FHWA L-LINE PROGRAM
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Loading The Program

- Infrared
  - On The Source Calculator

1. Press \( \rightarrow \) then press I/O
2. Select "Send to HP 48"
presse OK

3. Press \( \alpha \) twice and type LLIN 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 **I/O** 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 **I/O** then press **I/O**
• On the Computer

6. Open the FILER program.

7. Click on [Connect]

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

9. Click on [Send]
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 nothing and press **ENTER**

4. Input easting and press **ENTER**
Computing A Backsight

1. Press \texttt{AZ TIE}

2. Input northing and press \texttt{ENTER}

3. Input easting and press \texttt{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**

8. 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 \[\text{NXT}\]

2. Press \[\text{SP-IN}\]

3. Press \[\text{NXT}\] twice

4. Press \[\text{DATA}\]

5. Input the PS station at the beginning of the spiral and press \[\text{ENTER}\]

6. Input the north coordinate of the PS and press \[\text{ENTER}\]

7. Input the east coordinate of the PS and press \[\text{ENTER}\]

8. Input the azimuth (AZ) from the tangent back and press \[\text{ENTER}\]
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 FAT 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-OUT**

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**

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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 Geопack 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 θ

300000

-25.00

30.95

150.3911
• Random Tie Stations

1. Press **RANDOM**

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

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

3. Input the offset and press ENTER

4. Station, azimuth and distance are displayed. Press NEXT 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 (RSC) 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]

Update ?

2. Press [UPDAT]

Curve Delta ?

3. Press [YES]

12.178322

4. Enter curve delta (CD) and press [ENTER]

• Curve to Curve

1. Press [NXT]

Update Complete.

2. Press [UPDAT]

Into 1: Tangent

3. Press [YES]

Spiral

4. Press [CURVE]

Compound Curve

Compound Spiral
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 71ES

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 Geopcoke 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, PO?) 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 'H' 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 SET UP

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 \texttt{PARA}

2. Select "Clear Old Jumps" press \texttt{ENTER}