
   Press OK

- **RAM Card**

1. With the calculator off.
   Insert RAM card into port 1 or 2.

   Press **ON**

2. Press ◁ then press **LIBRARY**



3. Press **PORTS**

4. Then select appropriate port (1 or 2).

5. Press **L.LIN**

6. Press **α** twice

7. Type in L.LIN

8. Press **STO**

- **Serial Interface**
  - **Set Parameters**

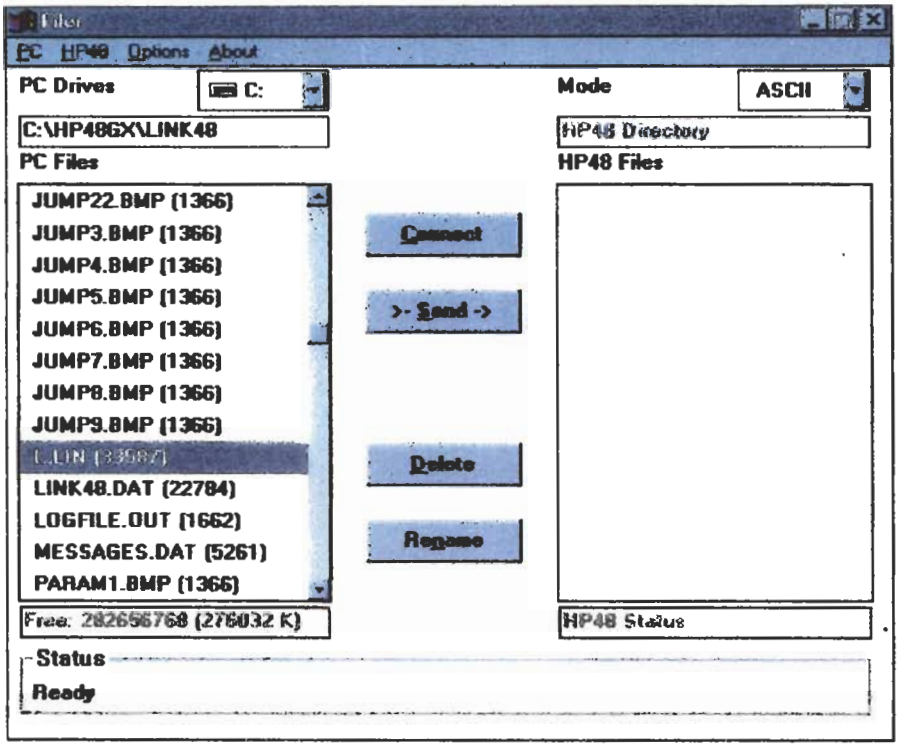
1. Connect HP-48 to the PC with serial interface cord.

2. Press  then Press I/O

3. Select "Transfer" and press OK

4. Set the parameters as shown and press ENTER

5. To put the calculator in server mode press  then press ▶



- **On the Computer**

6. Open the FILER program.

7. Click on 

8. In the "PC Files" window select L.LIN.

9. Click on 

Starting The Program

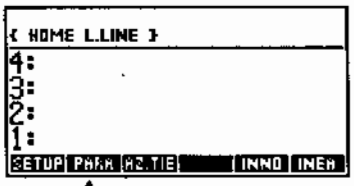
1. Press **VAR**

2. Press **L.LIN**

3. Press **CST**

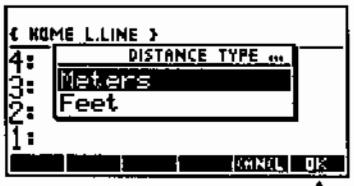
Input - Output Parameters

- **Setting Parameters**
  - The program can accept and compute distances in feet or meters.
  - The program can accept and compute azimuths from north or south.
  - The program can use bearings for input only, directions will be north azimuths.
  - Bearings must be entered this way : Quadrant Angle i.e. SE 65.23321

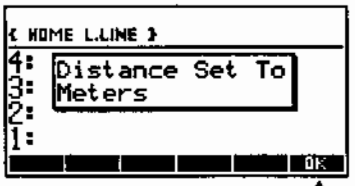


1. Press **PARA**

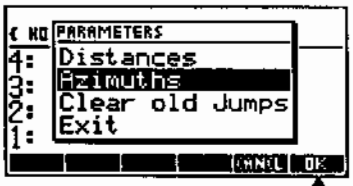
2. Select "Distances" and press **OK**



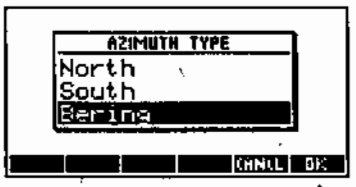
3. Select distance type and press **OK**



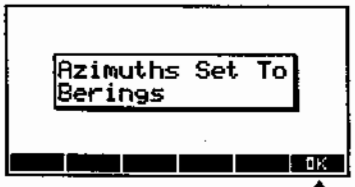
4. Press **OK**



5. Select "Azimuths" and press **OK**



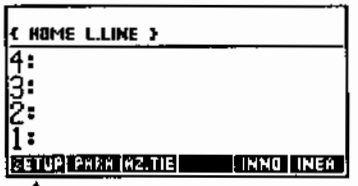
6. Select azimuth type and press **OK**



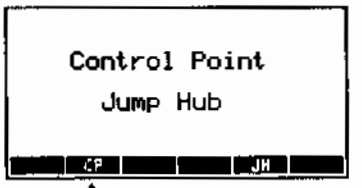
7. Press **OK**

8. Select "Exit" and press **OK**

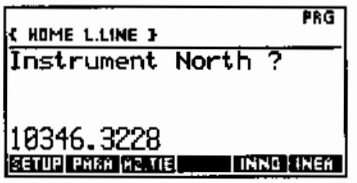
Instrument Coordinates



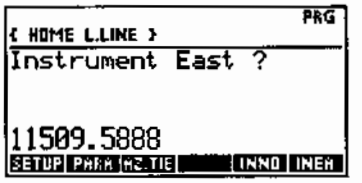
1. Press **SETUP**



2. Press **CP**

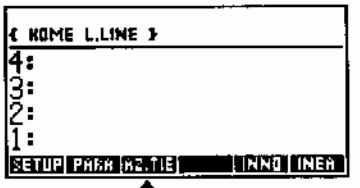


3. Input northing and press **ENTER**

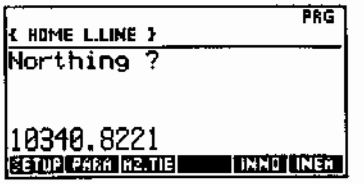


4. Input easting and press **ENTER**

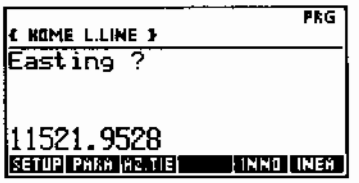
Computing A Backsight



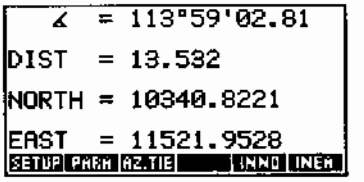
1. Press **AZ TIE**



2. Input northing and press **ENTER**



3. Input easting and press **ENTER**

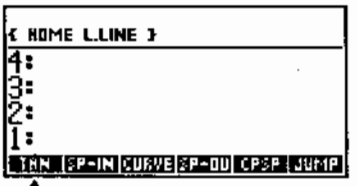


Azimuth, distance and coordinates are displayed

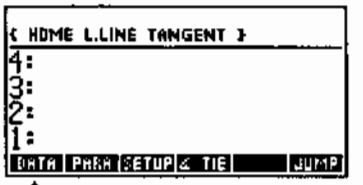
Line Data

- The calculator can store five different segments of line data at one time
  - Tangent
  - Spiral - In
  - Curve
  - Spiral - Out
  - Compound Spiral (Middle Spiral)

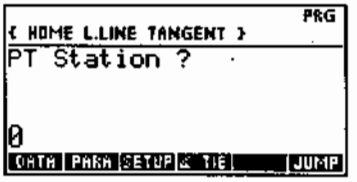
- **Tangent Data**



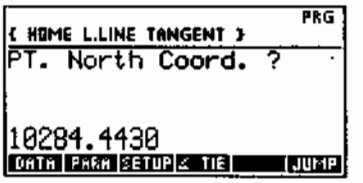
1. Press **TAN**



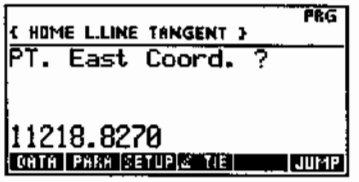
2. Press **DATA**



3. Input beginning tangent station (PT, PST, POT) and press **ENTER**

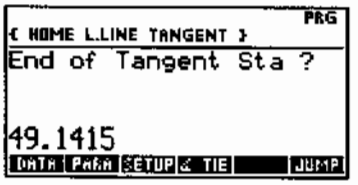


4. Input the north coordinate and press **ENTER**



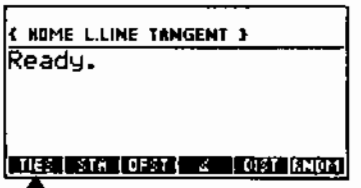
5. Input east coordinate and press **ENTER**

6. Input the tangent azimuth (AZ) and press **ENTER**

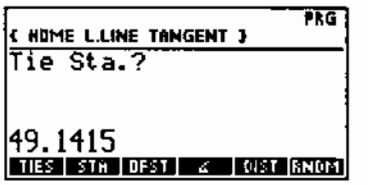


7. Input the station at the end of the tangent (PC, PS, POT) and press **ENTER**

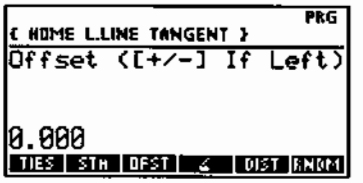
• Tangent Check-In



1. Press **TIES**

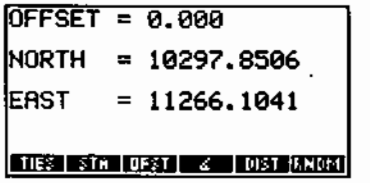


2. Input the end station of the tangent (PS, PC, POT) and press **ENTER**



3. Input the offset and press **ENTER**

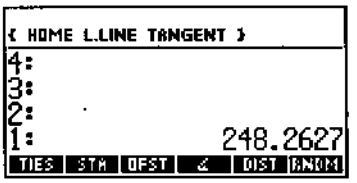
4. Station, azimuth and distance are displayed.
   Press **NXT** to display offset and coordinates.



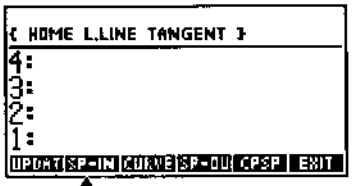
5. Check coordinates with the Geopack Line Data.

6. To clear the display press **ENTER**

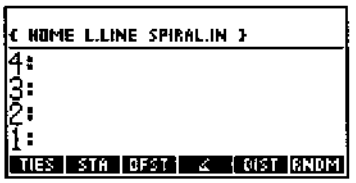
- **Spiral-In Data**



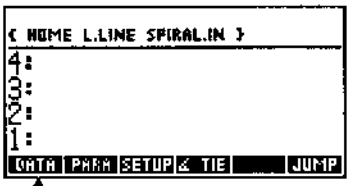
1. Press **NXT**



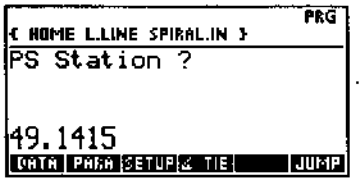
2. Press **SP-IN**



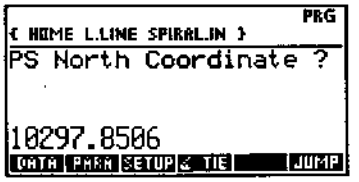
3. Press **NXT** twice



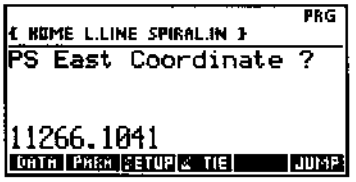
4. Press **DATA**



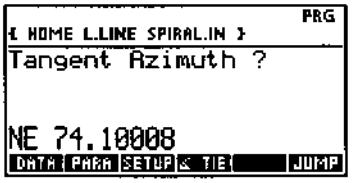
5. Input the PS station at the beginning of the spiral and press **ENTER**



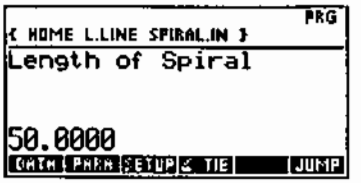
6. Input the north coordinate of the PS and press **ENTER**



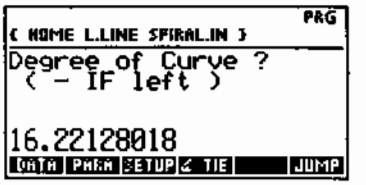
7. Input the east coordinate of the PS and press **ENTER**



8. Input the azimuth (AZ) from the tangent back and press **ENTER**



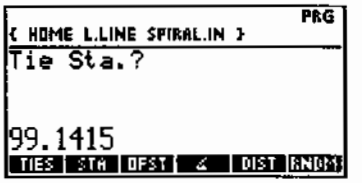
9. Input the length of spiral (LS) and press **ENTER**



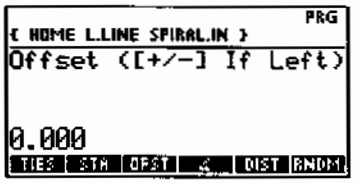
10. Input the degree of curve (DC) of the curve ahead and press **ENTER**

• Spiral Check-In

1. Press **TIES**

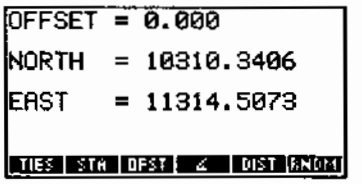


2. Input the end station of the spiral (PSC) and press **ENTER**



3. Input the offset and press **ENTER**

4. Station, azimuth and distance are displayed.
Press **NXT** to display offset and coordinates.



5. Check coordinates with the Geopack Line Data.

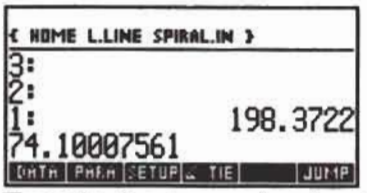
6. To clear the display press **ENTER**

- **Curve Data**

  - **After a spiral you must update the azimuth at the PSC by adding the spiral delta (SD).**

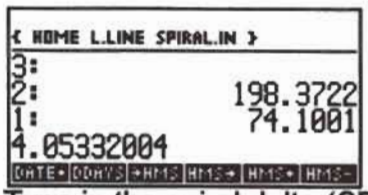
  - **If your calculator is set to bearings you must convert it to an azimuth then add the spiral delta and convert it back to a bearing.**

- **Adjusting the azimuth**



1. Type in the tangent azimuth from the tangent back and press **ENTER**

2. Press ◀ **TIME** **NXT**



3. Type in the spiral delta (SD) from the spiral back then press **HMS+**

4. To see more digits press ◀ **MODES**

5. Then press **FMT** **STD**

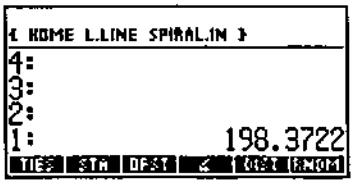
6. Write down the azimuth for later use

7. To return to program menu press **CST**

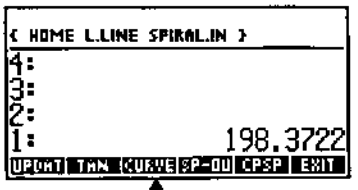
- A negative curve delta (CD) denotes a left curve. Do not enter (CD) as a negative value.

- If the curve direction is left the degree of curve must be entered as negative.

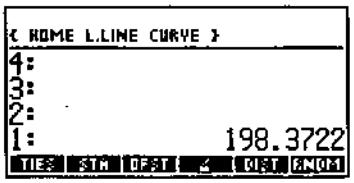
• Curve Data



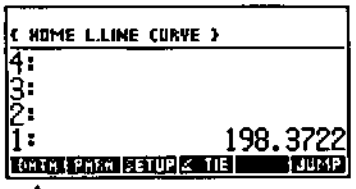
1. Press **NXT**



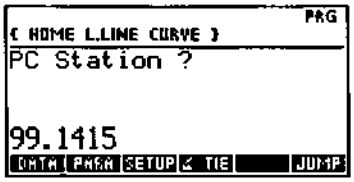
2. Press **CURVE**



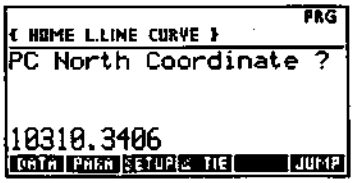
3. Press **NXT** twice



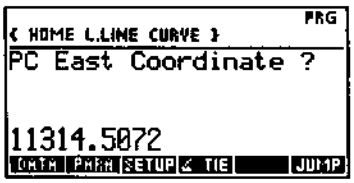
4. Press **DATA**



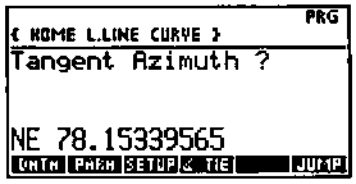
5. Input the beginning station of the curve (PC, PSC) and press **ENTER**



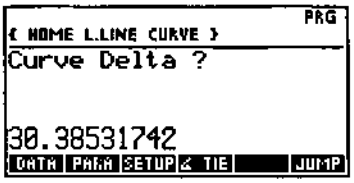
6. Input the north coordinate and press **ENTER**



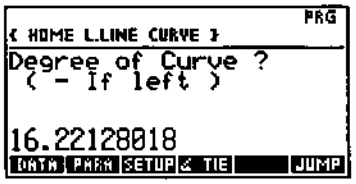
7. Input the east coordinate and press **ENTER**



8. Input the azimuth (AZ) at the PSC and press **ENTER**

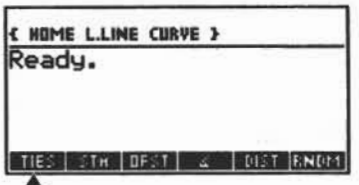


9. Input the curve delta (CD) as a positive and press **ENTER**

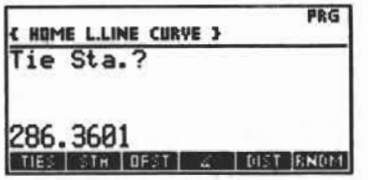


10. Input the degree of curve (DC) (- left, + right) and press **ENTER**

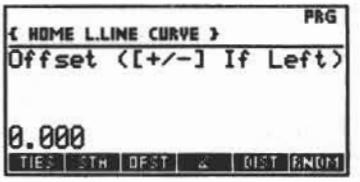
• Curve Check-In



1. Press **TIES**

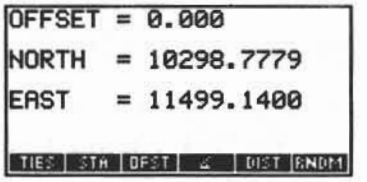


2. Input the end station of the curve (PCS, PT, PCC) and press **ENTER**



3. Input the offset and press **ENTER**

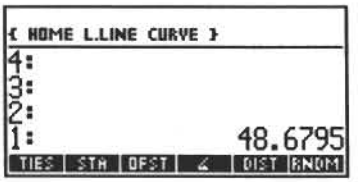
4. Station, azimuth and distance are displayed.
Press **NXT** to display offset and coordinates.



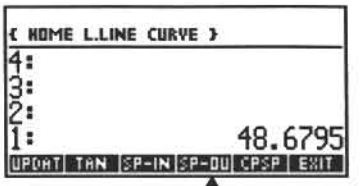
5. Check coordinates with the Geopack Line Data.

6. To clear the display press **ENTER**

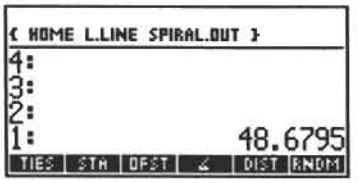
- **Spiral-Out Data**



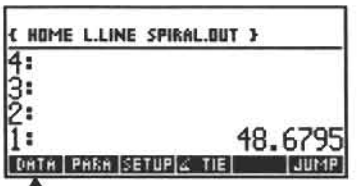
1. Press **NXT**



2. Press **SP-OU**



3. Press **NXT** twice



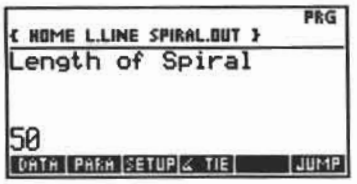
4. Press **DATA**

5. Input the PST station at the end of the spiral and press **ENTER**

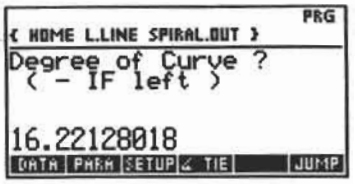
6. Input the north coordinate and press **ENTER**

7. Input the east coordinate and press **ENTER**

8. Input the azimuth (AZ) from the tangent ahead and press **ENTER**

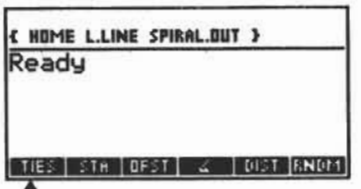


9. Input the length of spiral (LS) and press **ENTER**

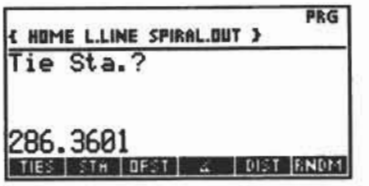


10. Input the degree of curve (DC) of the curve back (left -, right +) and press **ENTER**

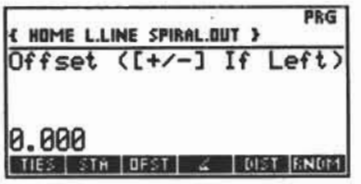
- **Spiral Check-In**



1. Press **TIES**

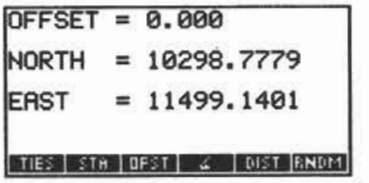


2. Input the beginning station of the spiral (PCS) and press **ENTER**



3. Input the offset and press **ENTER**

4. Station, azimuth and distance are displayed.
   Press **NXT** to display offset and coordinates.

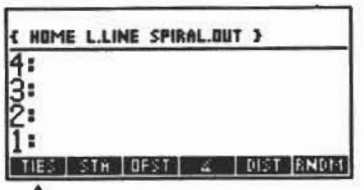


5. *Check coordinates with the Geopack Line Data.*

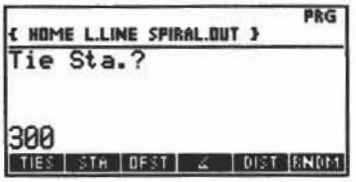
6. To clear the display press **ENTER**

Staking Centerline and Offsets

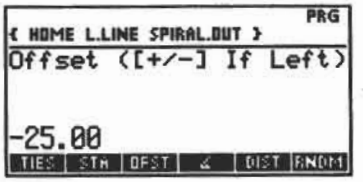
- **Tie Stations**



1. Press **TIES**

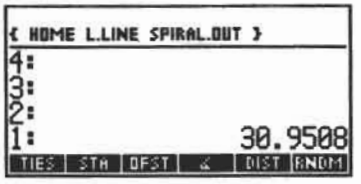


2. Input the station you want to set and press **ENTER**



3. Input the offset (left - , right +) and press **ENTER**

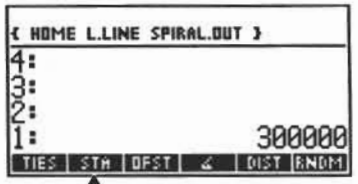
4. Station, azimuth and distance are displayed.



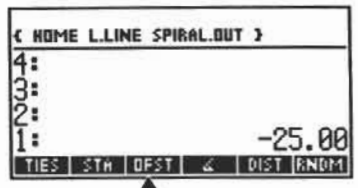
5. Set the azimuth in the instrument. Press **ENTER** to clear the display

   Distance to the station is displayed in stack level 1

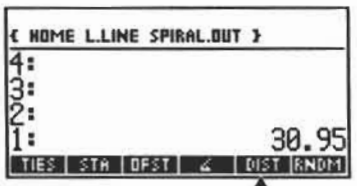
- **Recalling Data**



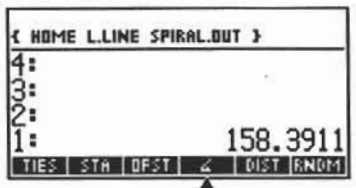
Tie Station - press **STA**



Offset - press **OFST**

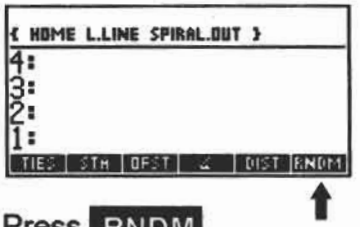


Distance - press **DIST**

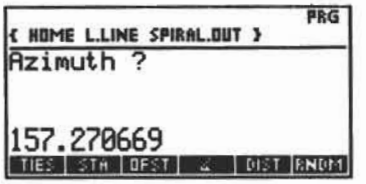


Azimuth - press **∠**

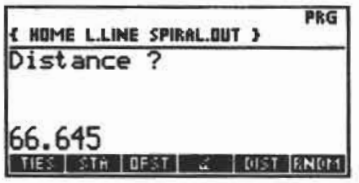
- **Random Tie Stations**



1. Press **RNDM**



2. Input the azimuth measured to the station and press **ENTER**



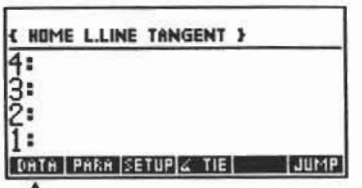
3. Input the distance measured to the station and press **ENTER**

Station, Offset, and coordinates are displayed

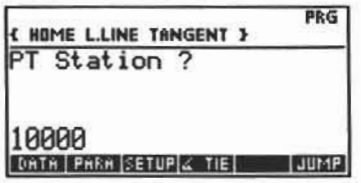
To clear the display press **ENTER**

Updates

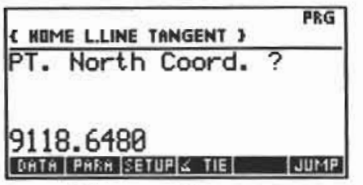
- **Beginning Tangent**



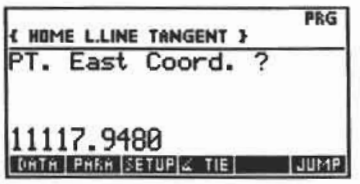
1. Press **DATA**



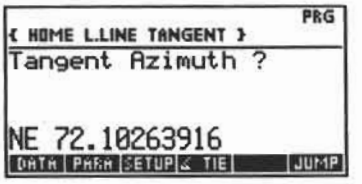
2. Input beginning tangent station (PT, PST, POT) and press **ENTER**



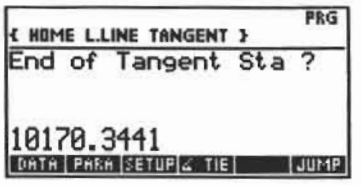
3. Input the north coordinate and press **ENTER**



4. Input east coordinate and press **ENTER**

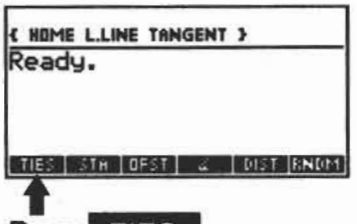


5. Input the tangent azimuth (AZ) and press **ENTER**

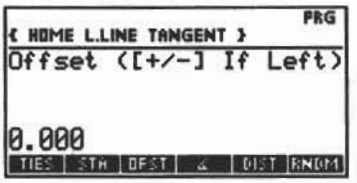


6. Input the station at the end of the tangent (PC, PS, POT) and press **ENTER**

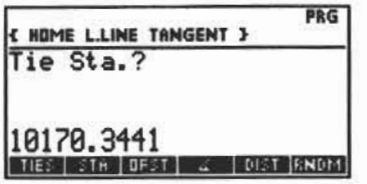
• Tangent Check-In



1. Press **TIES**

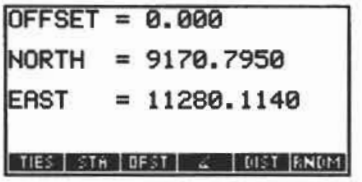


3. Input the offset and press **ENTER**



2. Input the end station of the tangent (PS, PC, POT) and press **ENTER**

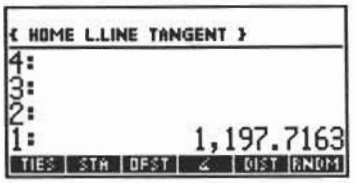
4. Station, azimuth and distance are displayed.
Press **NXT** to display offset and coordinates.



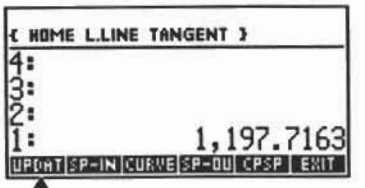
5. Check coordinates with the Geopack Line Data.

6. To clear the display press **ENTER**

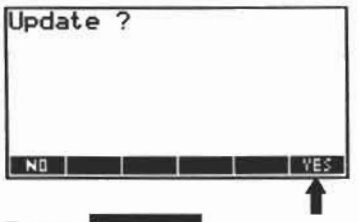
- **Tangent to Spiral**



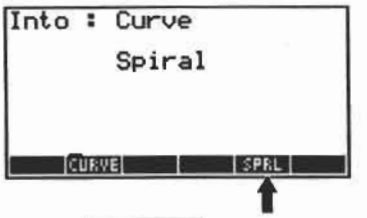
1. Press **NXT**



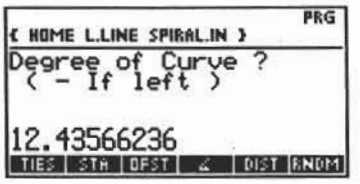
2. Press **UPDAT**



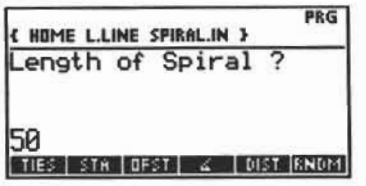
3. Press **YES**



4. Press **SPRL**

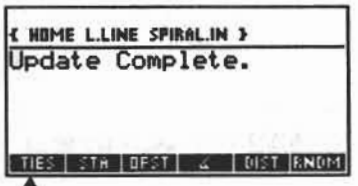


5. Input degree of curve (DC) of the curve ahead (left -, right +) and press **ENTER**

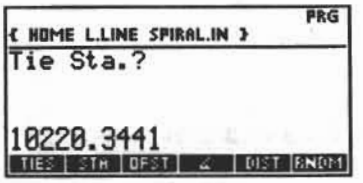


6. Input length of spiral (LS) and press **ENTER**

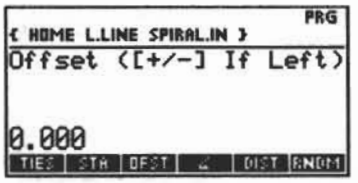
• Spiral Check-In



1. Press **TIES**

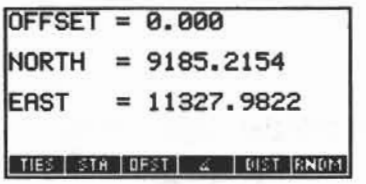


2. Input the station at the end of the spiral (PSC) and press **ENTER**



3. Input the offset and press **ENTER**

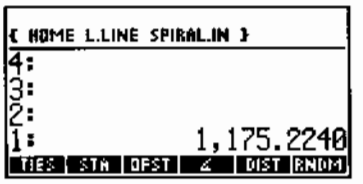
4. Station, azimuth and distance are displayed.
Press **NXT** to display offset and coordinates.



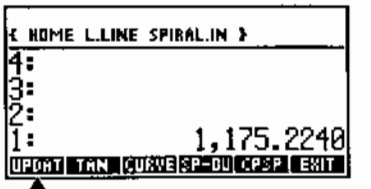
5. Check coordinates with the Geopack Line Data.

6. To clear the display press **ENTER**

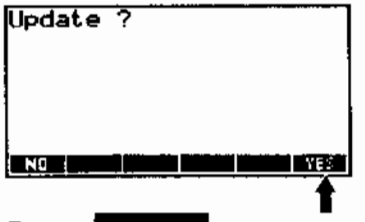
• Spiral to Curve



1. Press **NXT**



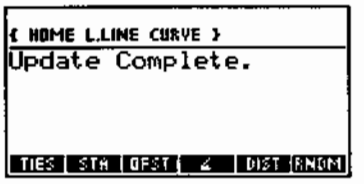
2. Press **UPDAT**



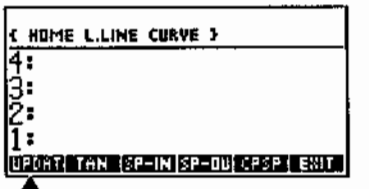
3. Press **YES**

4. Enter curve delta (CD) and press **ENTER**

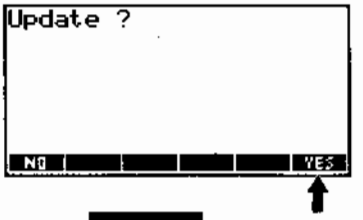
• Curve to Curve



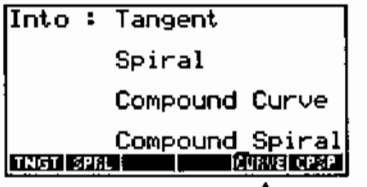
1. Press **NXT**



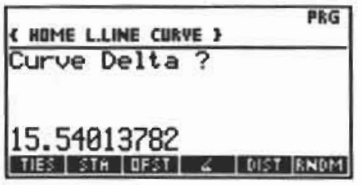
2. Press **UPDAT**



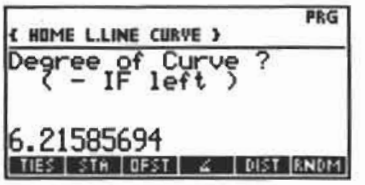
3. Press **YES**



4. Press **CURVE**

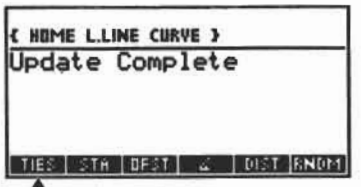


5. Input curve delta (CD) and press **ENTER**

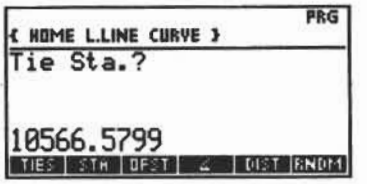


6. Input degree of curve (DC) and press **ENTER**

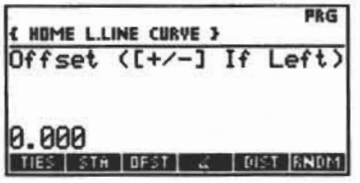
• Curve Check-In



1. Press **TIES**

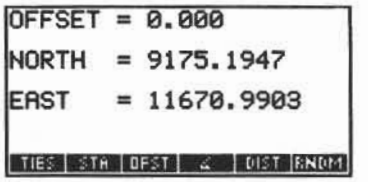


2. Input the end station of the curve (PCS, PT, PCC) and press **ENTER**



3. Input the offset and press **ENTER**

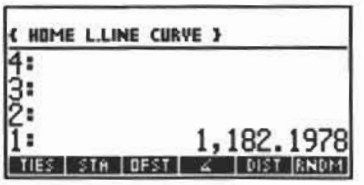
4. Station, azimuth and distance are displayed.
Press **NXT** to display offset and coordinates.



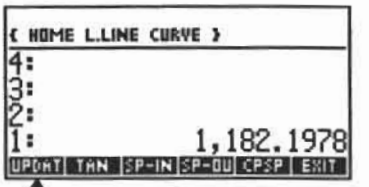
5. Check coordinates with the Geopack Line Data.

6. To clear the display press **ENTER**

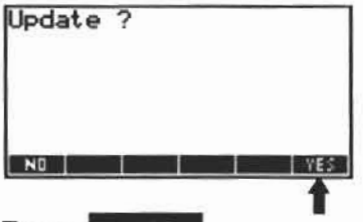
• Curve to Spiral



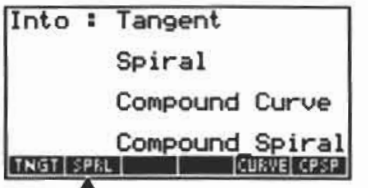
1. Press **NXT**



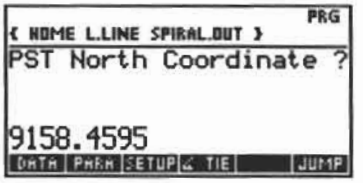
2. Press **UPDAT**



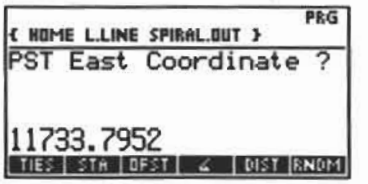
3. Press **YES**



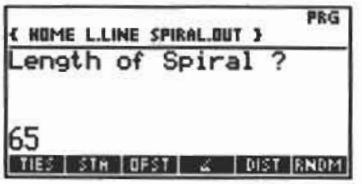
4. Press **SPRL**



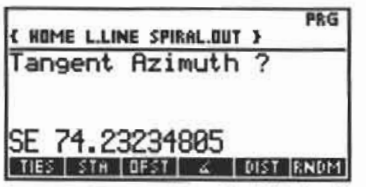
5. Input the north coordinate of the PST at the end of the spiral and press **ENTER**



6. Input the east coordinate of the PST at the end of the spiral and press **ENTER**



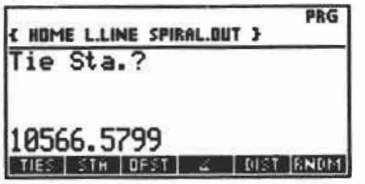
7. Input the length of spiral (LS) and press **ENTER**



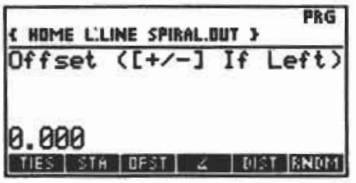
8. Input the azimuth (AZ) of the tangent ahead and press **ENTER**

- **Spiral Check-In**

1. Press **TIES**

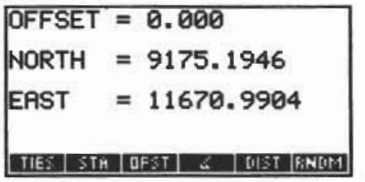


2. Input the beginning station of the spiral (PCS) and press **ENTER**



3. Input the offset and press **ENTER**

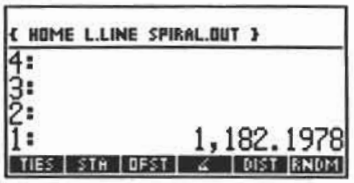
4. Station, azimuth and distance are displayed.
   Press **NXT** to display offset and coordinates.



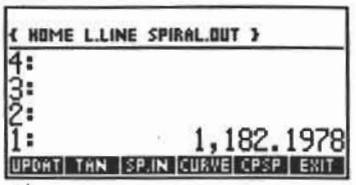
5. Check coordinates with the Geopack Line Data.

6. To clear the display press **ENTER**

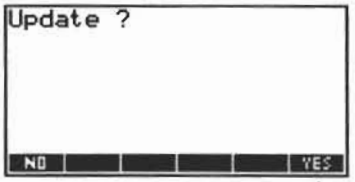
- **Spiral to Tangent**



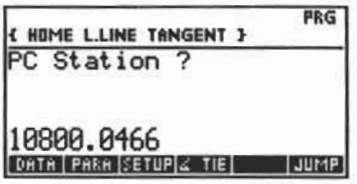
1. Press **NXT**



2. Press **UPDAT**

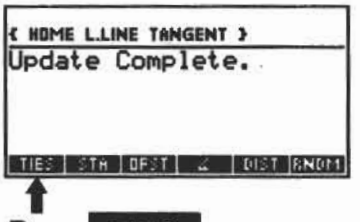


3. Press **YES**

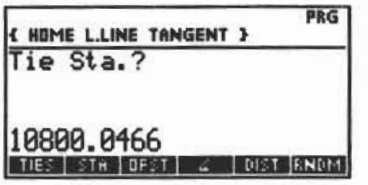


4. Input the end station of the tangent and press **ENTER**

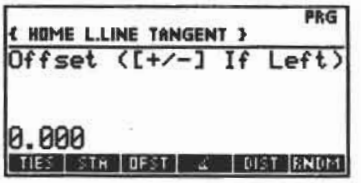
• Tangent Check-In



1. Press **TIES**

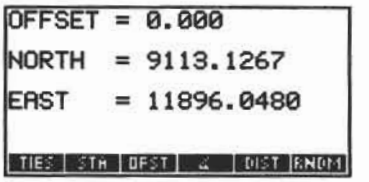


2. Input the end station of the tangent (PS, PC, POT) and press **ENTER**



3. Input the offset and press **ENTER**

4. Station, azimuth and distance are displayed.
Press **NXT** to display offset and coordinates.

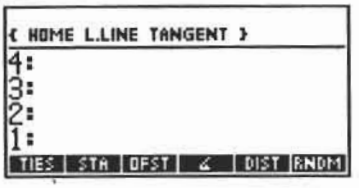


5. Check coordinates with the Geopack Line Data.

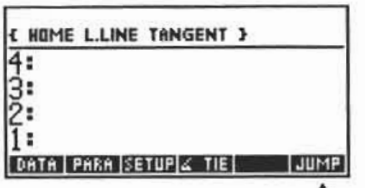
6. To clear the display press **ENTER**

Jump Hubs

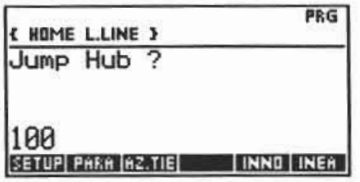
• Creating and Storing Jump Hubs



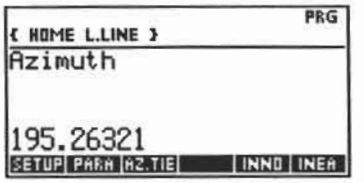
1. Press **NXT** twice



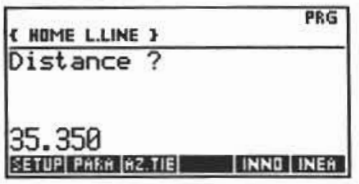
2. Press **JUMP**



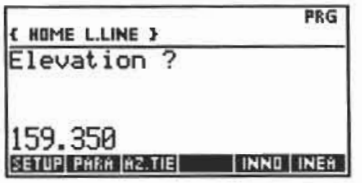
3. Type in jump hub name then press **ENTER**



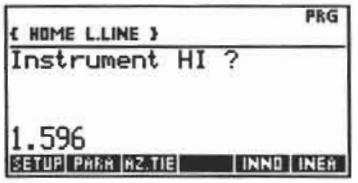
4. Type in azimuth then press **ENTER**



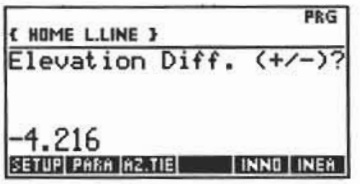
5. Type in distance then press **ENTER**



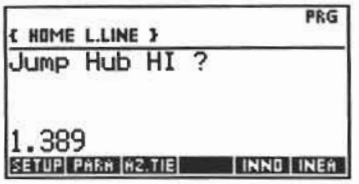
6. Type in the elevation of the instrument point then press **ENTER**



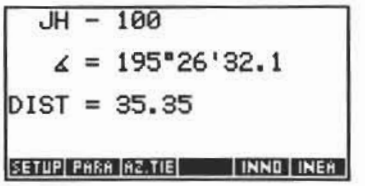
7. Type in the instrument HI then press **ENTER**



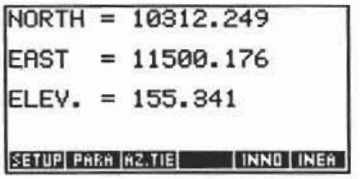
8. Type in the elevation difference then press **ENTER**



9. Type in the jump hub HI then press **ENTER**

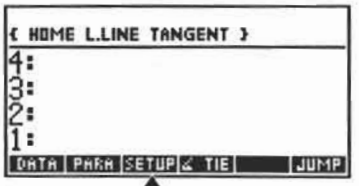


10. The azimuth and distance are displayed. Press **NXT** to display the coordinates.

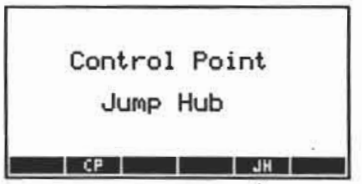


11. Press **ENTER** to clear the display.

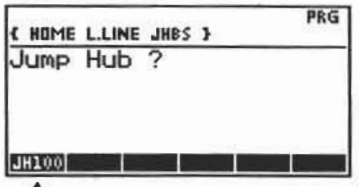
- **Using Jump Hubs**



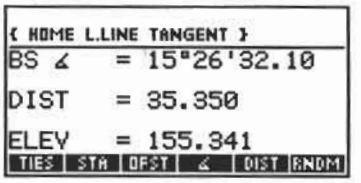
1. Press **SETUP**



2. Press **JH**



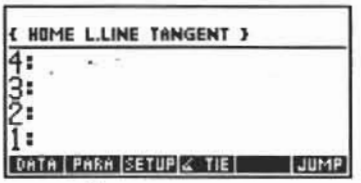
3. Press **JH100** then press **ENTER**



4. Backsight azimuth, distance and elevation are displayed. Press **ENTER** to clear the display.

- **Deleting Jump Hubs**

**** WARNING : This will clear all stored jump hubs.**



1. Press **PARA**

2. Select "Clear Old Jumps" press **ENTER**