



40-6910 22x Builders Level
Service Manual



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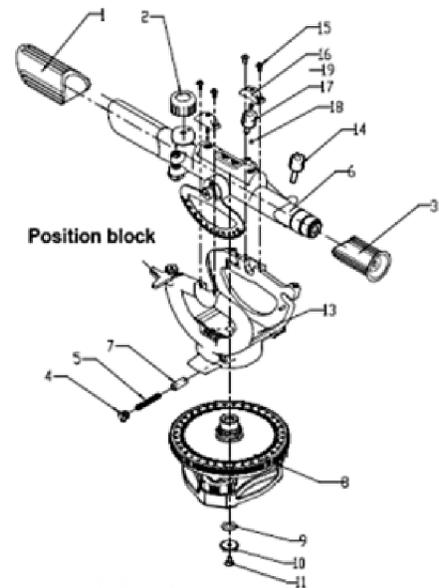
1. Overall Instrument Assembly

This optical level is a highly accurate instrument. Out side of a few customer adjustments (outlined in the owners manual), all adjustments/service operations are internal to the instrument and to be performed only by authorized service personnel. Authorized personnel should adhere to the guidelines described within this service manual for all repairs and/or service work. It should be note that procedures in this manual should be referred to based on the specific situation.



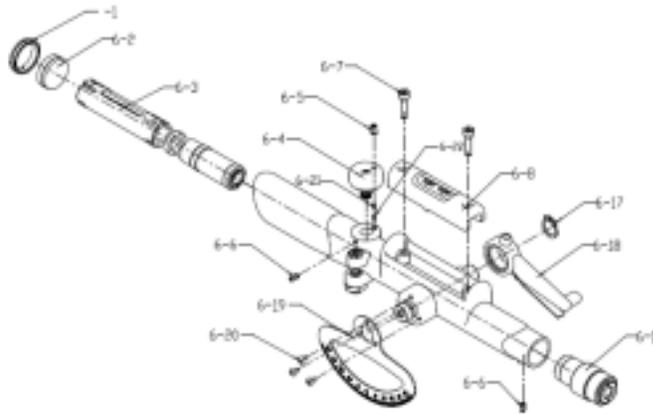
1.1 Main Assembly (40-6910)

Item	JLT Part	Description	Qty
1	AP1990	Rubber Cover 1	1
2	AP1991	Rubber Cover 2	1
3	AP1992	Rubber Cover 3	1
4	AP1993	Press Spring Screw	1
5	AP1994	Horizontal Press Spring	1
6	AP2026	Telescope Assembly	1
7	AP1996	Horizontal Pres Spring Base	1
8	AP1997	Base Assembly	1
9	AP1998	Wave Ring	1
10	AP1999	Retainer	1
11	AP2000	M4x8 Cross Sunk Screw	1
13	AP2027	Frame Assembly	1
14	AP2028	Vertical Fine Adjustment Knob	1
15	AP1022	M3x6 Cross Plate Screw	4
16	AP2029	Press Cover	2
17	AP2030	Vertical Locking Knob	1
18	AP2031	Dampening Piece	2
19	AP2032	Press Spring	2



1. Remove Rubber 1 (#1), rubber cover 2 (#2), and rubber cover 3 (#3) by hand.
2. Remove vertical locking knob (#17) and vertical fine adjustment knob (#14) from frame assembly (#13) by turning counter clockwise.
3. Remove telescope assembly (#6) from Frame Assembly (#13) by removing 4 Retaining screws (#15), 2 Press covers (#16), 2 dampening pieces (#18), and Press Springs (#19).
4. Remove Frame Assembly (#13) from Base Assembly (#8) by removing Retaining screw (#11), Wave ring (#9), Retainer (#10), Press Spring Screw (#4), Horizontal Press Spring (#5), and Horizontal Press Spring base (#7).

1.2 Telescope Assembly (AP2026)

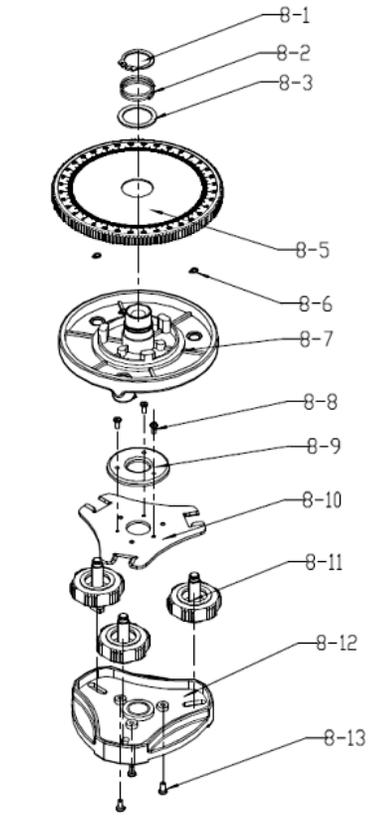


Item	JLT Part	Description	Qty	Item	JLT Part	Description	Qty
6-1	AP2001	Objective Press Loop	1	6-13	AP1449	M2.5 x 6 Cross-slot Plate Screw	2
6-2	AP2002	Objective glued lens	1	6-14	AP2013	Horizontal micro motion loop	1
6-3	AP2003	Focus Lens assembly	1	6-15	AP2014	Horizontal Micro-motion Locking Knob	1
6-4	AP2004	Focus knob assembly	1	6-17	AP2033	Axis Elastic Retainer	1
6-5	AP2005	M4 x 6 Inner Hexagon Notched Tightening Screw	1	6-18	AP2034	Vertical Locking Loop	1
6-6	AP2006	M3 x 6 Inner Hexagon Notched Tightening Screw	2	6-19	AP2035	Vertical Graduated Circle	1
6-7	AP2007	M4x12 Inner Hexagon Column head screw	2	6-20	AP1488	M2.5x4 Cross Plate Screw	3
6-8	AP2008	Vial Seat Assembly	1	6-21	AP2036	Press Spring	1
6-11	AP2011	Eye Piece Assembly	1	6-22	AP2037	Rod	1
6-12	AP2012	Horizontal vernier	1				

1. Remove Vial Seat Assembly (6-8) by removing the 2 retainer screws (6-7).
2. Remove objective glued lens (6-2) from Telescope Assembly (6) by removing objective press loop 6-1). Be very careful not to damage the lens as 6-1 is unscrewed.
3. Remove Eye Piece Assembly (6-11) by loosening set screw (6-6) with 1.5 mm Allen wrench.
4. Remove Focus Lens Assembly (6-3) by loosening set screw (6-6) with 1.5mm Allen wrench and remove lens focus knob assembly (6-4). Once removed Lens focus assembly (6-3) is removed by pushing it from the front towards the back until it freely slides out.
5. Remove Vertical Graduated Circle (6-19) from Telescope Assembly (6) by removing 3 retaining screws (6-20).
6. Remove Vertical Locking Loop (6-18) from Telescope Assembly (6) by sliding off axis elastic retainer (6-17) and Vertical Locking Loop (6-18)

1.3 Base Assembly (AP1997)

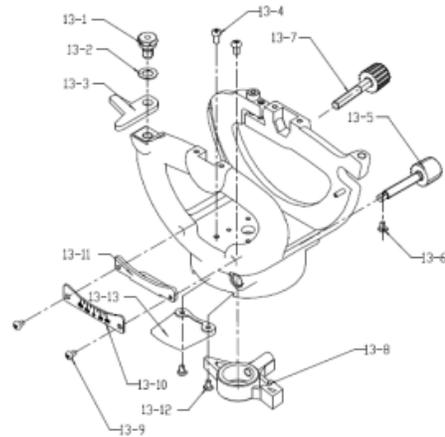
Item	JLT Part	Description	Qty
8-1	AP2017	C-ring	1
8-2	AP2018	Compression Spring	1
8-3	AP2019	Spacer	1
8-4	N/A	N/A	0
8-5	AP2020	Horizontal Graduated Circle	1
8-6	AP1579	2.5M Split Washer	3
8-7	AP2021	Base Module	1
8-8	AP1449	M2.5 x 6 Cross-slot Plate Screw	3
8-9	AP2022	Press Board	1
8-10	AP2023	Bottom Plate	1
8-11	AP2024	Foot Screw	3
8-12	AP2025	Bottom Module	1
8-13	AP1022	M3 x 6 Cross-slot Plate Screw	3



1. Remove Horizontal graduated circle (8-5) from Based Module (8-7) by removing C-ring retainer (8-1), compression spring (8-2), and spacer (8-3) respectively. A ring pliers is a very useful tool in removing the C-ring
2. Remove the 3 foot screws (8-11) from Base Module (8-7) by removing 3 split washers (8-6) located at the top each foot screw (8-11). Once the 3 split washers (8-6) have been removed, rotate each foot screw counter clock-wise to unscrew them from the Based module (8-7).
3. Remove Press Board (8-9) from Bottom plate (8-10) by removing 3 retaining screws (8-8).
4. Remove the Bottom module (8-12) from the Bottom plate (8-10) by removing the 3 retaining screws (8-13).

1.4 Frame Assembly (AP2027)

Item	JLT Part	Description	Qty
13-1	AP2038	Position Block Screw	1
13-2	AP2039	Elastic Gasket	1
13-3	AP2041	Position Block	1
13-4	AP1022	M3x6 Cross Plate Screw	2
13-5	AP2009	Horizontal Fine Adjustment Knob	1
13-6	AP2010	M1.6x3 Cross Plate Screw	1
13-7	AP2014	Horizontal Locking Knob	1
13-8	AP2013	Horizontal Micro-motion Loop	1
13-9	AP1488	M2.5x4 Cross Plate Screw	2
13-10	AP2042	Vertical Vernier	1
13-11	AP2043	Bracket	1
13-12	AP1449	M2.5x6 Cross Plate Screw	2
13-13	AP2012	Horizontal Vernier	1



1. Remove Horizontal Micro-motion loop (13-8) from Frame Assembly (13) by turning Horizontal Locking knob (13-7) counter clockwise until it comes out the sliding off Horizontal Micro Motion Loop (13-8)
2. Remove Position Block (13-3) from Frame Assembly (13) by removing Position Block Screw (13-1) and Elastic Gasket (13-2).
3. Remove Horizontal Fine Adjustment knob (13-5) from Frame Assembly (13) by removing retaining screw (13-6) and turning Horizontal Fine Adjustment knob (13-5) counter clockwise until it comes out.
4. Remove vertical vernier (13-10) and bracket (13-11) from Frame Assembly (13) by removing 2 retaining screws (13-4) and (13-9) respectively.
5. Remove horizontal vernier (13-13) from Frame Assembly (13) by removing 2 retaining screws (13-12)

2.0 Calibration

Calibration is a process that is used to correct for accuracy and/or functional errors above and beyond those stated in published specifications. This product is fairly easy to verify and calibrate as there are only two adjustments that can be made. Each item discussed is shown below.

2.1 Vial Verification/Calibration

Mount the instrument on the tripod. Turn the telescope to the position as shown in figure A, and line up the telescope bubble in alignment with foot screws A & B. Note that the bubble moves always in the same direction as your left thumb.

If the bubble is not centered, first grasp screws A & B so that both thumbs are moving in opposite directions, either toward each other or away from each other, in order to make the bubble centered. Then turn the

telescope to the position as shown in figure B, turn the foot screw C to make bubble centered. Now, the instrument should be leveled up, but to be certain, double-check. Rotate the instrument by any angle, and the bubble should always be centered. Otherwise, please make calibration for the bubble.

If the bubble leans to the right side, adjust screws A & B as figure C shows, in order to remove one half the error.

Remove the other half of the error by adjusting the two bubble level screws as shown in figure E, i.e. loose one screw while tightening the other screw. The instrument is calibrated when the bubble remains center as the telescope is rotated throughout a 360° rotation. If the bubble leans to the left side, turn screws A & B as shown in figure D, and repeat the steps as described above.

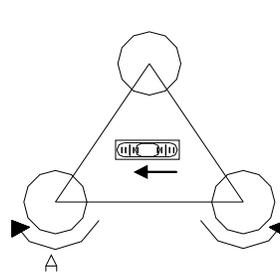


Figure A

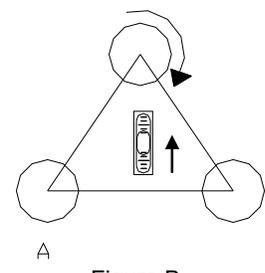


Figure B

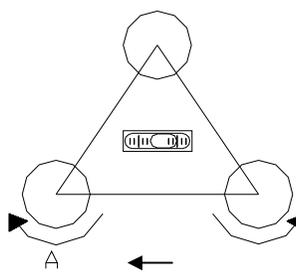


Figure C

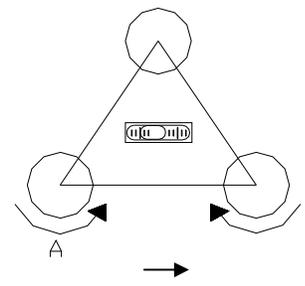
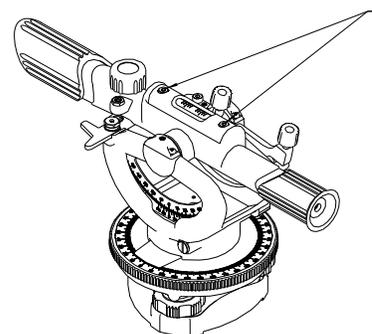


Figure D



Bubble level

Figure E

2.2 Line of Site Verification/Calibration

Once Vial calibration has been verify/achieved, it is necessary to verify/calibrate the line of site. Essentially this assures that the stadia lines within the telescope (cross hairs) are on the same plane as your reference. This can be done a number of ways:

- By purchasing an automatic level/collimator.
- By comparing the test instrument to a ***known good*** reference laser, theolite, etc.
- Using the long shot, short shot method.

Regardless of the method, calibration adjustments are the same. This manual only discusses verification using an automatic level.

Setup the instrument as shown in figure F, level the bubble, and focus the lens until you can clearly see the stadia lines inside the collimator tube. If the center horizontal hair on the stadia lines of the instrument is not coincident with the horizontal reference line on the of the collimator tube, the instrument should be calibrate using the method below.

Leveling accuracy using an automatic level

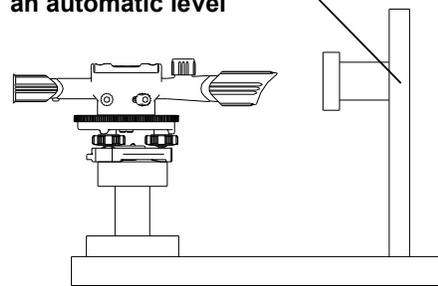


Figure F

1. Remove rubber cover 3 (3) to expose calibration set screws 6-6 and 6-16.
2. Using a 1.5mm Allen wrench, loosen calibration set screws 6-6 and 6-16.
3. Rotate the eyepiece seat to make the crosshair center on the reticle of instrument on the same level with crosshair center on the reticle of collimator tube. Then rotate the eyepiece tube to make the horizontal hair on the reticle of instrument level. Now the middle horizontal hair on the reticle of the instrument coincide with the horizontal line on the reticle of the collimator tube.
4. Tighten the two set screws 6-6 and 6-16 and restore rubber cover 3 (3) to its original position.

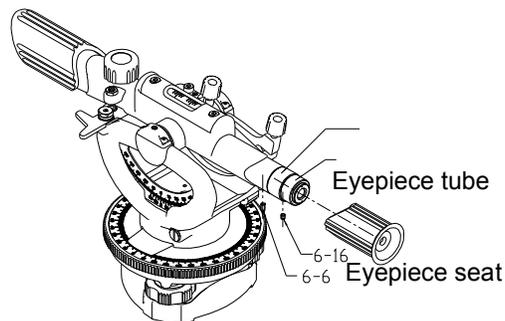
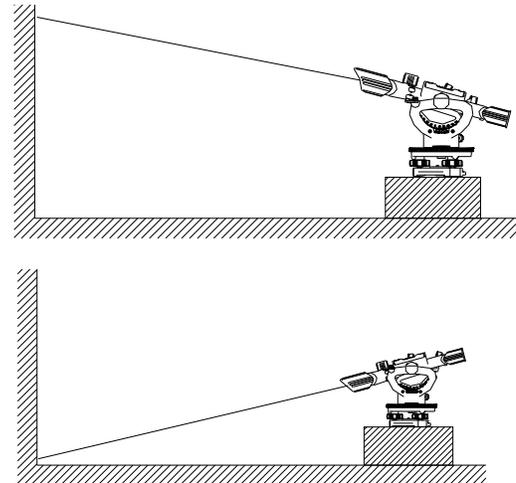


Figure G

2.3 Vertical Accuracy Verification/Calibration

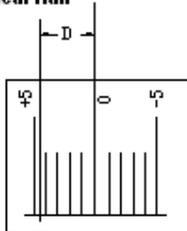
1. Set the instrument on the platform and face telescope to the wall.
2. Tighten the center screw and level the instrument.
3. Loosen the vertical lock knob and adjust the telescope as shown in the figure to the right.
4. Adjust the focus knob until the target on the top end of the wall could be observed clearly.
5. Turn the telescope to make the vertical hair of the cross hair coincide with the zero position of the target.
6. Adjust the telescope, as shown in figure to the right. To focus until the target on the lowest end could be observed clearly.
7. Then observe the deviation D of the vertical hair from the zero position. If $D > 1.5\text{mm}$, the vertical accuracy of the instrument is beyond the tolerance and should be calibrated.



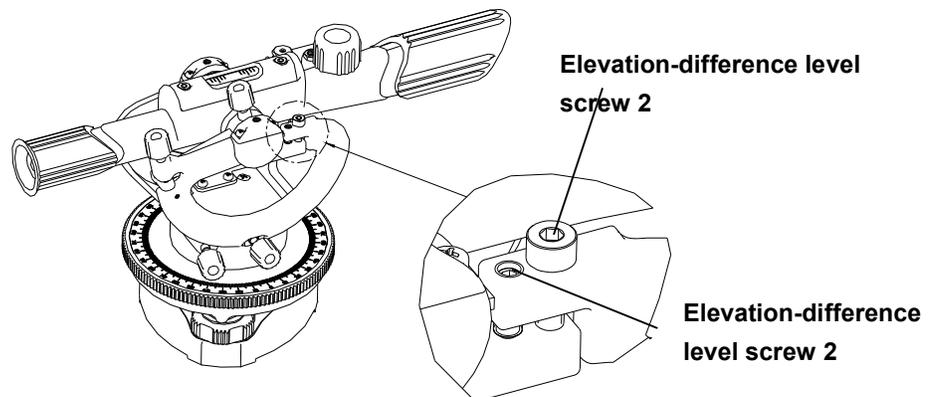
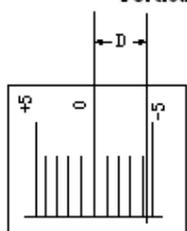
2.3.3 Vertical accuracy calibration

1. If the vertical hair locates on the left side of the zero position, as shown below, use a hexagon spanner to loosen elevation-difference level screw 2 and tighten elevation-difference level screw 1, as shown below. Tighten the two level screws simultaneously until the vertical hair coincides with the zero position.
2. If the vertical hair locates on the right side of the zero position, as shown below, use a hexagon spanner to loosen elevation-difference level screw 1 and tighten elevation-difference level screw 2, as shown below. Tighten the two level screws simultaneously until the vertical hair coincides with the zero position.

Vertical hair



Vertical hair



After the vertical accuracy of the instrument has been adjusted, please recheck the sightline levelness of the instrument with the same method as above. If the sightline levelness is beyond tolerance, it is necessary to make readjustment.

3.0 Trouble Shooting Guide

No.	Symptom	Cause	Corrective Action
1	The horizontal micro-motion knob doesn't work	The horizontal locking mechanism is damaged or defective	Replace the horizontal locking mechanism
2	The focus knob doesn't work	The upper gear on the focus tube has a lot of wear	Replace the focus tube
3	Fail to level the bubble	The bubble is broken	Replace the bubble
4	The cross hair is obscure	The position of the eyepiece is not correct	Adjust the position of the eyepiece
5	There is something on the reticle	The reticle is dirty	Clean the reticle
6	Bubble is not centered in any direction	The bubble level screw is loose	Recalibrate according to the above method