40-6600

Self Leveling Laser Marker

SERVICE MANUAL

Main Instrument

Bracket

1. Overall Instrument Assembly

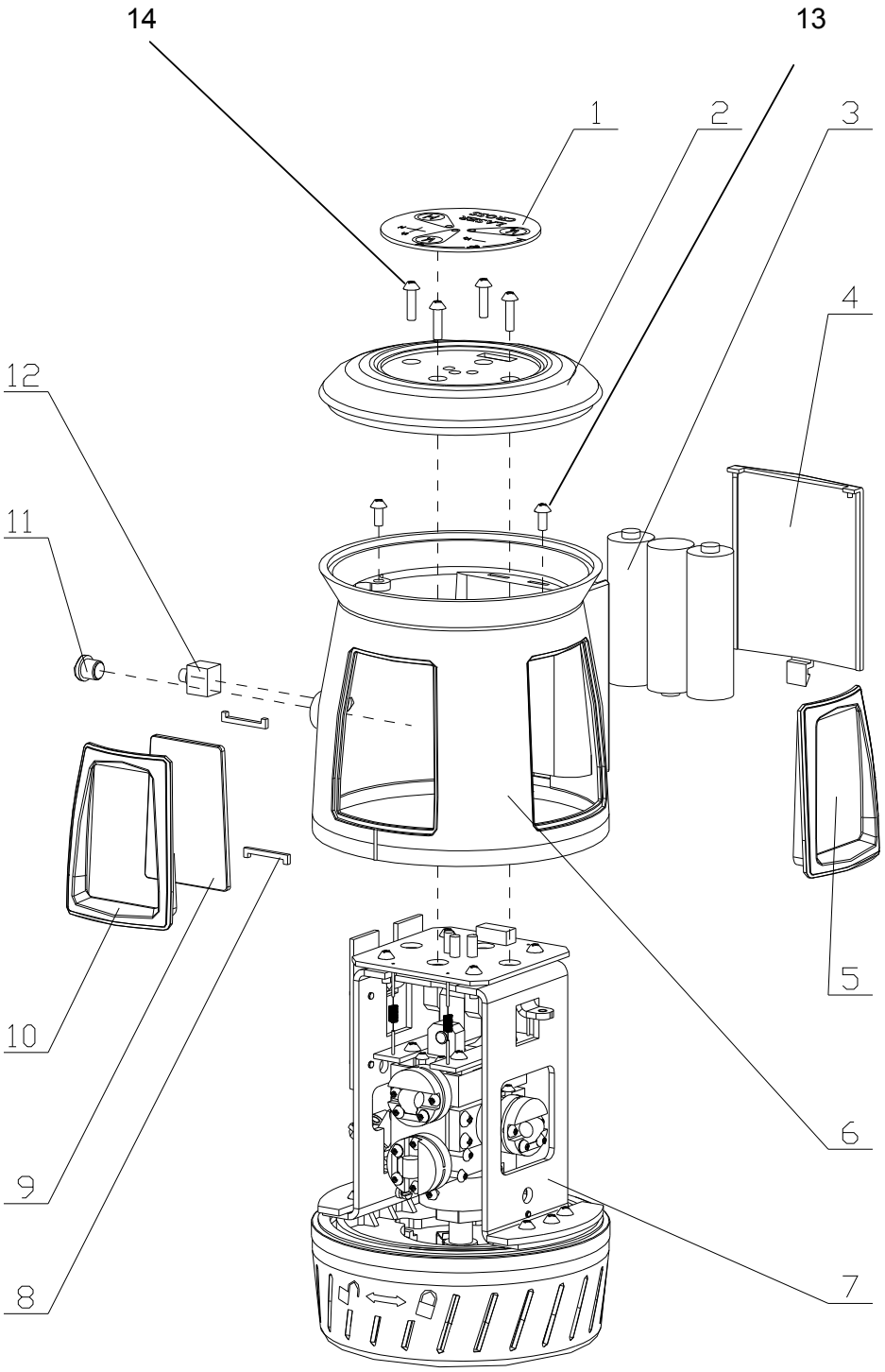


Fig. 1-A **See Item Description list on next page**

Item	JLT Part #	Description	Qty
1	AP1730	Keypad Cover	1
2	AP1731	Top Cover	1
3		Batteries	1
4	AP1732	Battery Cover	1
5	AP1733	Side Window Module (incl. Braces, Window, and Frame)	1
6	AP1734	Main Housing	1
7	AP1735	Central Unit (see Sec. 2.1)	1
8	AP1736	Window Braces (2 for each window)	4
9	AP1737	Front Window	1
10	AP1738	Front Window Frame	1
11	AP1739	Plastic Screw Cover	1
12	AP1740	DC Socket Connection	1
13	AP1741	Cross Plate Screw M 2.5 x 5.75	2
14	AP1742	Cross Plate Screw M 2.5 x 12	4

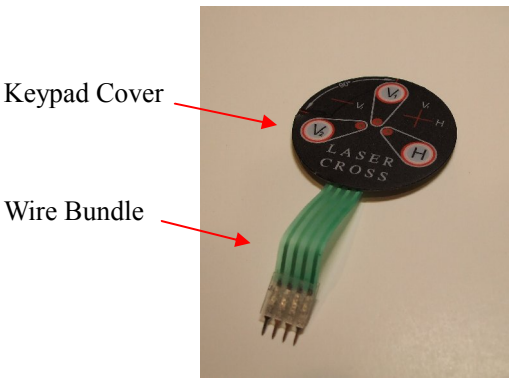
General Assembly Instructions

[Note: Refer to section 3.0 for information on electrical connections.]

1. Make sure all 3 wires are connected to DC Socket Connection (12): 2 wires go to #1 Main Circuit Board and one wire connects to bottom end of battery compartment. Then attach the DC Socket Connection to the Main Housing (6) from the inside with a circular screw-on ring securing it from the outside. (The diagram is somewhat misleading with the DC Socket Connection pictured outside the housing.)

2. Position the Main Housing (6) to fit down over the Central Unit (7). Use 2 Cross Plate Screws (13) to secure the Housing. (Make sure that the wire from the top of the battery compartment is attached to the Main Circuit board.)

3. Feed the wire bundle coming from the Keypad Cover (1) through the top side of the Top Cover (2) and then connect the wire bundle to the matching connection receptor on the Main Circuit Board. See figures below.



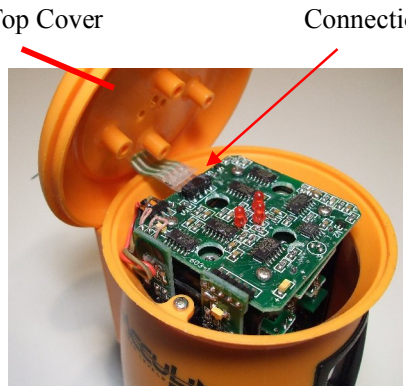


Fig. 1-B Fig. 1-C

4. Now position Top Cover (2) into the Main Circuit Board and secure using the four Cross Plate Screws (14).

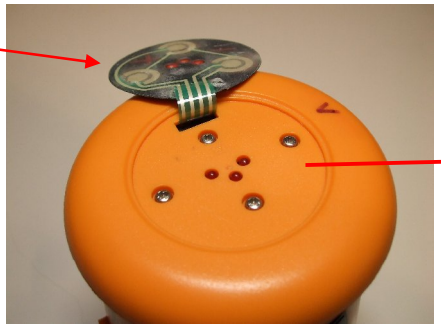


Fig. 1-D

5. The Keypad Cover (1) has a sticky side. Orient the Keypad Cover to fit over the matching circle on the Top Cover and press down so that it sticks. The three indicator lights must match the red light marks on the top of the Keypad Cover.

6. Place Batteries (3) in the battery compartment of the Main Housing (6) and then attach the Battery Cover (4).

The instrument can be <u>dis</u>assembled using the reverse order described above.

NOTE: When <u>removing</u> the Keypad Cover (1) use a sharp edge (razor) to work the Keypad Cover free.

Fig. 1-E

2.0 Component Assembly

Regarding General Assembly of all Components

NOTE OF CAUTION

This module should not be assembled by anyone other than professional service technicians with appropriate equipment. Cutting the hairspring wires or any other wires is NOT recommended.

If repairs / replacements are needed for this module, it is recommended to send the unit to the appropriate repair facility. Call the main office of Johnson Levels for further information.

2.1 Central Unit Assembly (AP1735)

See Item Description list on next page

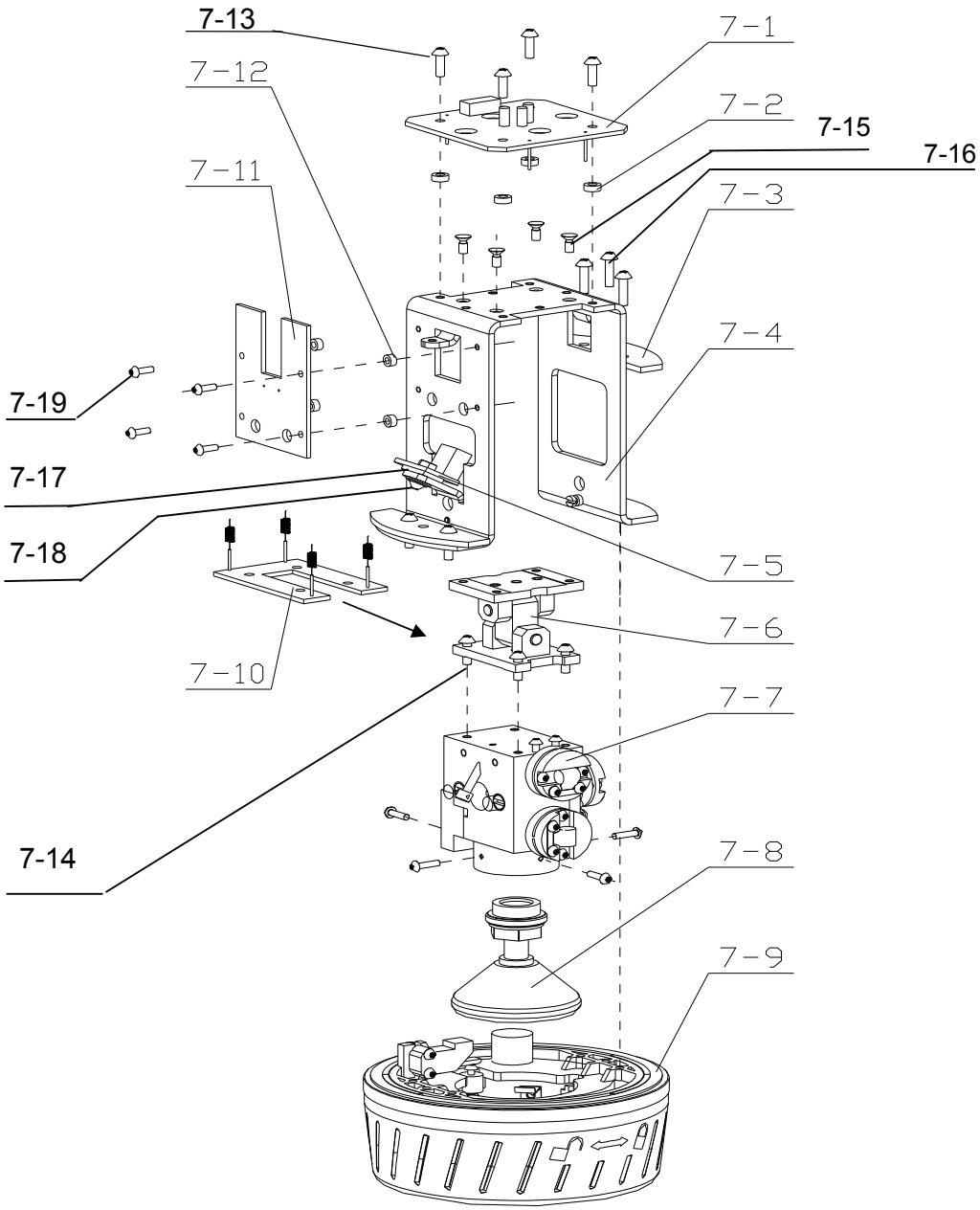


Fig. 2-1-A **See Item Description list on next page**

Item	JLT Part #	Description	Qty
7-1	AP1743	# 1 Main Circuit Board	1
7-2	AP1744	Pad Ring #1	1
7-3	AP1745	Frame Pads	2
7-4	AP1746	Support Frame	1
7-5	AP1747	# 3 Alarm Tube Circuit Board	1
7-6	AP1748	Gimbal Module	1
7-7	AP1749	Core Laser Module	1
7-8	AP1750	Pendulum	1
7-9	AP1751	Base Module	1
7-10	AP1752	# 4 Hairspring Connection Circuit Board	1
7-11	AP1753	# 2 Alarm Circuit Board	1
7-12	AP1754	Pad Ring #2	1
7-13	AP1449	Cross Plate Screws M 2.5 x 6	4
7-14	AP1493	Cross Plate Screws M 2.5 x 8 (w. Lock washers)	4
7-15	AP1446	Cross Countersink Screws M 2.5 x 6	4
7-16	AP1755	Cross Self-Tapping Screws M 3 x 9	5
7-17	AP1756	Pad Square (approx. 8 x 11 mm)	1
7-18	AP1572	Cross Plate Screw M2.5 x 10	1
7-19	AP1464	Cross Plate Screws M 2 x 6	4

General Assembly Instructions

1. The Pendulum (7-8) is factory attached to the Core Laser Module (7-7). Place the Pendulum into the Base Module using a sideways entry motion. Be careful to lift the metal locking tabs within the Base Module to clear the Pendulum as it is inserted (see pictures below).

Screwdriver

Fig. 2-1-B

Fig. 2-1-C

2. Attach the Gimbal Module (7-6) to the top of the Core Laser Module (7-7) using the four Cross Plate Screws (and lock washers) (7-14) which first go through the # 4 Hairspring Connection Circuit Board (7-10).

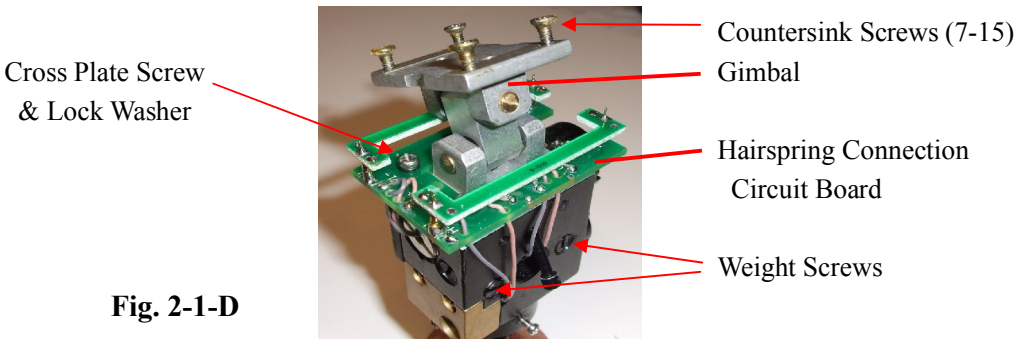


Fig. 2-1-D

NOTE: All wiring from Core Laser Module at this point needs to be connected to the #4 Hairspring Connection Circuit Board. (Also refer to diagram in Section 3.0 Electrical Connections.)

3. Now attach the top of the Gimbal Module (7-6) to the Support Frame (7-4) using the Cross Countersink Screws (7-15).

4. Secure the Support Frame (7-4) to the Base Module (7-9) using the five Cross Plate Screws (7-16). The screws must first go through the Frame Pads (7-3). The Support Frame is positioned so that the front two laser units are on the opposite side of the support piece for the On-Off Switch. See Fig. 2-1-E below. [Three screws are used on one side. Only two screws are used on the side below the # 3 Alarm Tube Circuit Board (7-5).]

5. Then using a needle-nose pliers pull the springs from the Base Module and hook them onto the catches on the inside near bottom of the Support Frame.

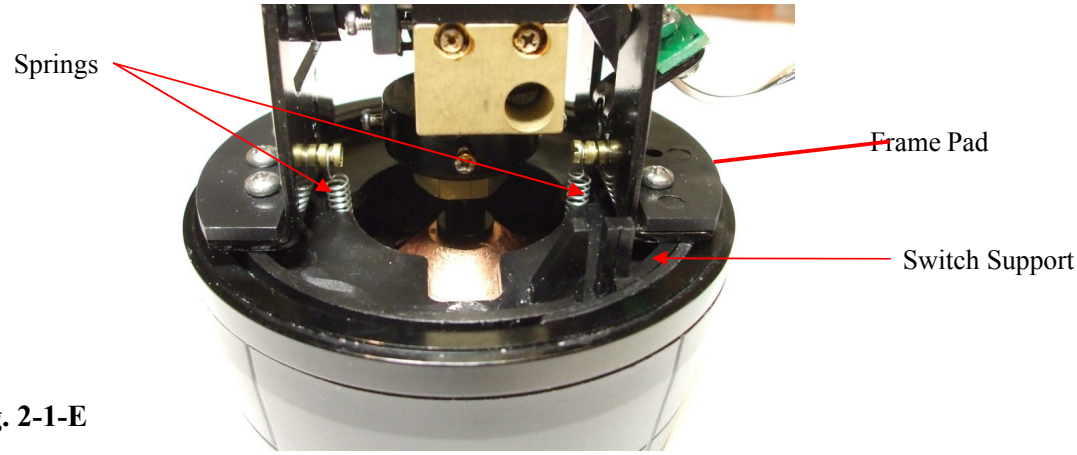


Fig. 2-1-E

6. Now connect the #3 Alarm Tube Circuit Board (7-5) to the matching part of the Support Frame (7-4) using a Cross Plate Screw, hexagon nut, and two washers (7-18). Make sure to place the Pad Square (7-17) between the circuit board and the Support Frame. NOTE: The Tube on the circuit board will need to be adjusted per Section 5.0 Alarm Adjustment. After adjustment calibration is finalized, the circuit board (along with pad, screw and washers) needs to be glued to provide non-slippage. A product such as 'Loc-Tight' or equivalent would be suitable.

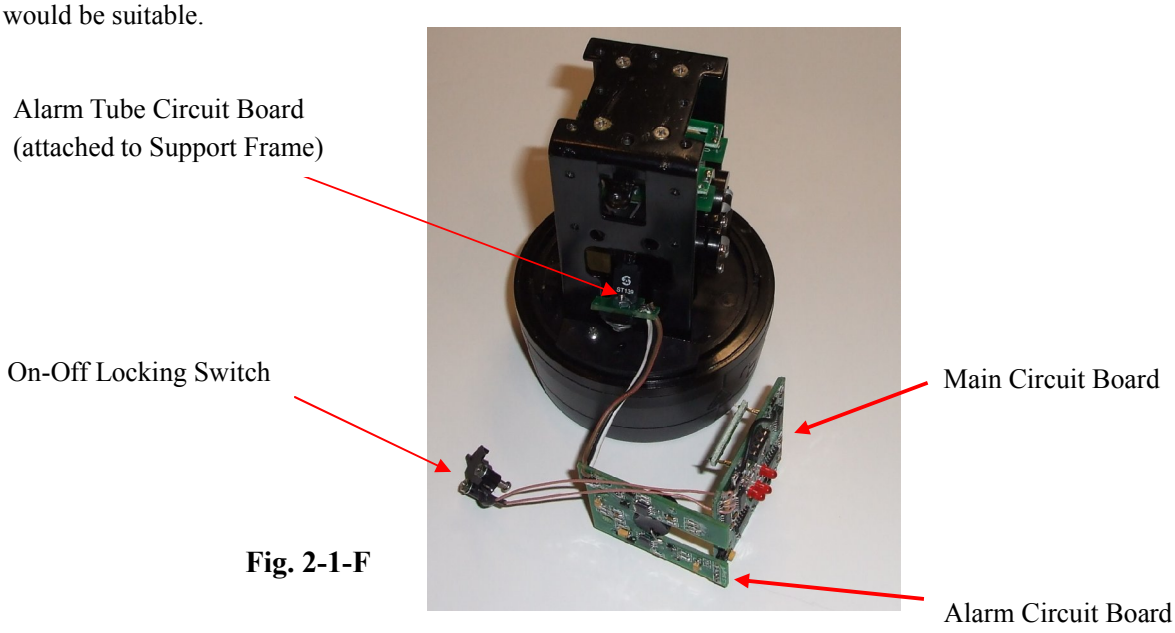


Fig. 2-1-F

NOTE : The wiring for all three circuit boards (#1 Main, #2 Alarm, and #3 Alarm Tube) and the On-Off / Locking Switch (see above figure) needs to be completed. See Section 3.0 Electrical Connections for help.

7. Set the two Pad Rings in place (7-2 and 7-12). Temporarily hang the smaller Pad Ring (7-12) on the Support Frame (7-4) where #2 Alarm Circuit Board (7-11) will go. Place the larger Pad Ring (7-2) on top of the Support Frame for the #1 Main Circuit Board (7-1). Place the two circuit boards on the Support Frame, position the Pad Rings, and then secure them with the Cross Plate Screws**:** (7-13) for #1 Main Circuit Board, and (7-19) for #4 Alarm Circuit Board.

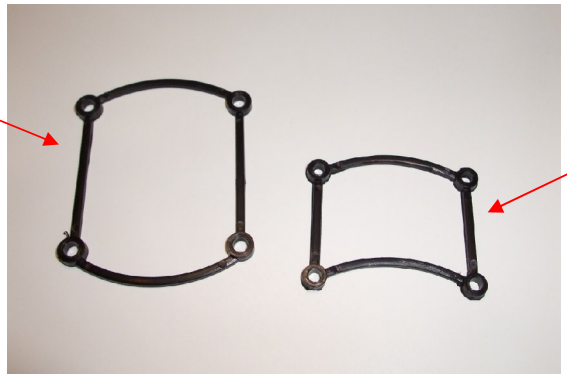


Fig. 2-1-G

8. The On-Off Locking Switch (Switch) can now be put in place. [The Switch includes two Cross Plate Screws (approx. 2 mm diameter and 12 mm in thread-length) and matching hexagon nuts with washers.] Feed the screws through the Switch device and attach the washer and nuts, but only so it catches on the screws. Fit the Switch into the support piece of the Base as shown in figure below. Then tighten the screws.

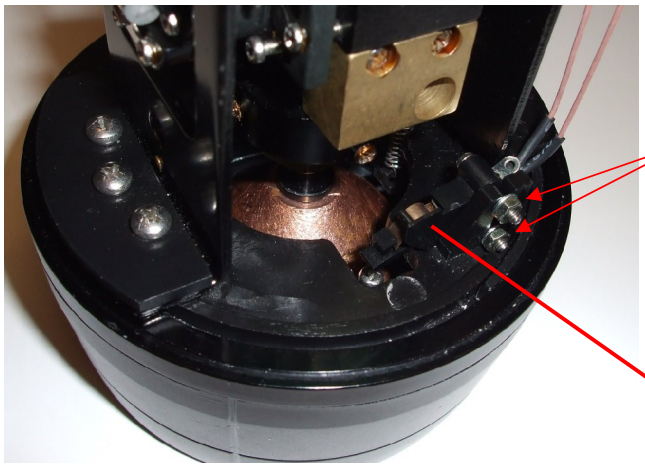


Fig. 2-1-H

9. Finally attach the four Hairspring wires. (See Fig. 2-1-J below.) This is a very precise and delicate procedure and can most likely only be accomplished with the proper equipment. The Hairspring wires nor the spacing board are **not** shown in the Central Unit parts diagram (Fig. 2-1-A), but are shown in the below figure.

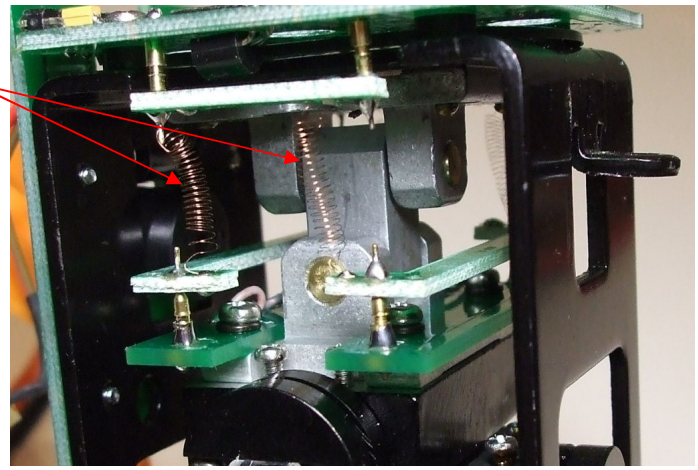


Fig. 2-1-J

Two other wires are attached in same manner on opposite side.

The Central Unit assembly can be disassembled using the reverse order described above.

2.2 Core Module Assembly (AP1749)

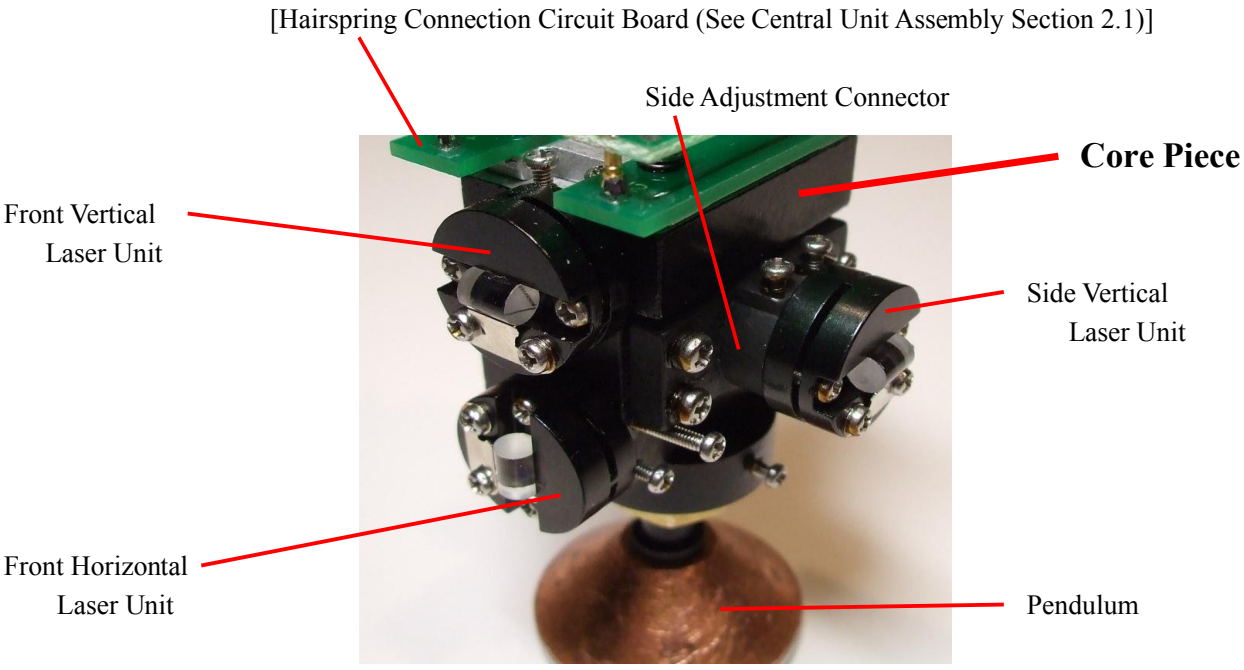


Fig. 2-2-A

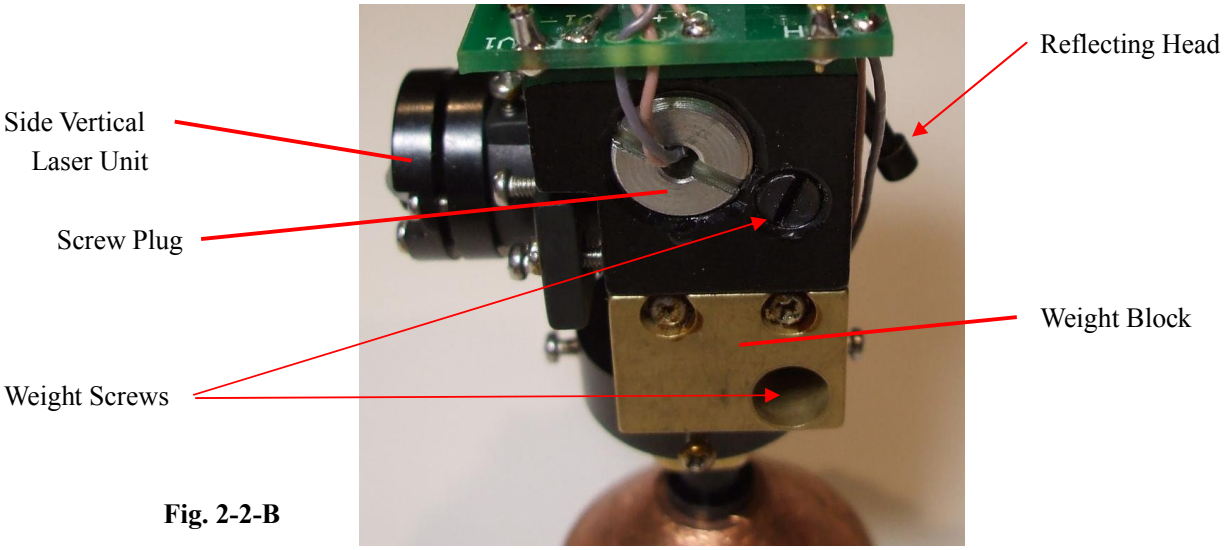


Fig. 2-2-B

General Assembly Instructions

The Pendulum (see Fig. 2-2-A) comes attached from the factory. The Reflecting Head (see Fig. 2-2-B) is also attached from the factory.

The Hairspring Connection Circuit Board is attached later during the Central Unit Assembly. The two wires coming out of the back of each of the three laser units are eventually connected to the Hairspring Connection Circuit Board. See Fig. 2-1-D as an example.

1. Make sure that the Side Adjustment Connector (see Fig. 2-2-A) is attached to the Core Piece.

2. Position and insert all three laser units as shown in the above pictures. Each unit uses two cross plate screws (2 mm in diameter and approximately 6 mm long) to secure it in place. [Each laser unit comes with a laser light with wiring coming out the back end, circular housing structure, and a clear light passage tube held on the front by a metal clip.]

3. Attach the Weight Block using two cross plate screws and the Screw Plug. (See Fig. 2-2-B.)

4. Screw in all four Weight Screws (Fig. 2-2-B and 2-1-D).

The Core Module can be <u>dis</u>assembled using the reverse order described above.

2.3 Base Assembly (AP1751)

Fig. 2-3-A

NOTE: The Base Module pictured above is factory assembled (and glued together). It should not be taken apart. If a new unit is required, please contact the main office at Johnson Levels for further help.

2.4. Bracket Assembly (40-6852)

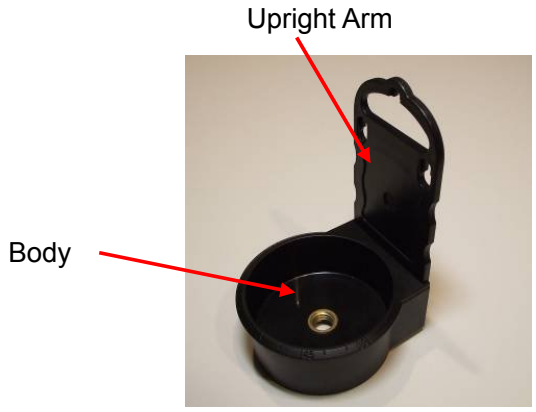


Fig. 2-4-A

Fig. 2-4-B

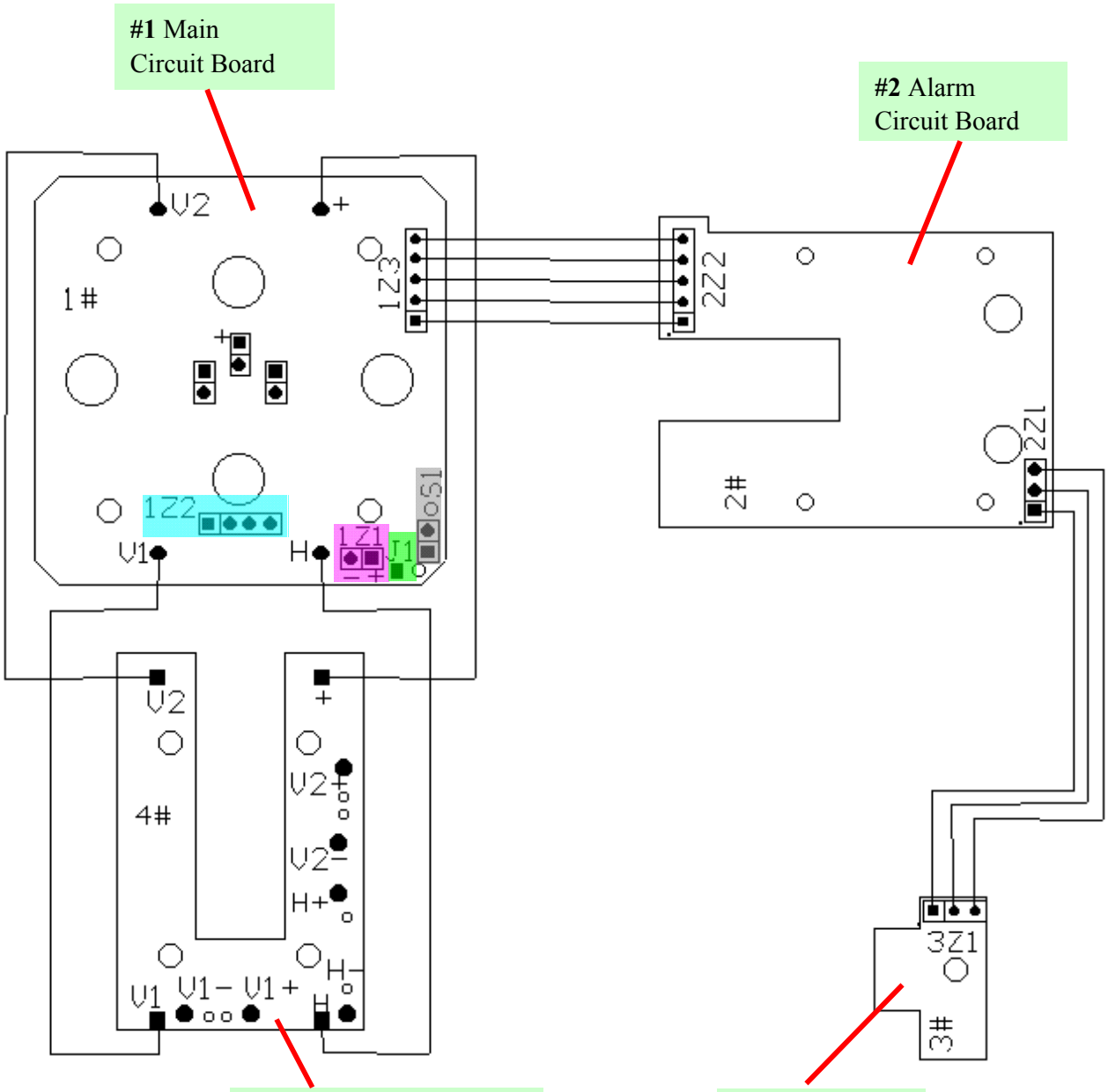
Item	JLT Part #	Description	Qty
1	AP1758	Bracket Body	1
2	AP1759	Upright Arm	1
3	AP1760	Cross Plate Tapping Screws ST 3 × 8	5

General Assembly Instructions

The Upright Arm (2) snaps into place on the back side of the Bracket Body (1).
It is then secured using the 5 Cross Plate Tapping Screws (3) on the backside of Upright Arm.

The Bracket can be disassembled using the reverse order.

3.0 Electrical Connections



Additional connections needed to become fully operational:

J1: Connecting the anode of battery
1Z1: Connecting the DC socket connection
1Z2: Connecting the panel switches
S1: Connecting the locking switch

4.0 Calibration

Calibration is a process used to correct for accuracy and/or functional errors above and beyond those stated in published specifications. While Manual-leveling, Self-leveling, and Automatic-leveling (motor driven) devices have different mechanisms that require calibration, there are similarities with optics that are consistent regardless of the leveling mechanism. **This service manual discusses calibration specific to the 40-6600.**

All accuracy checking and calibration adjustments described below must be made while laser instrument is secured on a leveled platform.

4.1 Checking Accuracy

Note diagram below and follow instructions on next page.

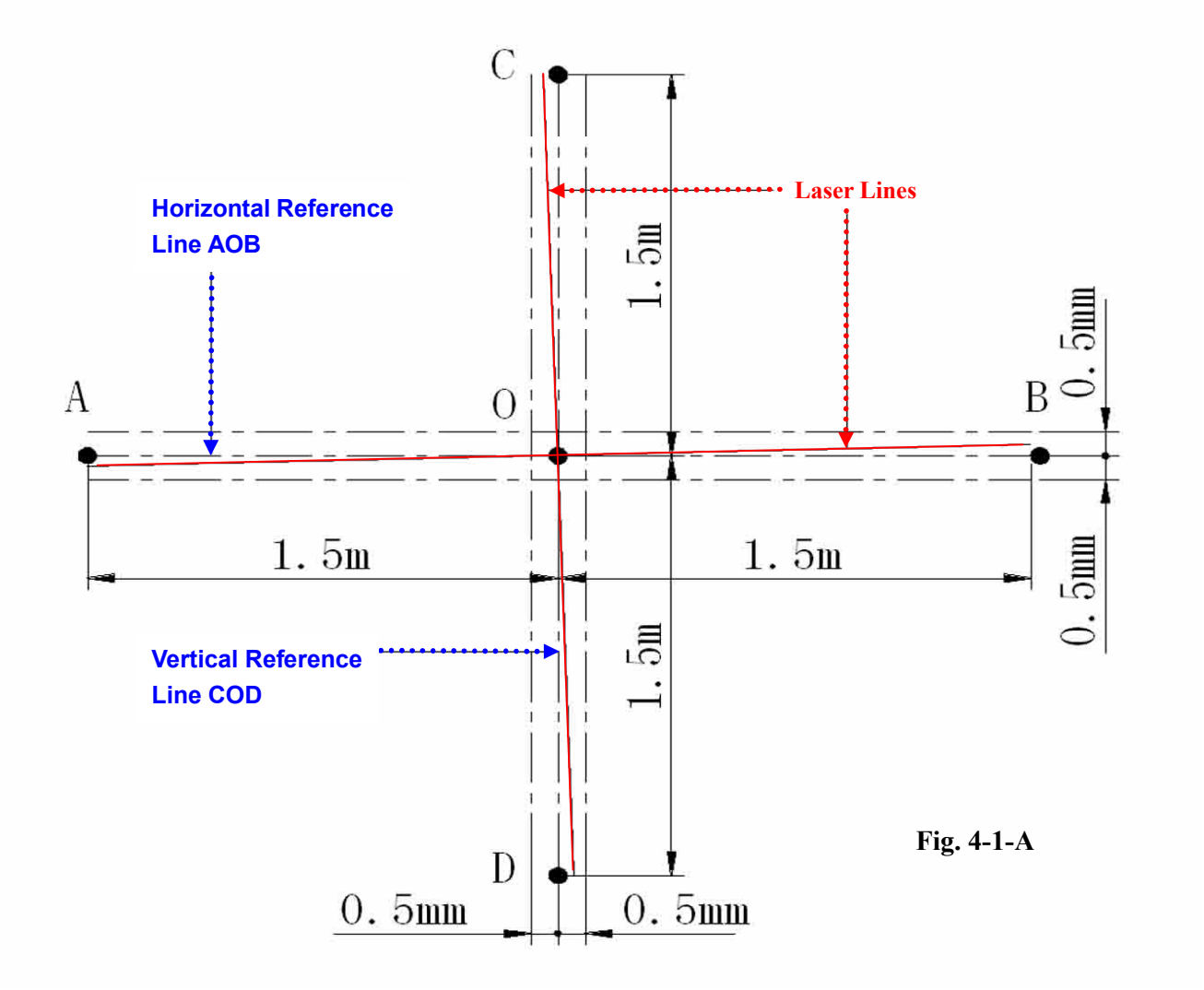


Fig. 4-1-A

A true and correct reference standard must first be established:

1. Use a wall surface 5 meters (16.5 feet) away from the level platform which supports the laser instrument.
2. Establish and mark a level horizontal line and TWO (2) plumb vertical lines as Reference Lines. The horizontal reference line is named AOB. The vertical reference line coming from the front of the instrument is shown in Fig. 4-1-A above and is named COD-1. [**NOTE:** ***Point "O" should share the same height as the laser output source of the instrument***] The vertical line coming from the side is named COD-2.
3. Mark lines on both sides of each reference line which are 1.5 mm from the lines. (see Fig. 4-1-A)
4. Now check the accuracy of the lasers against the reference lines. Use the diagram below Fig. 4-1-B) as guidance in setting up the testing.

1. Side Reference Line
2. Ruler to measure laser output height
3. 40-6600 Instrument
4. Level Platform
5. Front Vertical Reference Line
6. Horizontal Reference Line

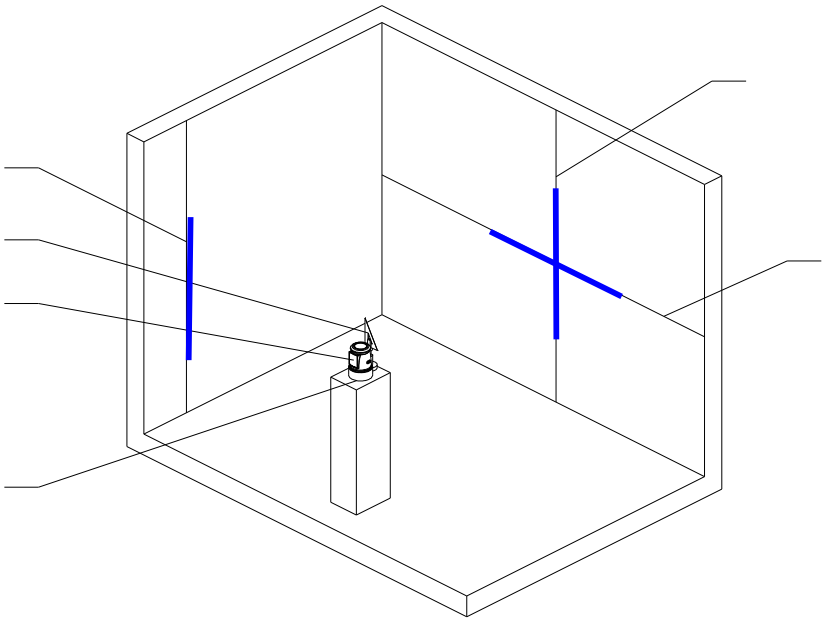


Fig. 4-1-B

If the laser lines are within the range created by the lines drawn 1.5 mm out from the reference lines (per Fig. 4-1-A), the laser instrument is operating within the accuracy specification of the instrument.
[Accuracy specification for the *40-6600* Self-leveling Laser: **±1/8"/35 ft. (± 3mm / 10m)**.]

If accuracy does not fall within specification, continue to review the following sections and make the needed calibration adjustments.

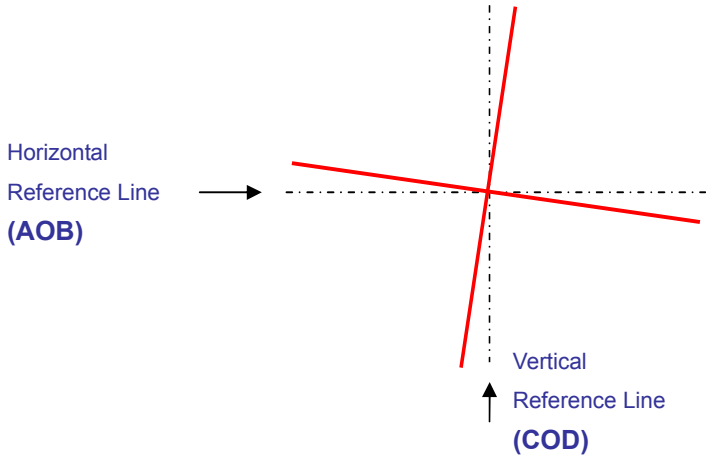
4.2 Minor Calibration Adjustments

If only minor calibration is needed, then two types of error (Oblique and Height) can be calibrated from outside the instrument. The outer housing of instrument will NOT need to be removed.

4.2.1 Minor adjustments for Oblique error.

This minor adjustment will work only if the vertical and horizontal laser lines are perpendicular (90°) to each other. If this is not the case, see later sections regarding major adjustments.

Fig. 4-2-A Oblique Error



Adjustment required: Remove the Plastic Screw Cover (Item 11, Fig. 1-A) and adjust by turning the screw inside using a small flat-head screwdriver. Turn screwdriver either way to bring lines to match reference lines.

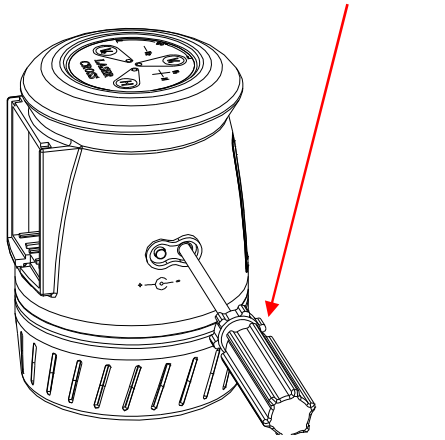


Fig. 4-2-B

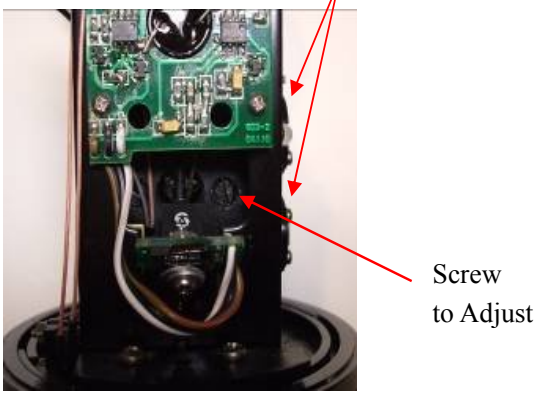
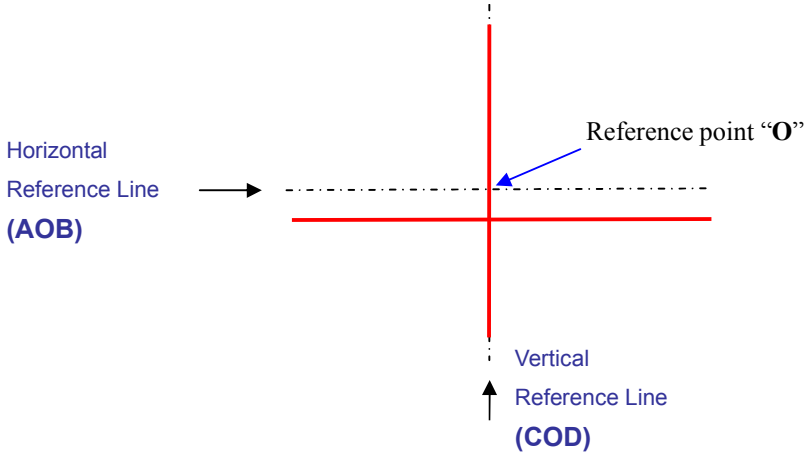


Fig. 4-2-C Inside View

4.2.2 Minor adjustments for Height error (of horizontal laser line).

This minor adjustment will work only if the side vertical laser line remains within the allowed error limits as adjustments are being made. (See Fig. 4-2-D below)

Fig. 4-2-D Height Error



Adjustment required: Remove the Plastic Screw Cover (Item 11, Fig. 1-A) and adjust by turning the screw inside using a small flat-head screwdriver. Horizontal laser line can be adjusted whether is starts above or below the reference line. Turn screwdriver either way to bring laser line to match the horizontal reference line. [NOTE: See note on next page regarding tolerance of side vertical laser.]

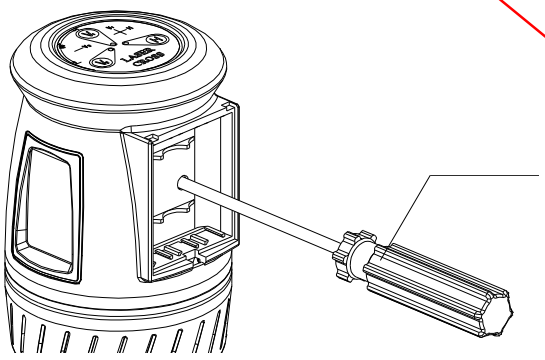


Fig. 4-2-E

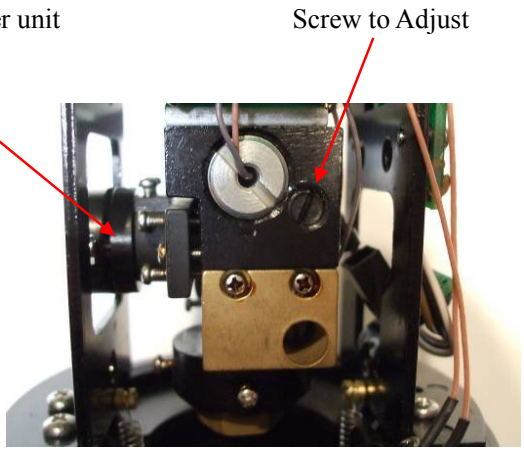


Fig. 4-2-F Inside View

NOTE:
The side vertical laser line must be observed during this process. As the height of the horizontal line is being calibrated and the side vertical line does not remain within the tolerance lines (see Fig. 4-2-G below), the adjustment will require major calibration. (See section 4.3 below.)

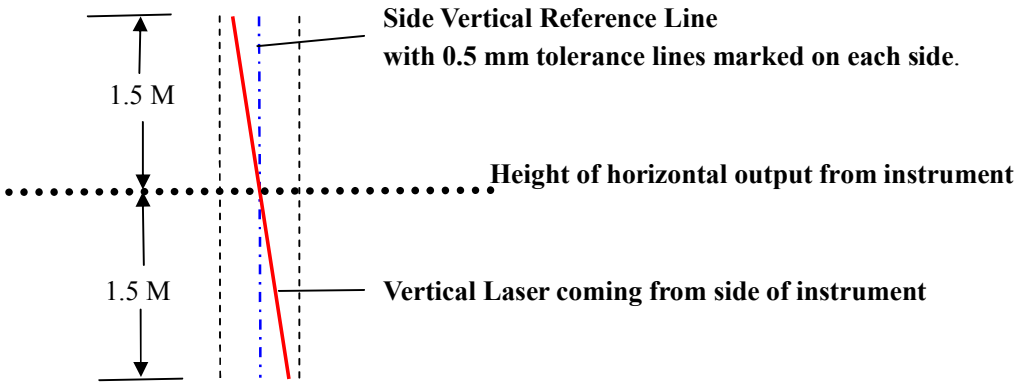


Fig. 4-2-G (Note that laser line is within allowed accuracy limit.)

4.3 Major Calibration Adjustments

There are three types of error described in the following sections:

4.3.1 Linearity (or curvature) error.
4.3.2 Oblique error.
4.3.3 Height error.

When making adjustments with the errors described below, a pair of screws must be turned in a certain manner. One of the screws needs first to be loosened slightly. The other screw then needs to be tightened by an equal amount. Continue loosening one screw and tightening the other (or go in the reverse direction) depending on the adjustment needed. When adjustment is completed, make sure both screws are tight.

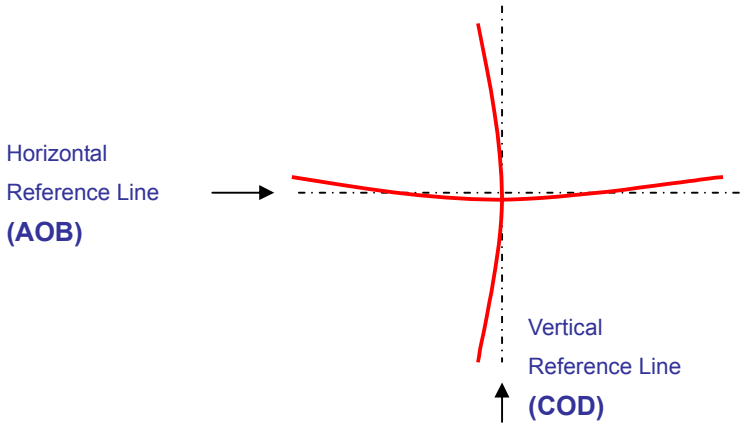
In order to calibrate any laser lines, the instrument must be functional. Even with the housing removed, all wiring must be reconnected so laser units are functioning. The instrument itself must be positioned on a known level platform and all laser lines must be tested against the fixed reference lines on the walls.

NOTE: When all accuracy checks and needed corresponding calibrations have been made, it may be necessary to adjust the position of the alarm (see section 5.0).

4.3.1 Linearity (or curvature) error.

Either the horizontal or vertical line is not straight (i.e. there is curvature).

Fig. 4-3-A Linearity (or curvature)



Adjustment required: Adjust the needed screws in the diagram below depending on which laser lines show curvature. [NOTE: The screws shown for the front vertical laser unit would be the same for the side vertical laser unit.]

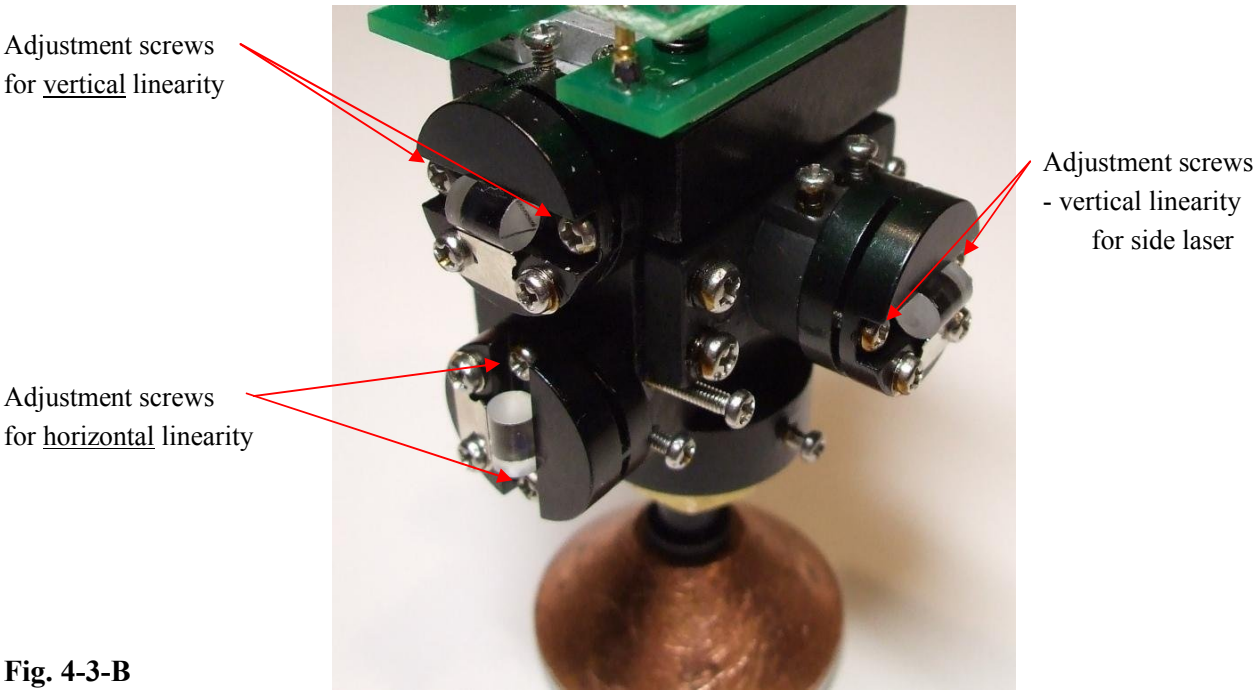
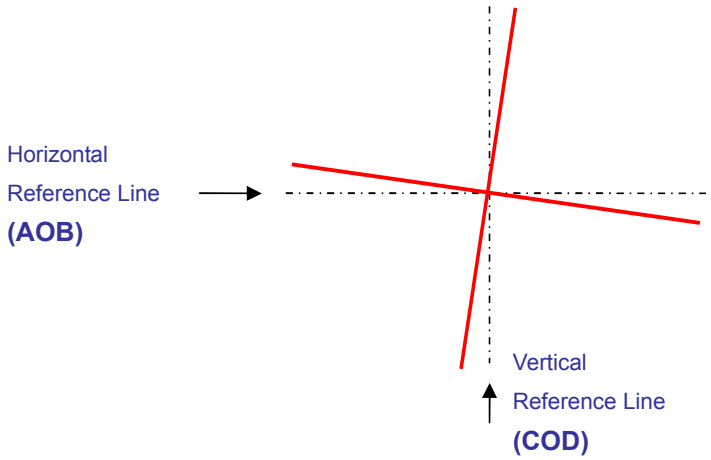


Fig. 4-3-B

4.3.2 Oblique error. Either vertical or horizontal line is not plumb.

Fig. 4-3-C Oblique Error



Adjustment required:

If the lines are not perpendicular to each other or a larger adjustment is needed, the housing needs to be removed. Adjust the appropriate screws indicated in figure below.

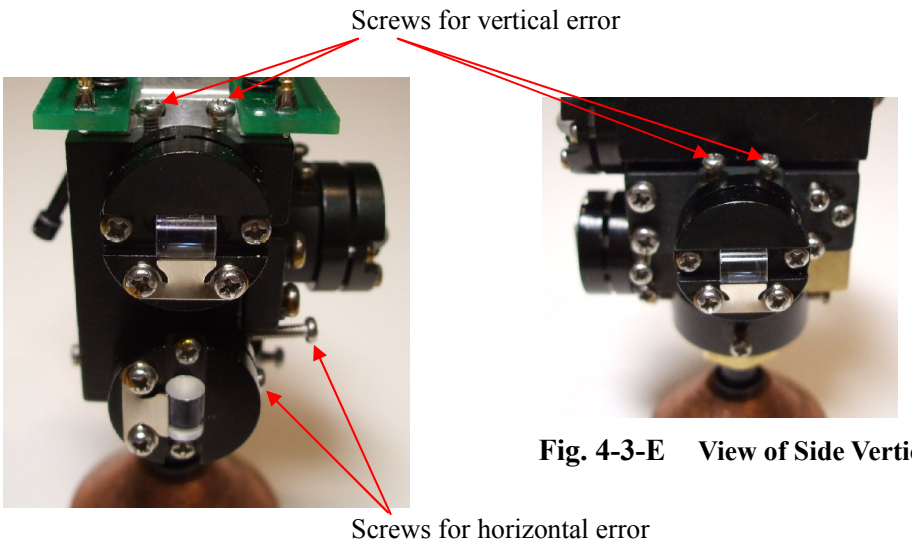


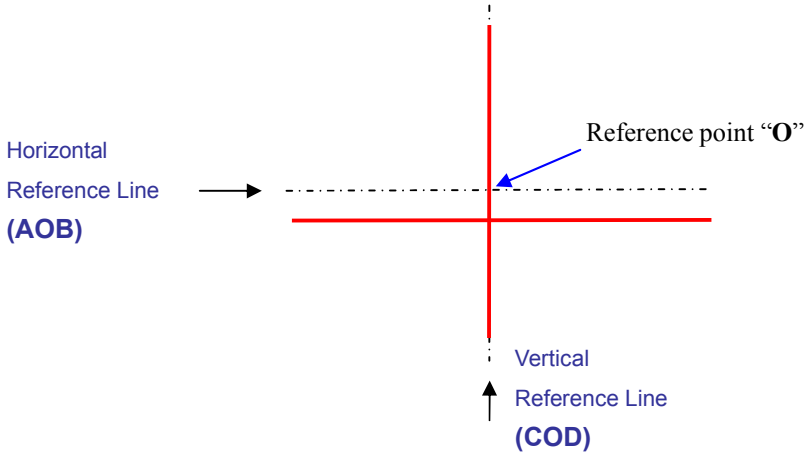
Fig. 4-3-E View of Side Vertical Laser

Fig. 4-3-D View of Front Laser Units.

NOTE: After this calibration step is completed, further (more exact) calibration can be done by following the above instructions in section 4-2-1 (Minor Adjustments for Oblique error).

4.3.3 Height error. Point "O" shares the same height as the laser output source of the instrument, yet the height of the laser height needs to be corrected.

Fig. 4-3-F Height Error



Adjustment required:

Adjust the horizontal laser line until it matches the reference line (AOB). Use the Weight Screw inside the Weight Block. If the adjustment is fairly close and only a little further minor adjustment is required, continue to make adjustments following the above instructions in section 4-2-2 (Minor Adjustments for Height error).

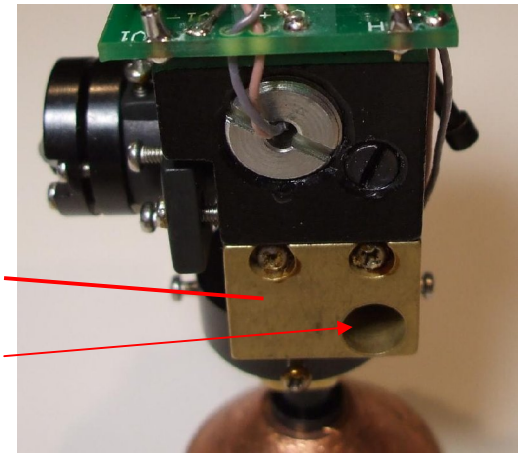


Fig. 4-3-G

NOTE: *The oblique error of the side vertical laser line must be re-calibrated after the height error is calibrated. See Fig. 4-3-E.*

5.0 Alarm Adjustment

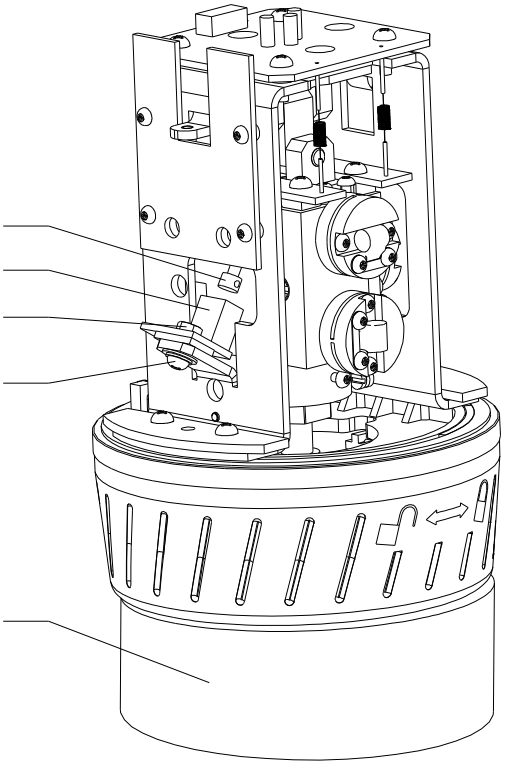
In order to perform this calibration, a 'tilt block' is required. This block has a preset angle that is the allowed accuracy tolerance for the instrument. The tilt block must rest on a level platform.

1. Connect all needed wires to assure instrument is fully operational. See wiring diagram in Section 3. Make sure needed wires are reconnected per the directions at bottom of diagram.

2. Connect the Key Pad Cover and turn on the instrument. (Also make sure unit is unlocked; i.e. core assembly is hanging freely.)

3. As the tilt block (NOT the instrument) is rotated 360 degrees, observe whether the alarm flashes. If needed make adjustments by moving Receiving Tube (2) slightly until alarm stops flashing.

4. Then rotate tilt block again observing the horizontal laser line to make sure it remains within the tolerance lines.



1. Reflecting head

2. Receiving Tube

3. Nut

4. Screw

5. Tilting Block

Fig. 5-A

6.0 Locking Switch Adjustment

As the base of the instrument is turned, the Core Laser Module is locked or unlocked (depending on direction). [The base of the instrument should be turned one way or the other completely until there is a stop.]
The locking and unlocking of the Core Laser Module turns the instrument on or off. The instrument should be turned on in the unlocked position.

If adjustment is needed, remove the On-Off Locking Switch in order to access the Adjustment Screw (see Fig. 6 – A below). Turn the screw to the desired working height, restore the On-Off Locking Switch, and test the function.

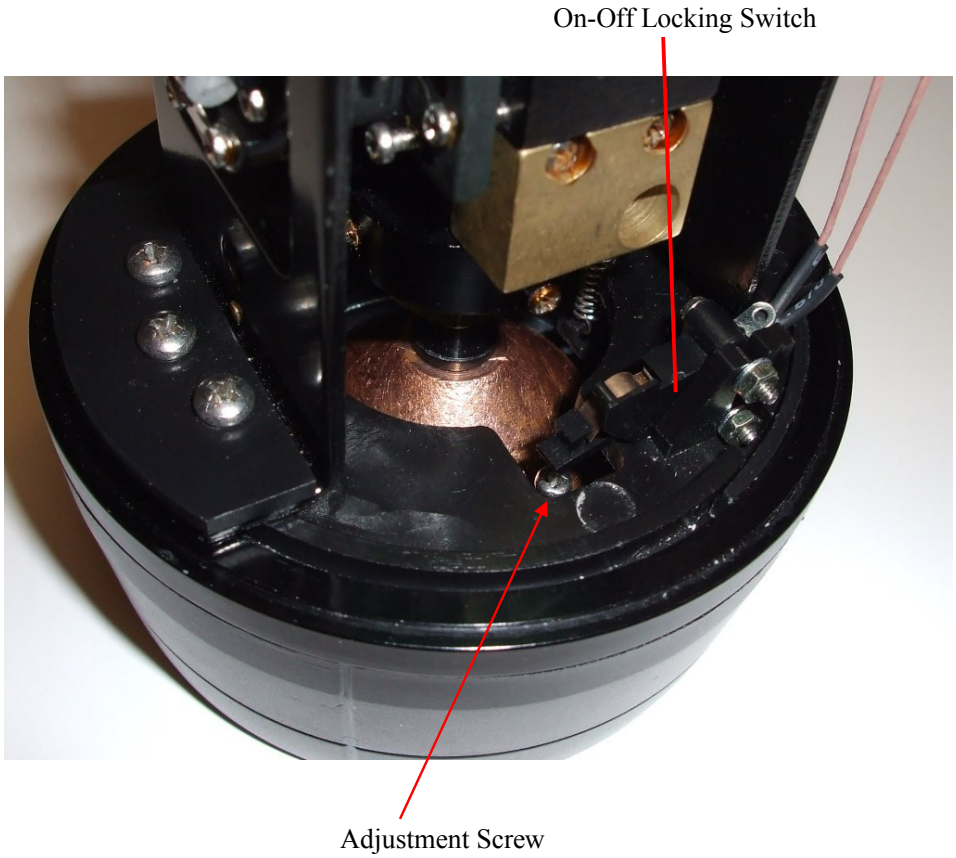


Fig. 6-A

7.0 Troubleshooting Guide (see Section 3 for visual display of circuit boards)

No.	Symptom	Cause	Corrective Action
1	Failure to start using batteries (instrument does not turn on).	Low batteries.	Recharge or replace batteries.
		On-Off Switch does not work.	Adjust On-Off Switch Assembly – (see Section 6.0) or replace
		Wires are disconnected or broken.	Repair connecting wires.
		#1 Main Control circuit board does not work.	Replace circuit board.
2	Failure to start using DC connection (instrument does not turn on).	Wires are disconnected or broken.	Repair connecting wires.
		DC Socket Connection does not work.	Replace Socket Connection
3	Power is on but indicator light on Keypad Cover is not working	Wires is wire bundle from Keypad Cover are broken	Replace Keypad Cover unit (including wire bundle)
		LED lights of circuit board damaged	Replace LED or replace circuit board
		#1 Main Contol circuit board does not work.	Replace circuit board.
4	No laser	Hairspring wire is broken	Replace hairspring wires
		Core connection wire to laser is cut	Replace the connection wire
		#1 Main Contol circuit board does not work	Replace circuit board
		Laser light source is broken	Replace the laser

No.	Symptom	Cause	Corrective Action
5	No buzzer (when instrument is tilted beyond tolerance)	Buzzer is broken	Replace buzzer
		#2 Alarm Circuit Board does not work	Replace circuit board.
		Connecting wires between circuit boards #2 and #3 are broken	Repair connecting wires.
		#1 Main Contol circuit board does not work.	Replace circuit board.