



# Leveling Procedures using the Theodolite

Technical Note – 10100120 Rev. B

# Barak



## Safety Procedures

Before reading this Technical Note, please refer to the section on Safety Procedures in the *Barak User's Manual*.

## About this Technical Note

This Technical Note describes how to use the Theodolite for leveling the printer.

## The Theodolite Box

### Dimensions

The box's dimensions are:

Length – 204cm

Width – 43cm

Height – 44cm

It weighs 73 kgs (gross)

### Contents

The Theodolite Box contains:

- A tripod for the Theodolite
- Shims: 0.2 & 0.5 & 1.0 & 2.0 (double the quantity of 0.2 & 0.5)
- Screws & nuts & washers & O-rings
- A set of different screws, nuts and washers
- A quantity of Print Head screws, washers and O-rings
- Screws and O-rings for the SITs
- Grease for SIT Heaters
- Ink Connectors for SIT ( x 8)

- Plastic screws and washers for the Print Head Drivers
- Screws for the Print Table
- Special Nuts for the Print Table Screws and Wings
- Screws for the Head Calibration Jig ( x 4 at least)
- Screws for the Tilt Calibration Jig ( x 3 at least)
- Loctite: 5331, 542, 222, and Special Loctite for UV Lamp Screws (272)
- Lupa magnifying glass and flashlight with a blue LED
- Ink Pumps x 2 (with correct connectors)
- UV Filters
- Ink Filters (x 8)
- Ink Connectors for Pumps (x 8)
- Vacuum Metal Connectors for SIT and Manifold (x 8)
- Jig for Print Table Calibration
- 6mm clear tube (5 m)
- 6mm black tube (5 m)
- Gloves
- Print Head cleaning paper

The Theodolite Box is normally stored in our European office with all the parts listed above. It should be constantly maintained so that it can be shipped to any installation site in Europe, by the time the actual printer arrives.

Unless instructed otherwise, the box should be returned to Matan's Europe office as soon as the leveling and installation have been successfully carried out. Please refer to *"Returning the Theodolite to Matan's Office,"* page 16.

## Removing the Shipping Supports

When delivered to the user, a SHIPPING SUPPORT is attached to the front and rear side of the printer as shown in Figure 1.



Figure 1. Printer with Shipping Support attached to the rear side

The supports are connected to the Printer's BASE RAILS through an L-shaped profile and four bolts at each end, as shown in the following figure.



Figure 2. L-shaped Profile for Shipping Support

The L-shaped profiles are secured to the printer's BASE RAIL with T-nuts.



Figure 3. T-nut

➤ **To remove the Shipping Supports:**

1. Detach the two SHIPPING SUPPORTS from the L-shaped profiles by removing the four nuts and bolts located at each end of the two supports.
2. Detach the four L-shaped profiles from the printer by remove the T-nuts from under the Printer's BASE RAIL.



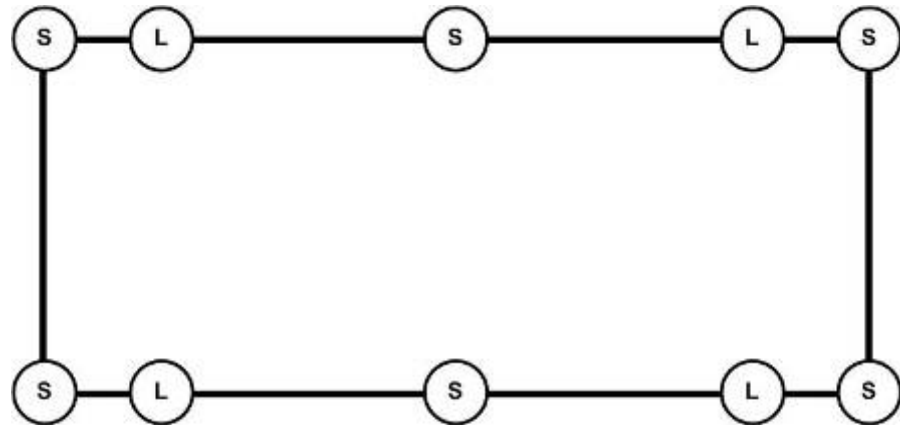
Remember to store the Shipping Supports together with the L-shaped profiles nuts, and bolts, for possible future use by the Technician.



The printer stands on ten legs which are attached after the shipping crate has been removed.

## Leveling the Printer

The **Barak** printer has ten feet – four for leveling (**L**) and six for support (**S**), as shown in the following diagram:



**S** = Supporting Feet  
**L** = Leveling Feet

Not to scale

Figure 4. The Barak5 Printer's Feet

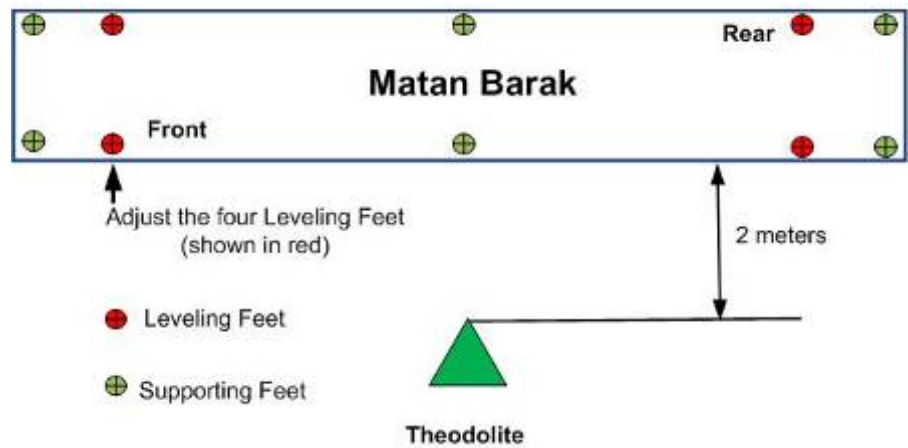
Figure 5 shows the front two LEVELING FEET. The two rear ones are not visible from the front of the printer.



Figure 5. Leveling the Printer

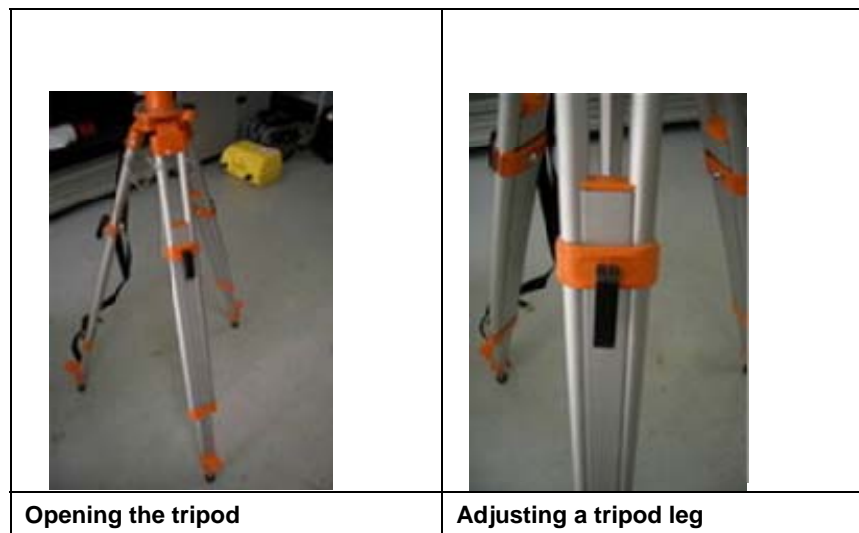
## Location

You should locate the Theodolite at a distance of approximately 2 m from the front-center of the printer, as shown below.

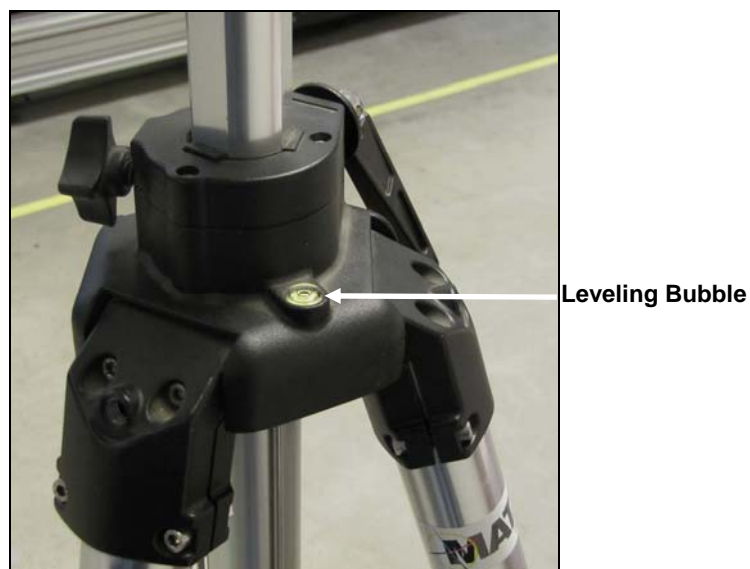


## Preparing the Theodolite

1. Open the tripod and fix all three legs to their limit, for maximum stability.

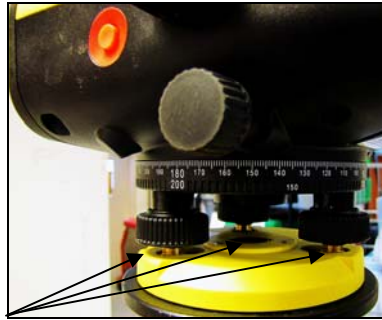


2. Using the tripod's leveling bubble, make sure that it is standing level.





3. Attach the Theodolite to the tripod.
4. Use the Theodolite's three leveling buttons and its leveling bubble to make sure that it is standing level.



The Theodolite's Leveling Buttons



The Theodolite's Leveling Bubble

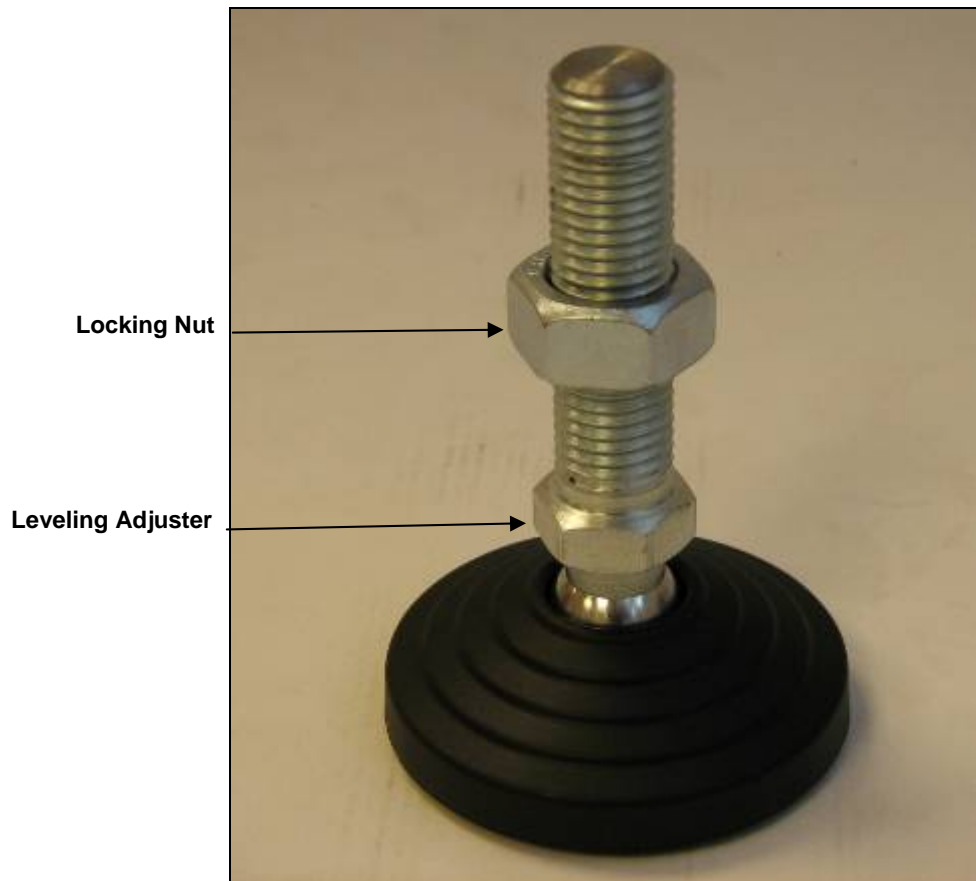
## Leveling the Printer

To level the printer, you will need the following tools:

- The PRINTER LEVELING JIG and GAUGES
- The THEODOLITE BOX and target.
- Two open spanners: #30 and #24.

➤ **To level the printer:**

1. Connect the printer to the electricity and air supply and switch on the power.
2. Raise the Y and T-ROLLERS (Shafts).
3. Using an appropriate spanner, raise the six SUPPORTING FEET as shown in Figure 4, and Figure 6, page 10, by releasing the locking nut on each foot and turning the LEVELING ADJUSTER in a counter-clockwise direction, until the feet are no longer touching the floor.



**Figure 6. Leveling or supporting foot**

Only the four LEVELING FEET should now be touching the floor.

These feet are to be used for raising or lowering the printer.



Make sure that when you lower the two middle Supporting Feet, you lock them when the legs are just touching the floor.

If you over-turn these two feet, you might put the printer out of level.

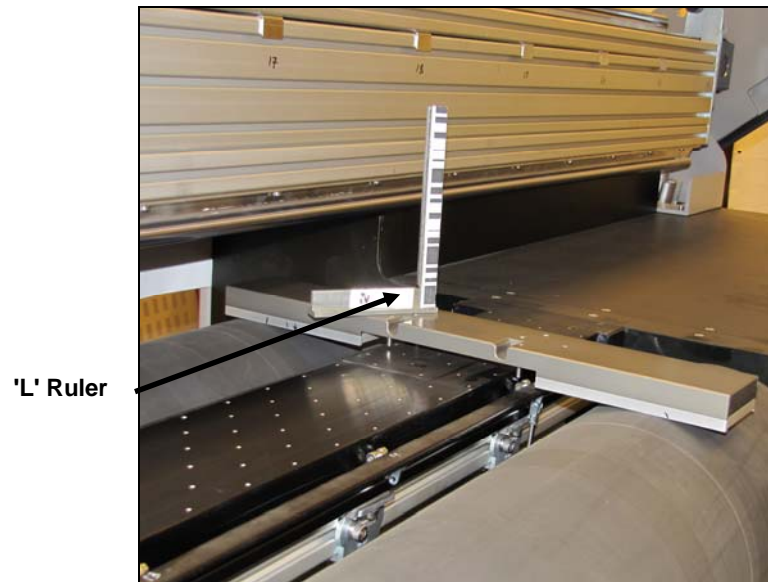
## Creating a Reference Point

1. Make sure that the SHAFT ROLLERS are in the UP position.
2. Place the jig on the right side of the printer, perpendicular to the two RUBBER ROLLERS, as shown below.

Jig placed  
perpendicularly to  
the Rollers



3. Place the 'L' ruler (TARGET) on the jig, as shown below.



Make sure that it is stable and stationary.

4. Focus the Theodolite on the 'L' ruler (TARGET).
5. Look through the Theodolite and try to find next view where you have a correct B&W (black and white) position.



You can use the FOCUS BUTTON as shown below, to obtain a clearer image.



You can use the ROTATE BUTTON (shown above,) to rotate the Theodolite and fine-tune the position.



6. Once you have a clear view and the Theodolite position is correct, press the  $\Delta H$  BUTTON and then the MEASURE BUTTON, as shown below.



**ΔH Button**



**Measure Button**



**Display Screen**

The text 'Meas. Target !' appears on the display screen (as shown in the right hand photo above).

This is the first reference point.

## Creating Additional Reference Points

After you have created the first reference point, which will be the “**0**”, measure the distance to the other three points.

1. Move the 'L' ruler (TARGET) to the front side of the JIG.
2. Orient and focus the Theodolite.
3. Press the MEASURE button.
4. Write down the measure result with the position name.
5. Move the JIG to the other side of the printer and repeat the operation (point 4 : c + d + e ) to the pending 2 point.

Once you have taken the other three readings, you have an accurate idea of whether the printer is level.

## Re-selecting the Reference Point

The optimal solution is to always move the printer UP.

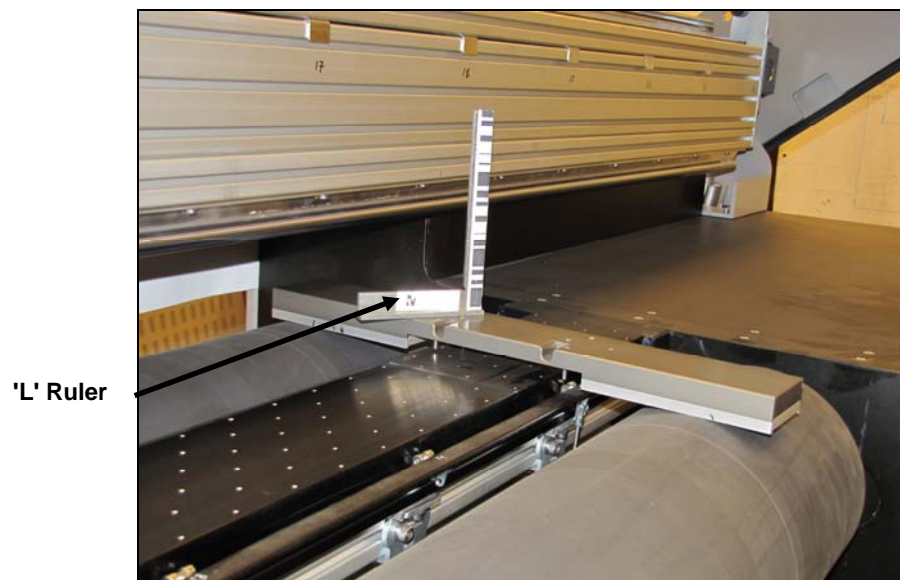
If there is a positive reading, you have higher point/s than the REFERENCE POINT.

If this happens, select the higher point and make it the reference.

Once you have this new reference, you can start the printer leveling procedure.

## Leveling the Printer

1. Make sure that there is enough thread on the four LEVELING FEET (on the printer,) to allow for adjustment.
2. Place the JIG on the right side of the printer, perpendicular to the two RUBBER ROLLERS.
3. Place the 'L' ruler (TARGET) on the JIG, as shown below.



4. Orientate and focus the Theodolite on the 'L' ruler (TARGET) and then press the MEASURE button.
5. Move the Theodolite to the left side of the printer (point #2). Measure the point.  
If the result is negative, you have to raise the printer to obtain a maximum tolerance of  $\pm 0.0001$  m from the "0" of the Reference Point.
6. Repeat this operation in the same position until result is within tolerance.
7. Repeat step 4, 5, and 6 for the two remaining points.

If all of the four points are within the tolerance, then the procedure has been successfully completed.

If the measurement is out of tolerance, then you need to re-level the machine in a fine tuning mode.

Once you have all four points correctly set, close the other six support legs and repeat the procedure at the four points, to make sure nothing was changed.

You might need to fine tune the leveling, in case the SUPPORT LEGS have modified the machine level.

## Returning the Theodolite to Matan's Office

Once you have finished using the Theodolite, carefully wrap it – using protective material – and pack it into the shipping crate.

Send it as instructed.

Please remember that this tool is very expensive and operating it requires great care.



## Appendix A: Damage Report Form (not for the Print Head)

<b>Customer's Name:</b>	
<b>Address:</b>	
<b>Barak5 Printer S/N*</b>	
<b>Faulty Part Name</b>	
<b>Details of faulty part:</b>	
<b>Remarks:</b>	
<b>Signed:</b>	
<b>Name:</b>	
<b>Position in Company:</b>	
<b>Date:</b>	

\* The Printer's Serial Number is displayed on the label located at the rear of the printer near the left end of the rollers, as shown below.



## Document History

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