ADAM®

Adam Equipment

PW ANALYTICAL BALANCES

SERVICE MANUAL

ADAM EQUIPMENT CO. LTD.
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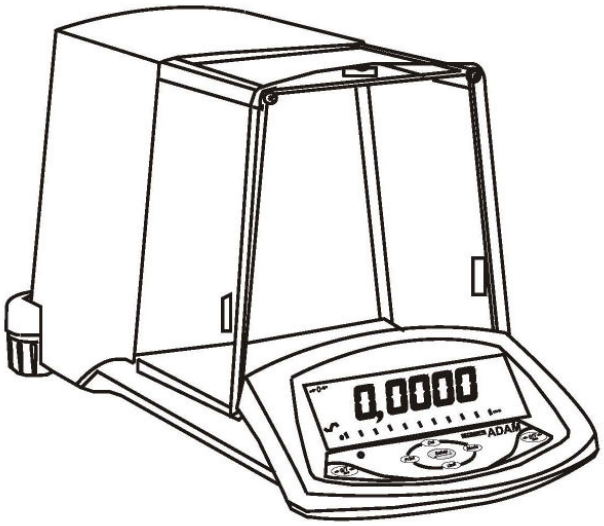
1.0 INTRODUCTION

The PW series of analytical balances are very precise devices used to measure mass in laboratory conditions.

To achieve precise measurements you should make sure the balances are in suitable environments and the conditions are as described in the Operators Manuals.

There are no user serviceable parts in the balance. All service and repairs should be done only by Service Personnel trained and approved by Adam Equipment.



FEATURES:

- Large easy to read LCD display with backlight
- Standard applications include weighing, check weighing, percentage weighing, parts counting, animal / dynamic weighing, net/total and density determination
- Internal Calibration using motorised internal calibration weight or external calibration if set by the user
- Bi-directional RS-232 interface
  Can be configured to print a GLP Compliant report after each calibration to include the time, date, balance number and a verification of the calibration
- Automatic temperature compensation
- Display in 4 languages- English, French, German and Spanish
- Multiple weighing units
- Capacity tracker
- Date and time
- Easy to use, sealed keypad
- Below balance weighing facility
- Password protection
- Security locking point
- Robust metal casing

2.0 DESCRIPTION OF CONSTRUCTION

2.1 PRINCIPLE OF OPERATION

The PW balances use an electro-magnetic force restoration (or force motor) type mechanics that converts a force generated due to an unknown mass placed on the weighing pan into a voltage which can be measured by a high-precision voltmeter.

The force restoration system uses a magnet section along with a coil to convert a current through the coil into a force. This force will balance the force caused due to the unknown mass on the balance pan. This is accomplished in a system using a method of applying the force from the unknown mass on one end of a beam and balancing it with the force generated due to the current in the coil on the opposite end. The balance position is detected by an optical detector connected to the beam.

When the mass is placed on the balance pan, the beam will be moved out of its original null position. This movement is detected by the optical sensor. An amplifier connected to the sensor will change the current through the coil, to force the beam to go back to its null position. The amount of change in the current through the coil is proportional to the unknown mass on the pan. The current passes through a precision resistor, creating a voltage that is measured by the A/D converter.

Mechanical parts surrounding the balance beam make the force generated due to the unknown mass go in a straight line through the balance beam, thus eliminating any differences, depending upon the location of the mass on the balance weighing pan.

The electronics measure the voltage using precision amplifiers, A/D converter with high resolution and a microprocessor working with memory, displays and power supply.

The microprocessor uses information from the A/D converter, a separate temperature sensor & A/D converter for measuring the magnet temperature and the internal program to determine the weight of the unknown mass and all other information to be displayed.

The system uses special programs to correct any temperature variations in the mechanism. The balance is tested and calibrated at extreme temperatures and the details are stored in the memory. These details are used to compensate for temperature changes inside the balance due to self heating and ambient conditions.

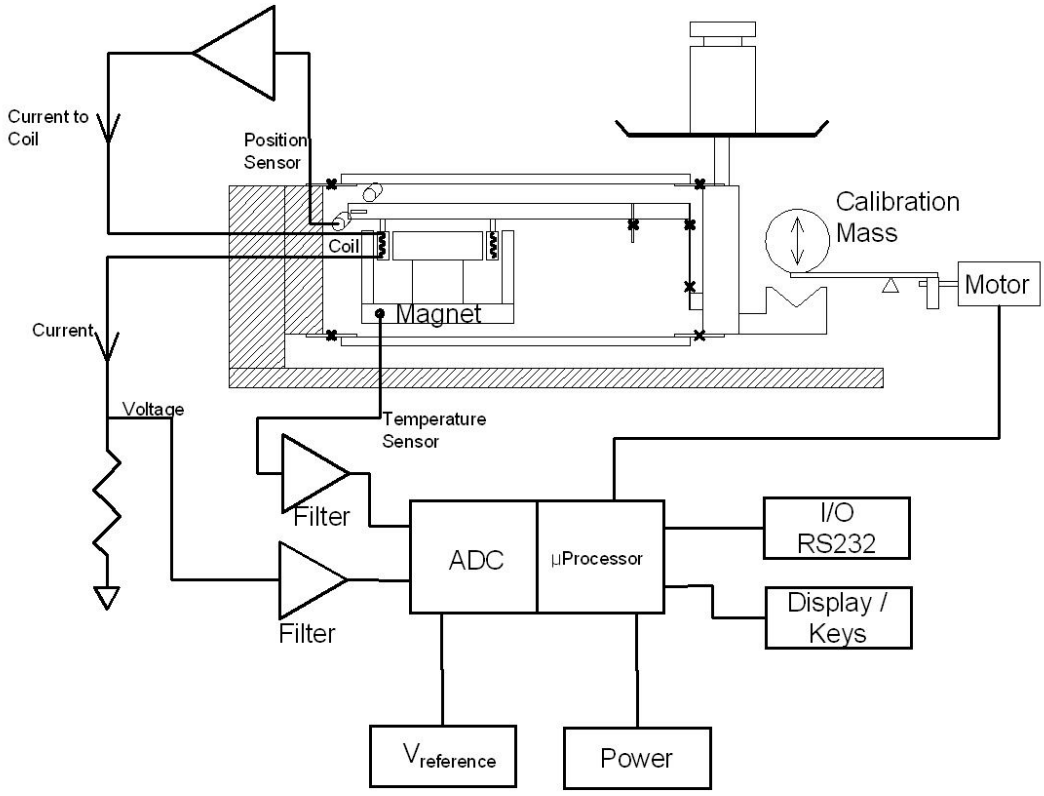
The internal calibration models include an internal calibration weight controlled by the microprocessor. This weight is not accessible by the user. Calibration can be performed when the temperature sensor detects a change in the pre-set temperature (or the pre-set time) either automatically or by manually entering in to the Calibration Menu.

ELECTRONICS MODULES

Within the balance there are electronic modules for:

- Main PCB assembly including analogue circuit
- Interface PCB assembly includes power supplies & RS-232 circuits
- Display PCB
- Calibration motor system

PRINCIPLES OF BALANCE MECHANISM:



Details of the operation of the balance are found in the PW User Manual.

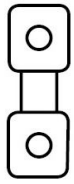
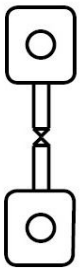
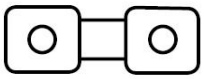
2.2 MODEL DIFFERENCES

The PW Series of balances have capacities from 120g to 250g. The basic electronics and software are identical, the only differences between the different models are:

- Value of current sense resistors are selected to optimise the voltage to the A/D converter.

- All other changes are set by parameters stored in memory and set at the factory by the manufacturer and can not be modified outside the factory.

TABLE 1: LIST OF FLEXURES (Common for all models)

Flexures		
Pivots x 2	**Puller x 1**	**Horizontal x 8**
		

NOTE: To order for spare flexures, refer to Table: 14 at the end of this manual.

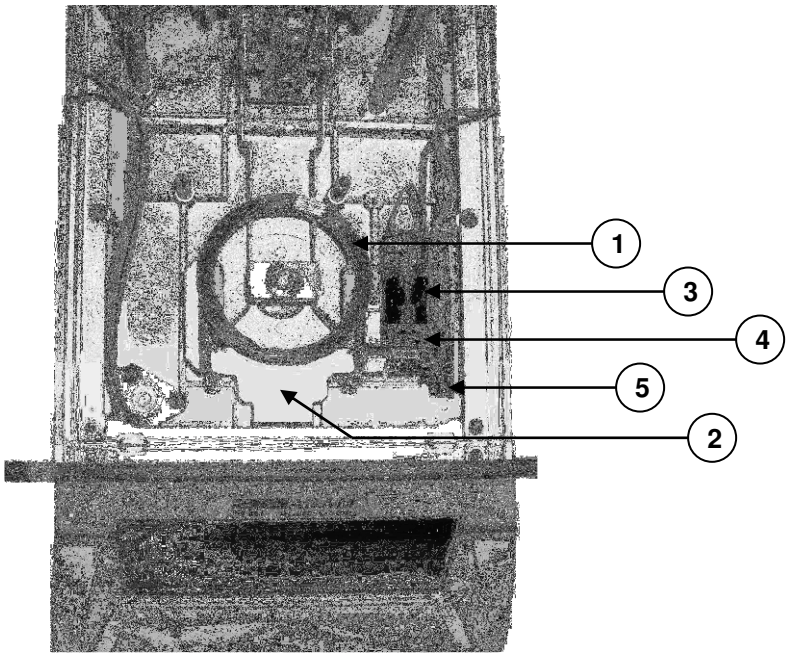
2.3 INTERNAL CALIBRATION MECHANISM

The mechanism for controlling the internal calibration mass consists of:

-Internal calibration mass (1)

-Mechanism for a lever to move the calibration masses (2)

-Electrical motor (3) with cam (4) operated from the optical switch (5)



Calibration process can be started by user (using calibration menu, internal calibration selection) or starts automatically when the time or temperature of the system changes by a pre-set value with respect to the time or temperature of last calibration. Automatic function of calibration can be disabled by the user in the calibration sub-menu.

2.4 EQUIPMENT AND TOOLS REQUIRED

The following tools and equipment may be helpful when working on the balance.

GENERAL TOOLS AND EQUIPMENT

Screwdriver Philips
Screwdriver Medium Flat
Allen Hex Keys-
- 3 mm
- 4 mm

Needle Nose Pliers
Soldering iron
Precise square
Slide calliper
magnifier X10
Voltmeter
Oscilloscope

SPECIAL TOOLS AND EQUIPMENT

Weighing mass OIML Class E2	Calibration and test masses should be used that will cover the weighing range of the balance to be tested. The masses should be of high accuracy or the actual mass should be known if less accurate masses are used.
Suitable place for temperature tests	A Constant Temperature Chamber or alternatively, a room capable of holding a steady temperature of ±1℃ and a differential temperatures of minimum 10ºC and have a suitable table or platform for the balances to be stable for performing the temperature compensation. This is required if the memory is cleared, wrong temperature compensation values are used or if the magnet has been modified. Repair of flexures normally do not require temperature compensation. See Table 9 details.

3.0 COMMON FAULTS

A general troubleshooting section follows in section 4.0.

In order to know if a balance is working properly, it will be necessary to carry out some performance tests on the balance. See section 5.0 for the details.

A brief description of the mechanical adjustments is covered in section 6.0.

In most cases, the first thing to be considered as a part of trouble-shooting is the software parameters as this is the main method used to set calibration and linearity, set parameters, view temperatures sensor values and perform the most basic of calibration functions. See section 7.0 to enter the Dealer Parameter Settings.

Faults associated with these balances leading to inaccurate weighing are generally of the following types.

a. Calibration and Linearity faults (See section 5.0 & 7.0)
b. Mechanical faults (See section 6.0)
c. Electronics faults (See the note below)

NOTE: The Electronics modules within the balance are not serviceable. In case of any electronics component failure, contact your supplier.

4.0 TROUBLE-SHOOTING GUIDES

Service of a balance will generally be necessary when the balance does not perform as expected. The balances are not user-serviceable. Problems usually fall into one of the following categories:

User Problems:

The user is asking the balance for something it cannot do or is confused by the modes and functions of a balance. It is also possible the user has set a parameter that has affected the balance operation. Resetting the parameter to a normal value will restore operation.

Mechanical Problems

The balances consist of complicated and fragile mechanical devices. They can be damaged by placing a weight on it which is too high for the balance or by dropping the balance or occasionally damage caused by careless shipping. The most fragile parts are the flexures. Dust, dirt, spills and other foreign objects in the balance can also cause problems. Shifting of calibration mass during shipping may cause weighing problems.

Electronic Problems:

These are the rarest of the problems affecting balances. If an electronic problem is suspected make sure the mechanical problems that can cause similar symptoms have been eliminated before attempting electronic repairs. With the exception of cables most electronic repairs are solved by PCB replacement. The Electronics modules within the balance are not serviceable. In case of any electronics component failure, contact your supplier.

The following table provides a guideline on the common problems. Note that many problems may have multiple solutions and there may be problems found that are not listed in the table. For more Information, contact your supplier.

TABLE 2: TROUBLE-SHOOTING

BALANCE DOES NOT FUNCTION		
Problems	**Possible causes**	**Suggestions**
The balance is dead when power is applied	Power supply failure Cable / Connector failure	Check adapter is working Check adapter is correct for the balance Normal adapter is 15VDC, 800mA. *Power supply circuit board failure *Short circuit on any circuit board
Display does not turn on but the calibration motor moves when power is applied	Power is getting to balance, display is not working	*Display cables may be faulty *Display module failure
The display stays on the initial test screen when power is applied. Calibration weight motor is on.	Unstable balance Balance not working correct Power supply	*Check if balance is stable, position of calibration mass and view A/D values Check whether the ring around the pan is touching the pan Check power supplies

BALANCE WORKS BUT IS NOT STABLE		
Balance is unstable by a few divisions	Noise or vibration from environment Friction in mechanics	Check whether the temperature is stable. Check the balance is positioned correctly to avoid vibration, wind or air movement, it is on a solid table, It is not near sources of heat or cool air, Check balance with weights if problem occurs when sample is used. Static electricity on the samples can cause drifting and instability. Check the area around the weighing pan for hair, dust, obstructions under the pan, *A complete inspection of the mechanics to look for sources of friction may be needed.
Balance is very unstable and does not weigh correctly	Mechanical problems Balance programming Electronic problems	Check whether the temperature is changing or there is a draught. *A complete inspection of the mechanics to look for sources of friction. *Verify the A/D is also unstable. If the A/D is OK then suspect the programming of the balance. Reset parameters, check temperature compensation, and redo the calibration. Some electronic problems can also cause this. But all mechanical problems must be resolved first.
BALANCE IS NOT ACCURATE		
You must have accurate and trusted weights to test a balance. If you suspect that the balance is not accurate then you must know your weights are accurate. A balance calibrated using a bag of flour is not accurate even if it works OK otherwise.		
Balance is not accurate	Repeatability Eccentric loading Linearity	Verify the balance shows the same value when the same mass is placed on the centre of the pan for a few tests. Verify the balance shows the same reading (within a tolerance depending upon the model) when a mass is placed at positions around the pan. Verify the balance is acceptable throughout the weighing range. The balance must give acceptable readings from low weights up to the capacity.
Poor Repeatability	Usually a mechanical problem.	Inspect the area around the pan for hair, dust or other obstructions, *Inspection of the mechanics may be needed for any possible problems.
Poor Eccentric loading	A mechanical problem	Inspect the area around the pan for hair, dust or other obstructions,

		*Inspection of the mechanics may be needed for any possible problems. *Readjusting of the Eccentric loading is recommended.
Poor Linearity	Usually a mechanical problem Electronic Problems	Re-check repeatability *Inspection of the flexures for damage or loose hardware may be required *Use the Linearity Function in the service menu to reset linearity *Problem in analogue circuit board or power supplies can cause poor linearity. Make sure all mechanical problems have been eliminated first
OTHER PROBLEMS		
Cannot calibrate	Zero shifted more than allowed Calibration timeout	*Check all flexures for damage *Reset factory calibration *Verify linearity and repeatability *The balance may be unstable. Verify stability as above. Try using a more aggressive filter
Calibration weight motor does not stop		*Check cables to the motor, try plugging the balance into the power again *Look for friction in the calibration weight movement *Check the opto-coupler that controls the motor position.
RS-232 not working	Doesn't print	Check parameters match the device connected Verify cable is correct *RS-232 circuits damaged
Display dark, keys beep	Display contrast poor Cable damaged LCDs on the display are faulty or damaged	*Check the cables to the display *Replace display-it may be damaged

***To be carried out by authorised technicians only.**

5.0 FUNCTIONAL TESTS AND ADJUSTMENTS

In order to know if a balance is working properly, it will be necessary to carry out the following tests on the balance. These tests should be performed initially, when it is not clear whether there is any problem with the balance. These tests should also be performed anytime a balance has been serviced or any changes are made.

Before performing the tests the balance should be allowed to warm-up in a stable environment for a minimum of 4 hours. During this time the following should be checked:

- Install the pan supports, the pan and the breeze-shield, if applicable and make sure they do not interfere with correct weighing.
- Level the balance.
- Verify all the keys work properly and the functions set are suitable for the balance to be tested. For example, set to grams weighing, all digits operating normally, the filters set to a normal setting, etc.
- Verify the RS-232 is operating correctly using a communications program.
- Verify the display is correct, the minus sign is shown, decimal points are in the correct position, the weighing unit is correct and the stability symbol is correct.
- Verify the calibration is functioning correctly.

For better accuracy, we suggest to use only the Class E2 weights during the linearity adjustment. The maximum permissible errors of E2 weights are given in the Table below.

TABLE 3: OIML R-111 TEST WEIGHT TOLERANCES

Class E2 Weight Value	Maximum Permissible Errors
200 g	± 0.30 mg
100 g	± 0.15 mg
50 g	± 0.10 mg
20g	± 0.080 mg
10g	± 0.060 mg

5.1 REPEATABILITY TESTING AT INTERNAL CALIBRATION MASS

Repeatability is checked at the approximate value of the internal calibration mass.

- Perform automatic calibration.
- Place the weighing mass on the pan as shown in the table below.
- Repeat this procedure 5 times.
- Compare the reading results with the actual mass.
- Compare results, the readings with the mass on the pan should agree within the acceptable error as shown.

TABLE 4: REPEATABILITY ERRORS AT INT. CAL. MASS

Balance model	*Mass*	*Acceptable error*
PW 124	100 g	± 0,4 mg
PW 184	100 g	± 0,4 mg
PW 214	100 g	± 0,4 mg
PW 254	100 g	± 0,5 mg

5.2 REPEATABILITY TESTING AT FULL CAPACITY

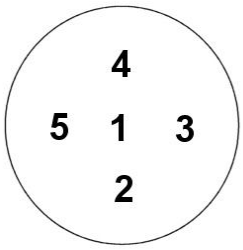
- Place the mass on the pan as shown in the table below.
- After stabilization record the reading.
- Take off the mass and after stabilization record the reading with no mass on the pan.
- Repeat 5 times.
- Compare results, the readings with the mass on the pan should agree within the acceptable error as shown.

TABLE 5: REPEATABILITY ERRORS AT FULL CAPACITY

Balance model	*Mass*	*Acceptable error (S.D.)*
PW 124	120 g	± 0,4 mg
PW 184	180 g	± 0,4 mg
PW 214	100 g	± 0,5 mg
PW 254	250 g	± 0,5 mg

REPEATABILITY ADJUSTMENT:
If the errors are still not acceptable, refer to section 7.0 for adjustment.

5.3 ECCENTRIC LOADING TESTING



- Check the balance readings in the positions marked.
- Place the mass shown in the table below at the center of the pan.
- After stabilization, record the value.
- Move the mass to the next point, half way between center and edge of the pan.
- Record the results for each point.
- The readings on the edges should match with the reading at the center point within the tolerances shown.

TABLE 6: ECCENTRIC LOADING ERRORS

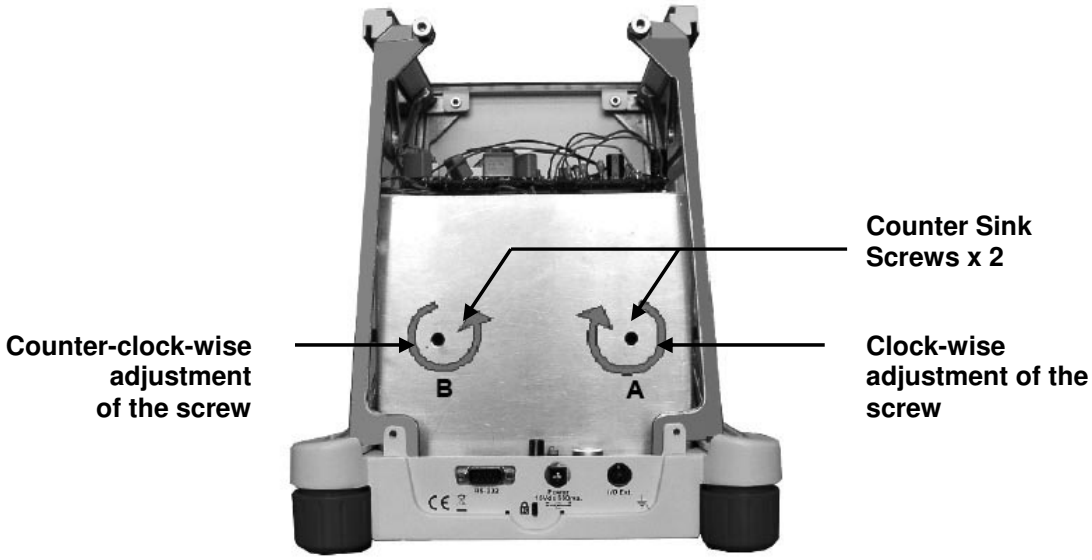
Balance model	*Mass*	*Acceptable error*
PW 124	50 g	± 0,3 mg
PW 184	50 g	± 0,3 mg
PW 214	100 g	± 0,3 mg
PW 254	100 g	± 0,3 mg

If the differences in the weighing values at the 5 locations are bigger than ±5 divisions, you need to adjust the balance for Eccentric loading as given below.

ECCENTRIC LOADING ADJUSTMENT:

These adjustments will result in moving the mounting points for the flexures so that the mechanical assembly is set right to produce the same weighing results regardless of the position of the mass on the weighing platform.

The adjustment is done using the Star Screw Driver on the two Counter Sink Screws on the mechanics as shown below. The amount of adjustment and the direction by which the screws are turned will depend on the amount of error observed as the mass is moved around the platform.



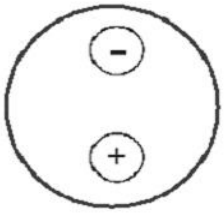
- Place the balance on a suitable and stable surface.
- Mount the pan on the pan supports.
- Remove the top cover of the balance. Do not unplug the display cable.
- Locate the Counter Sink Screws at the rear as shown above to adjust the eccentric loading. Use the Philips Star Screw Driver to adjust.
- Always adjust for the largest differences first, i.e., either the difference in value when the mass is placed at back to front or that of side to side- whichever difference is the largest should be adjusted first.
- Re-check the readings after each adjustment. For small corrections the screws will be turned by very small angles.
- The value of the mass used for adjustment should be of 1/3 to ½ of the balance capacity.
- When placing the mass on the pan, locate it at ½ the distance from the centre to the edge.

Refer to the following instructions for details-

A. When the difference is greater in case of back to front of the pan than that of side to side, do the front to back adjustment first -

Direction for adjustment

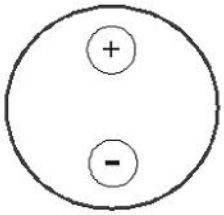
If the reading is more at the front, turn both the screws clockwise as shown above by the same angle.



PW Weighing Pan

Direction for adjustment

If the reading is more at the back, turn both the screws anti-clockwise as shown above by the same angle.

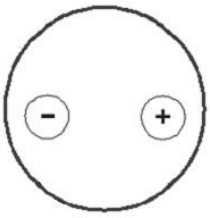


PW Weighing Pan

B. When the difference is greater in case of the mass placed from side to side than that of the mass placed from back to front, do the side to side adjustment first -

Direction for adjustment

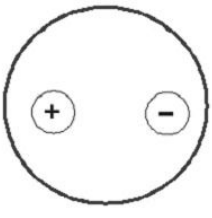
If the reading is more at the right side of the pan, turn the screw A anti-clockwise and the screw B clockwise by the same angle.



PW Weighing Pan

Direction for adjustment

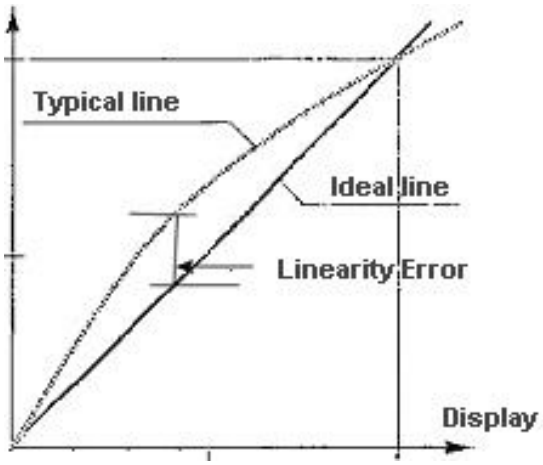
If the reading is more on the left side of the pan, turn the screw A clock-wise and the screw B anti-clockwise by the same angle.



PW Weighing Pan

After setting the adjustment, you should place the balance to one side for some time and weigh on it occasionally. This helps to reduce the internal tensions. Re-test again and continue adjusting, if necessary.

5.4 LINEARITY TESTING



- Place the weights on the balance covering the balance range- from minimum to maximum, as suggested in the table below.
- Check deviations of the displayed values from the actual values on the weights on pan.
- If necessary re-calibrate.
- Ensure the environment is stable, the warm up time is as specified and preferably the Class E2 weights are used during Linearity Testing.
- Check accuracy of linearity.

Examples of the weights that can be used for testing are given in the table below.

TABLE 7: SUGGESTED MASS FOR THE LINEARITY TESTING

PW 124	10g	20g	30g	40g	50g	60g	70g	80g	100g	120g
PW 184	10g	20g	40g	60g	80g	100g	120g	140g	160g	180g
PW 214	10g	20g	40g	60g	80g	100g	120g	150g	200g	210g
PW 254	10g	20g	40g	50g	100g	120g	150g	200g	220g	250g

It is necessary to know the values of the masses used to an accuracy that is better than the balance weighing results. **NOTE:** The accumulation of errors when using multiple masses can contribute to a larger apparent error. Refer to Table 3. If you are using 200g & 50g masses to make 250g, there may be an accumulated error of (0.30mg + 0.10mg) 0.40 mg.

The error at each value is determined by computing:

Error = Displayed mass – actual mass

TABLE 8: LINEARITY ERRORS

Balance model	***Acceptable error***
PW 124	± 0,4 mg
PW 184	± 0,4 mg
PW 214	± 0,5 mg
PW 254	± 0,5 mg

LINEARITY ADJUSTMENT:

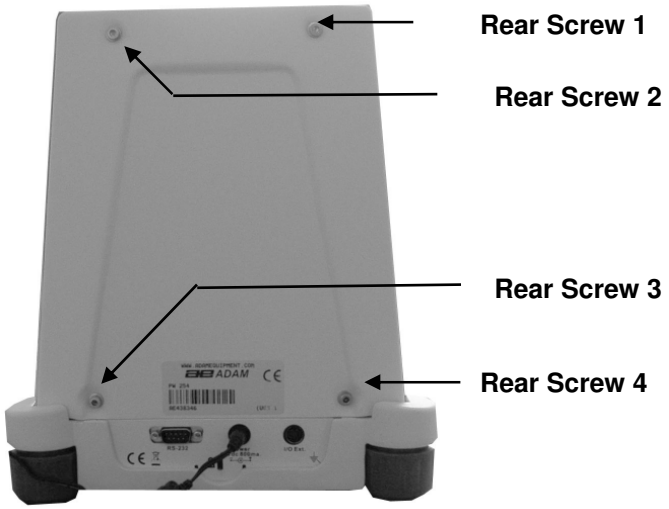
If the values are still not acceptable, refer to section 7.0 for Linearity adjustment.

6.0 MECHANICAL REPAIRS

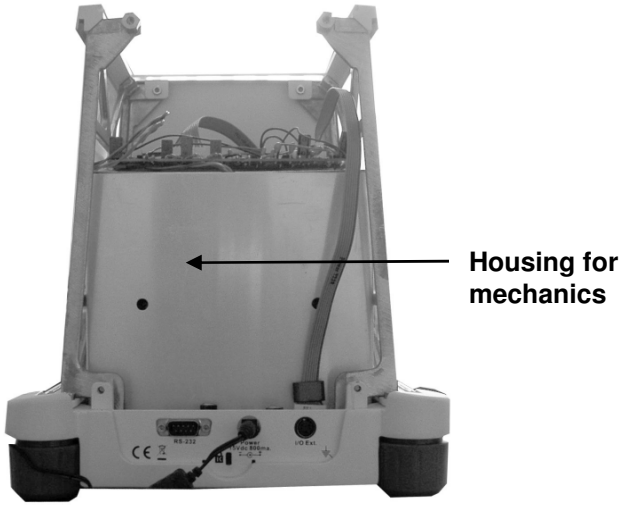
The mechanical repairs which are normally required will be:

-Replacing the broken glass shutters (see section 6.1)
-Repairing or replacing the internal parts including the internal calibration system (see section 6.2)
-Replace broken or damaged flexures (see section 6.3)
-Replacing the Keypad and LCD Panel (see section 6.4)

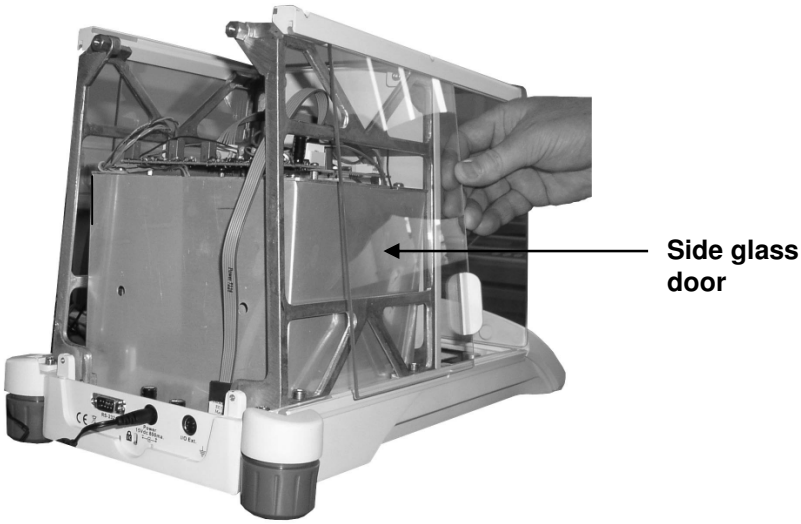
6.1 REPAIRING THE BROKEN GLASS SHUTTERS



Step 1: First remove the 4 screws on the rear panel using the 3mm Allen Hex Keys.

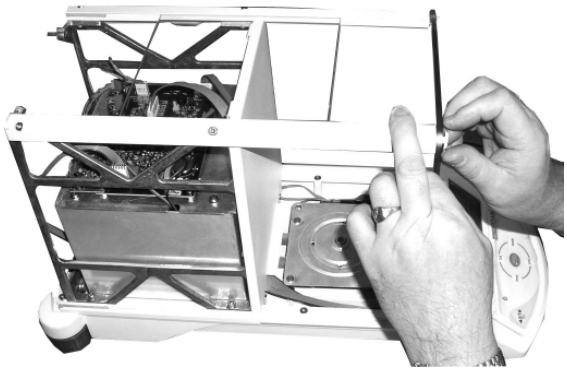


Step 2: Lift the balance top cover by carefully sliding it upwards.

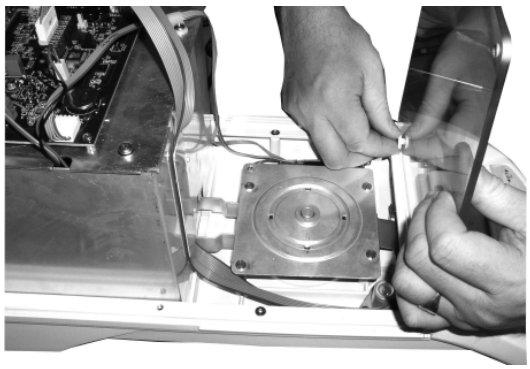


Step 3: Remove the side glass doors by lifting it slightly upwards while sliding it out of the channel.

Step 4: Remove the top glass door by sliding it backwards.



Step 5: Remove the top 2 x plastic-coated screws from the front glass shield



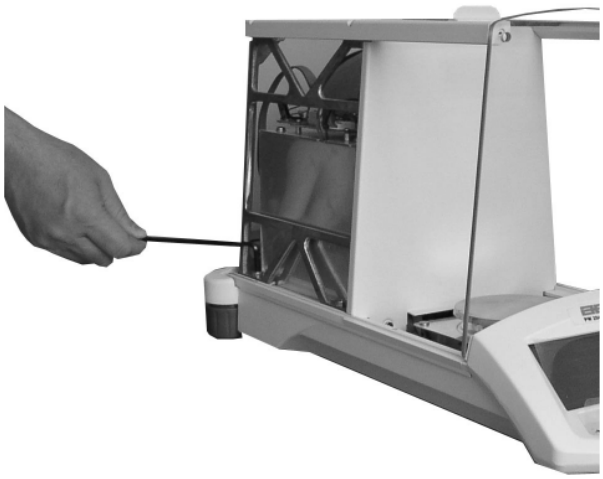
Step 6: Next remove the bottom 2 x plastic-coated screws.

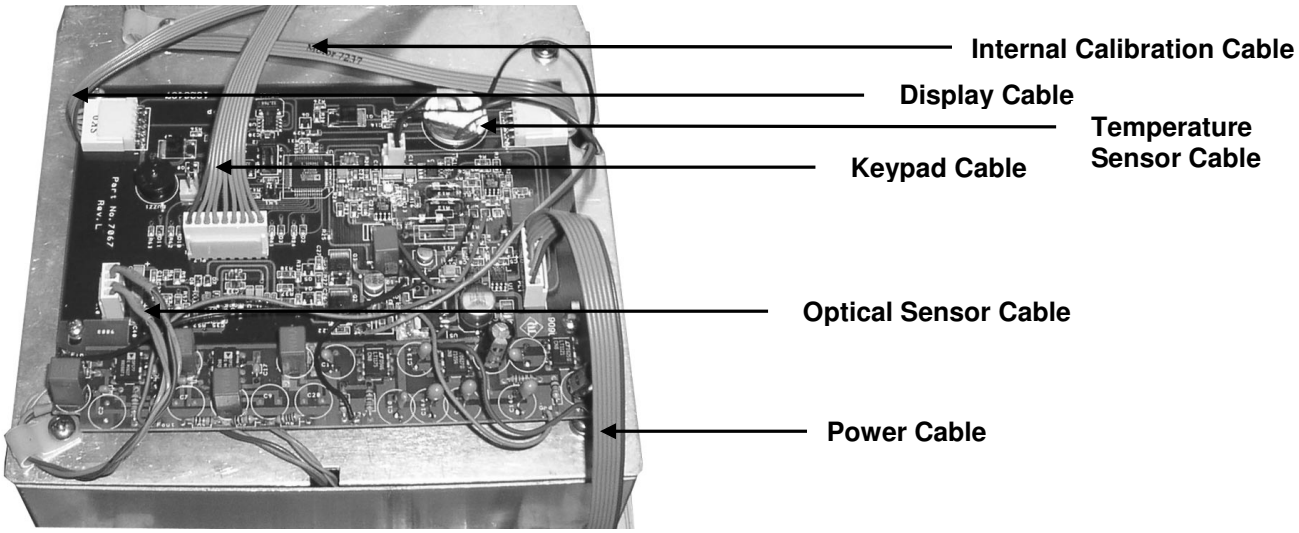
NOTE:

- The glass windows on the sides and top can be replaced by removing the balance cover. The glasses are secured by a plastic stop pressed into the rail. Remove the stop using needle nose pliers and slide the old glass out.
- Replace with new glass. Glue new handle onto the glass in position using double back tape supplied with the handles.
- Place the stop back into the guide to prevent the window from opening too far if the balance is tilted.
- To replace the front glass the 4 screws securing the glass can be removed and new glass installed.
- During other repair works, in most of the cases you do not need to remove the front glass shield unless it is broken and needs to be replaced.

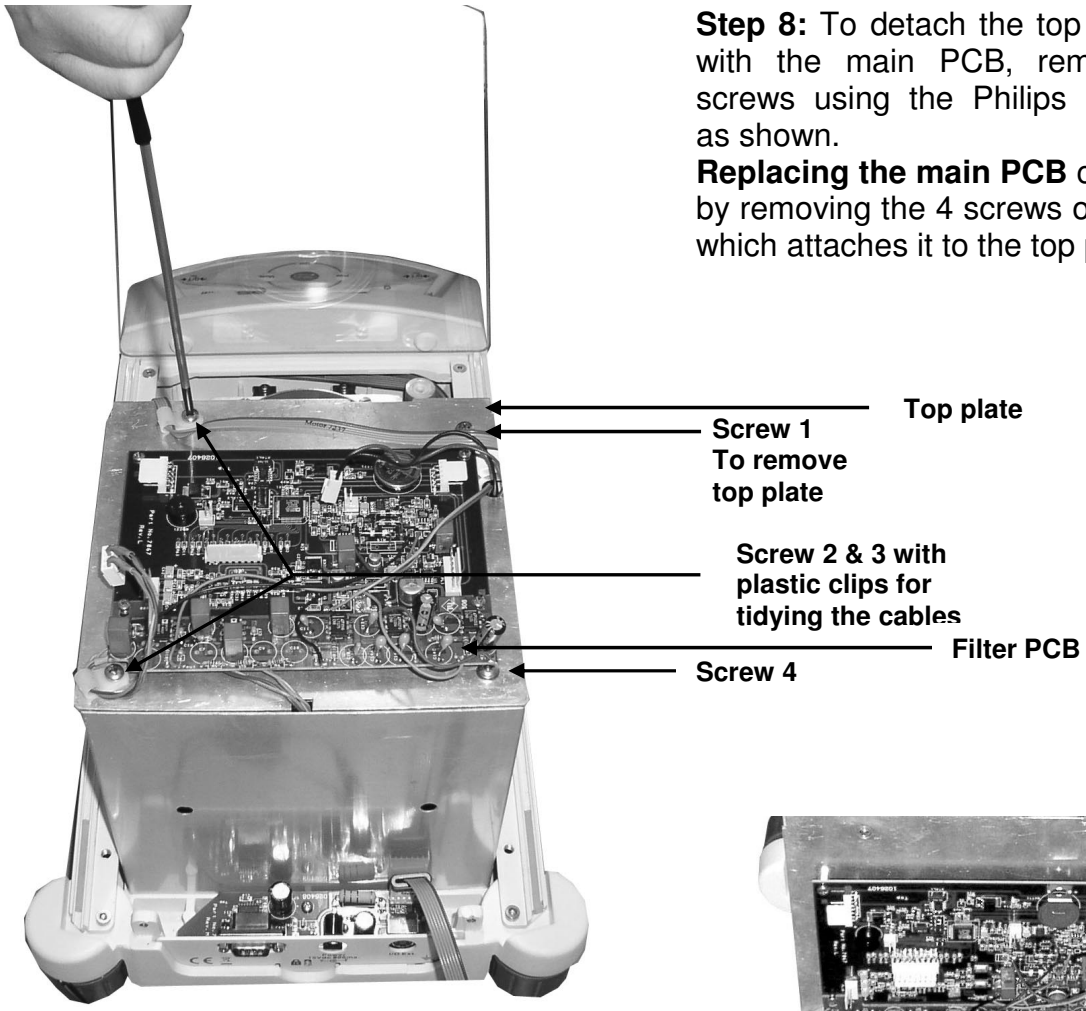
6.2 REPAIRING THE INTERNAL PARTS

Step 7: To gain access to the internal mechanism, you may need to detach the outer metallic frame by removing the side screws (4 on each side) using the 4mm Allen Hex Keys.

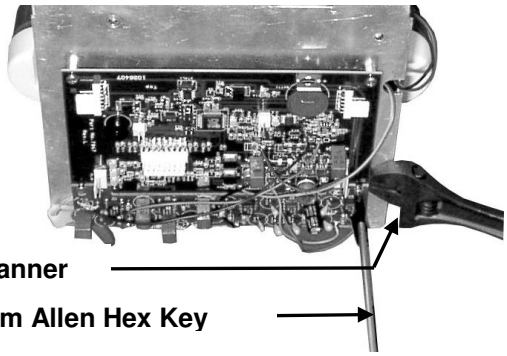




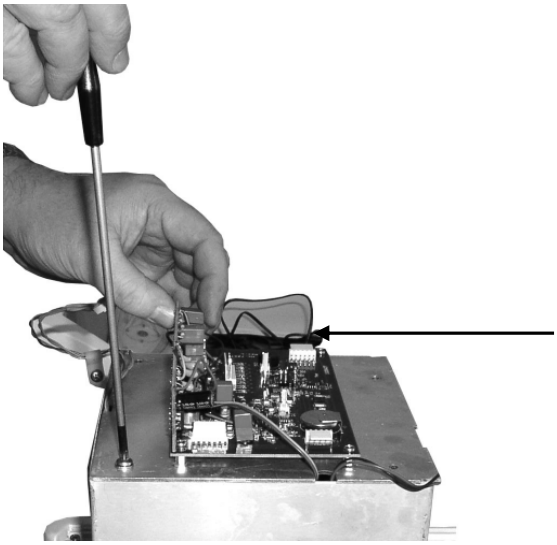
View of the Main PCB



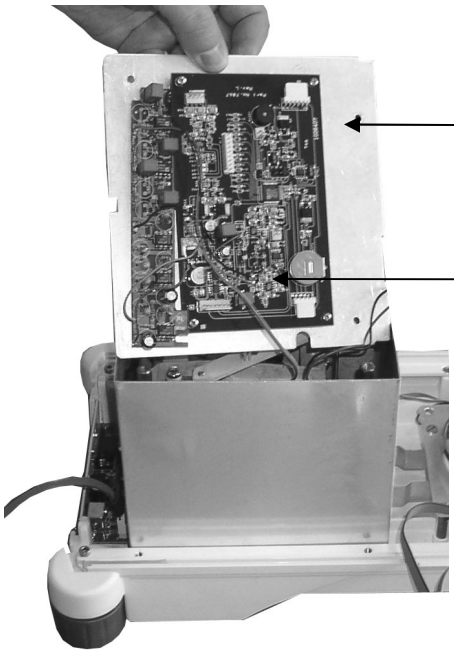
Step 8: To detach the top plate along with the main PCB, remove the 4 screws using the Philips Screwdriver as shown.
Replacing the main PCB can be done by removing the 4 screws on the board which attaches it to the top plate.

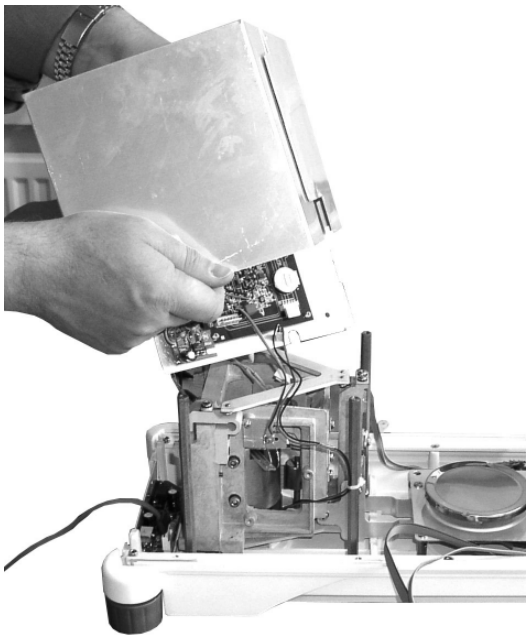


Step 9: You may need to detach the filter board to remove screw 3 & 4, which are just below the filter board. Hold the base of the screw attaching the filter board to the main PCB with a spanner for a better grip.

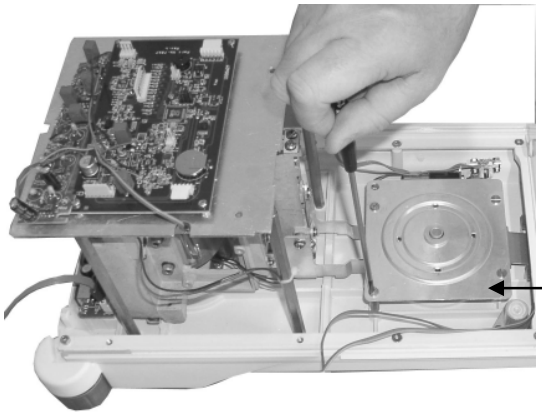


Step 10: Lift the filter PCB and remove the 2 screws (3 & 4 as shown in Step 9) to detach the top plate. You may now **change the filter board**, if needed.

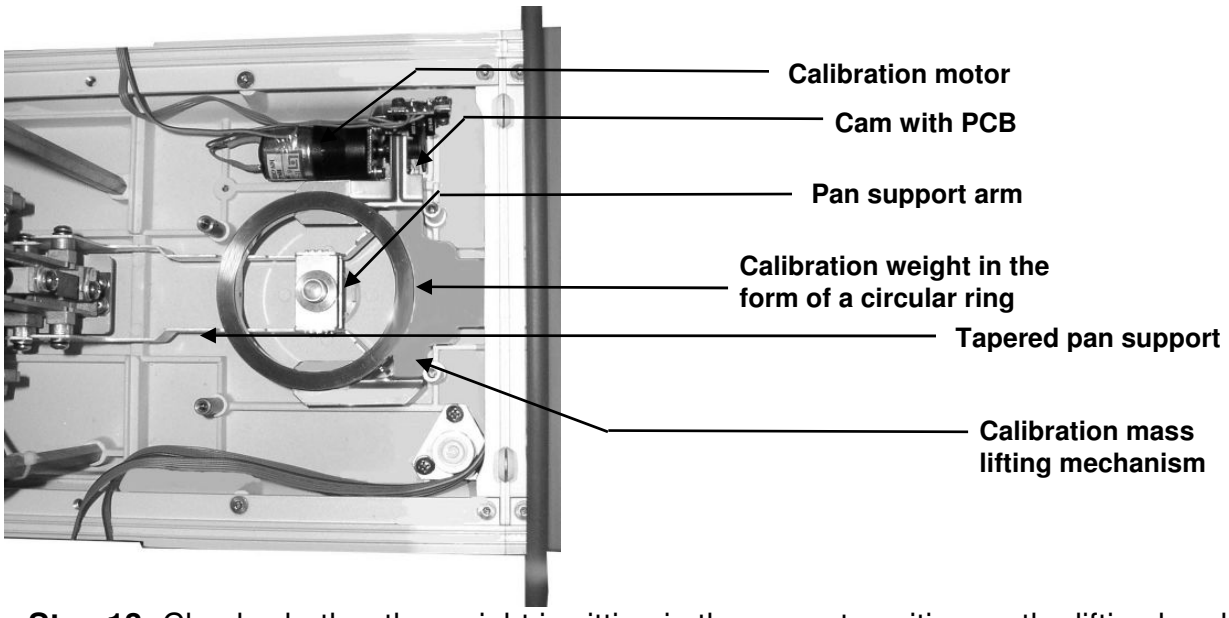




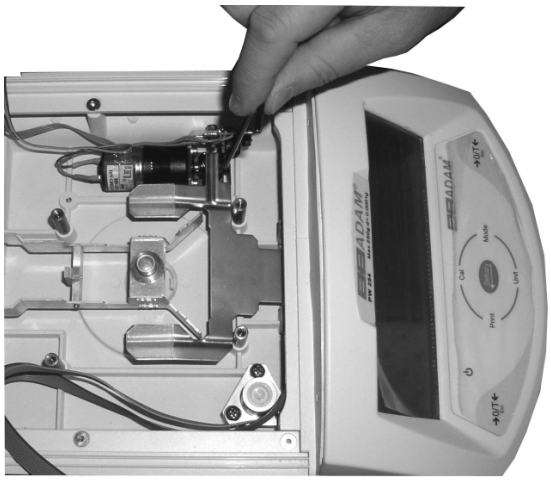
Step 11 Hold the PCB unit in one hand and carefully slide the metallic housing for the assembly upwards with the other hand. Take care not to damage any cables or flexures.



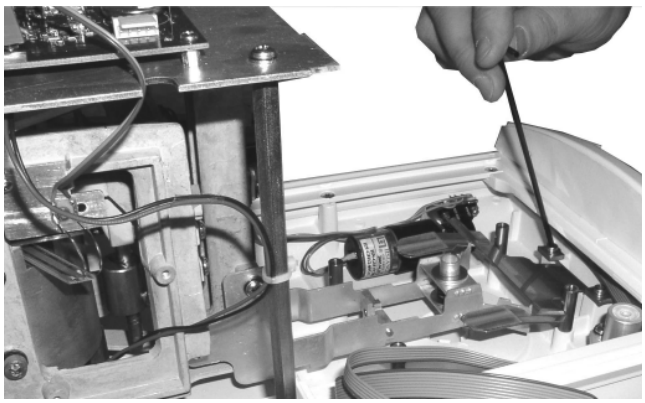
Step 12: If you need **to check the internal calibration mechanism**, remove the stainless steel weighing pan and then the 4 screws attached to the Aluminium plate using the slotted screw-driver.



Step 13: Check whether the weight is sitting in the currect position on the lifting bracket. The pan support should be exactly in the centre of the ring



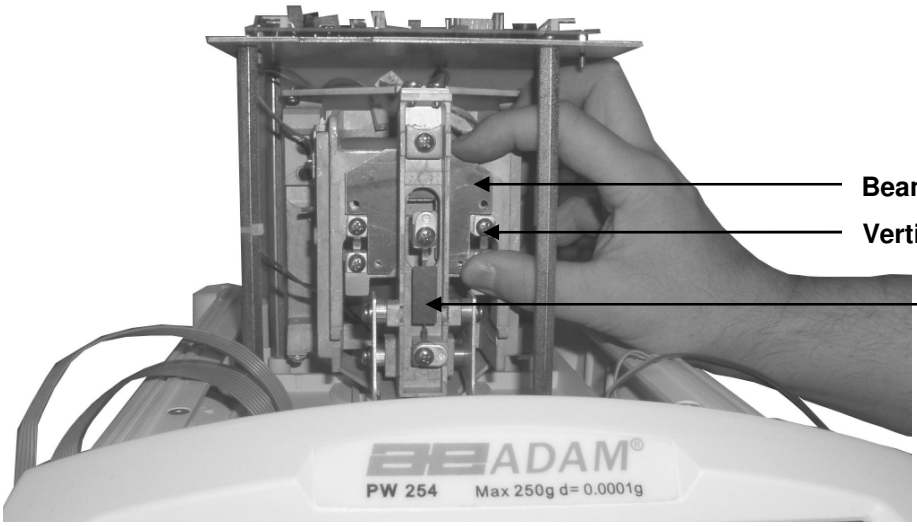
Step 14: To change the motor or the Cam, remove the screw using the 3mm Allen Hex Keys.



Step 15: If you need to replace the Calibration mass lifter, remove the 2 screws using the 3mm Allen Hex Key as shown here.

6.3 REPAIRING THE MECHANICS

<u>NOTE:</u> PW Analytical Balance is a highly sophisticated balance repairing of which calls for a lot of experience and skill. Unless the technician is trained and adequately experienced, it is suggested not to proceed with the repair work mention in this section.



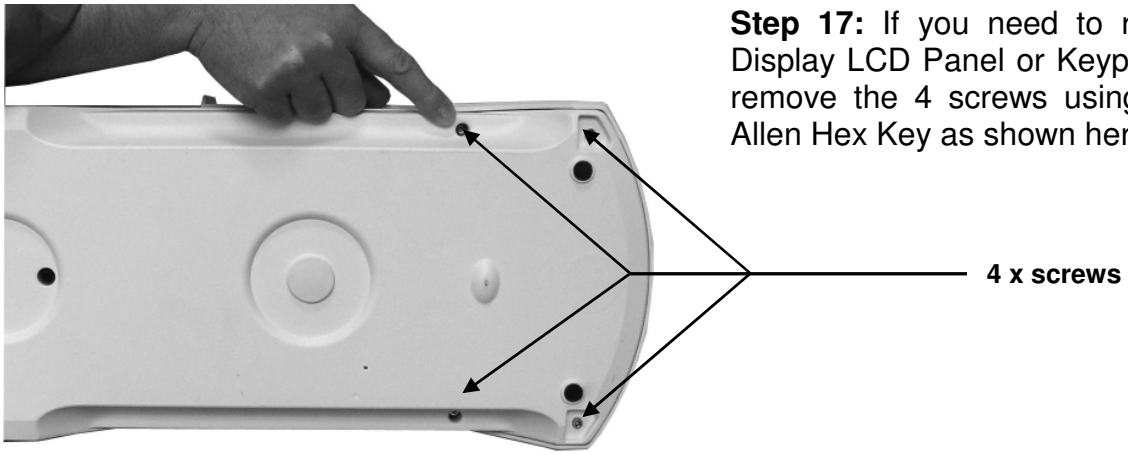
Step 16: If you need to change the Puller or the vertical flexures, hold the Beam Aligning tool (not supplied) as shown above to retain the alignment and any further damage to the mechanics. Remove the damaged flexure by using the 3 mm Allen Hex Keys and fix the new one. **For further repairing of the mechanics, contact your supplier.**

If you decide to replace flexures, the following guidelines may help.

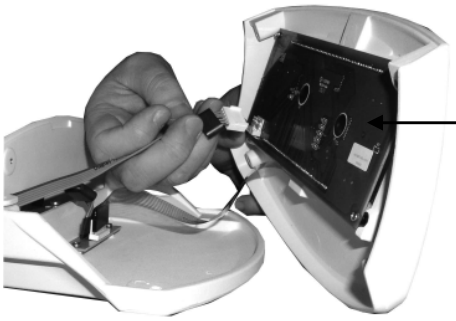
- Replace only with the correct flexure procured from Adam Equipment. See table 1 for details

- If possible only replace one flexure at a time.
- Keep all flexures aligned vertically, horizontally and from front to back.
- The active area of a flexure must align with the active area of all other flexures in the same axis.
- Do not over-tighten the flexure screws. Residual stress is often a cause of drift with temperature or unstable readings. When tightening the screws work slowly from one screw to the others to tighten all screws a little at a time.
- Do not allow the flexures to twist when tightening the screws.
- Be certain you are using the correct flexures for the balance. Many flexures look very similar but have different applications. The major difference between similar flexures is the thickness of the active area.
- Be very careful not to bend flexures during installation. Remember flexures are designed to be very weak in the direction they bend. They are not strong enough to support a large weight in the bending direction.

6.4 REPAIRING THE KEYPAD AND LCD



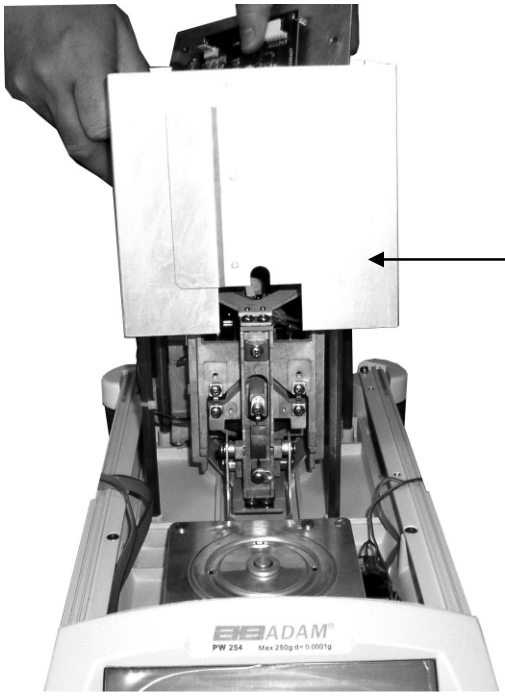
Step 17: If you need to replace the Display LCD Panel or Keypad overlay, remove the 4 screws using the 3mm Allen Hex Key as shown here.



Step 18: Detach the Display Cable from the LCD Panel

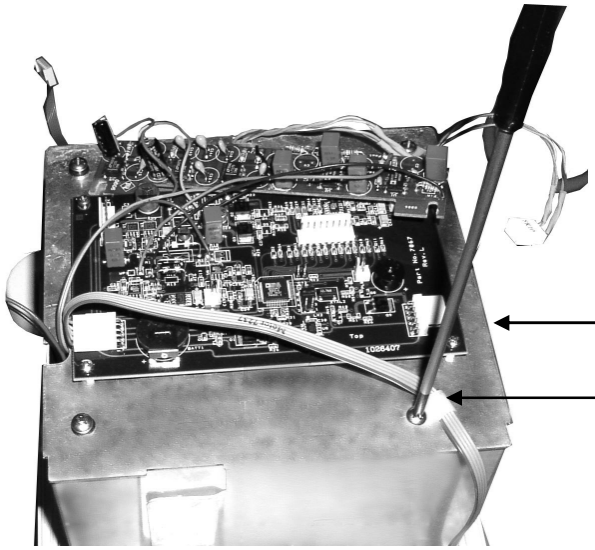
Step 19: After replacing the faulty part, ensure the cable connections are right.

6.5 RE-ASSEMBLING THE BALANCE PARTS



Step 20: After all repair work is done, follow the steps backwards to re-assemble the balance.
Slide back the mechanics housing in original position carefully.

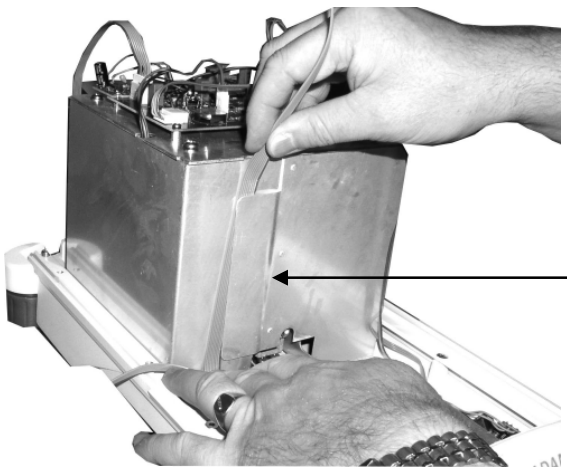
Metallic housing



Step 21: Fix the top plate with the main PCB and the Filter Board by fastening the top 4 screws. Ensure the two plastic clips are tied along with the screws as it was originally placed.

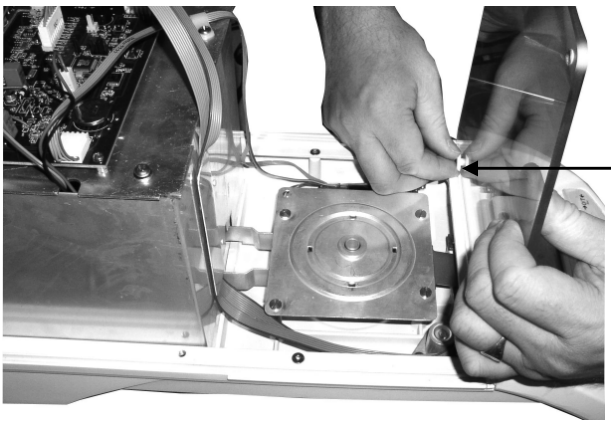
Top plate with PCBs

Plastic clip for cable tidy



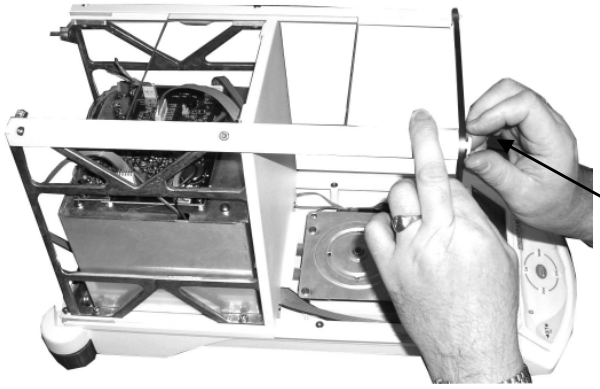
Step 22: Tuck the display cable into the slot on the metallic housing as shown here to make sure it does not touch the weighing pan after the balance is assembled.

Slot for tidying the display cable



Step 23: Place the front glass in the original position. Fasten the 2 plastic screws at the bottom as shown here.

Bottom Plastic Screws x 2



Step 24: After the balance frame is installed, align the holes on the horizontal beams of the frame with the two top holes on the glass and fasten the screws.

Top Plastic Screws x 2

<u>NOTE:</u> After the repair is complete and the balance is re-assembled, it is suggested that the balance is Temperature-calibrated using a Constant Temperature Chamber or in a suitable room, particularly for few cases as described in Table 9 given below.

TABLE 9: GUIDELINE FOR TEMPERATURE COMPENSATION

REPAIR UNDERTAKEN	REMARKS ON TEMP. COMPENSATION
Calibration Performed	Not required
Linearity adjusted	Not required
Eccentric Loading adjusted	Not required
Flexures repaired or replaced	Normally not required
Magnet and/or drive coil cleaned	Not required
Magnet and/or drive coil replaced	Must be done
Temperature sensor replaced	Must be done
Data erased or amended	Must be done
PCBs replaced	Must be done

7.0 DEALER PARAMETERS

The parameters available to the users are described in the User Manual in details. This section describes the parameters available to the dealers for setting up the balance. Access to these parameters is controlled by password.

- From the supervisor menu, select the **PASSCODES** option.
- From the **PASSCODES** menu, select the **OPERATOR** option.
- Enter the dealer passcode, which is 41218 (DLR as D=4th L=12th R=18th letter of the alphabet). Press **[Setup/Enter]**.
- Press the **[Mode]** key three times, or press the **[Esc]** key to return to weighing and then the **[Setup/Enter]** key to return to the outer level menu, which now displays **"SUPERVISOR"**.
- From this menu select the **DEALER** option.

Available options on the dealer menu are:

1. ADC COUNTS

The balance displays the averaged, temperature compensated and linearity corrected weight ADC counts in the small digits and the spread of the last 50 readings in the large digits.

- Pressing the **[Unit]** key switches the display between the weight and temperature ADC counts.
- Temperature counts display is indicated by a '**T**' symbol and shows the individual temperature ADC counts in the small digits and the average of the last 10 readings in the large digits.
- Pressing the **[Setup/Enter]** or **[Mode]** key escapes to the next item on the dealer menu.
- Pressing the **[Esc]** key returns to weighing.

TABLE 10: WEIGHT ADC

	ADC	**Range**
Zero Setting	> 500,000	0.5 to 1.5 million
Maximum Linearity Load (See Table 8)	< 16,000,000	14 -16 million

TABLE 11: MAXIMUM LINEARITY LOAD

BALANCE MODEL	MAXIMUM LINEARITY LOAD
PW 124	130g
PW 184	190g
PW 214	220g
PW 254	260g

2. DATA COMMS

- Displays **"ACTIVE"** when selected.
- Pressing the **[Print]** key sends the stored configuration data as a formatted table with address headers to the RS-232 port at 9600 baud, 8 bits, no parity, irrespective of the settings chosen in serial setup on the supervisor menu.
- Pressing the **[Setup/Enter]** or **[Mode]** key escapes to the next item on the dealer menu.
- Pressing the **[Esc]** key returns to weighing.

3. CALIBRATE

This menu offers two options:

A. TEMP CAL

- Select the **LOW** or **HIGH** temperature calibration point.
- Enter the balance temperature (10 to 40 deg C).
- If the low temperature calibration point is selected, the entered temperature must be at least 10 degrees below the one stored for the high temperature calibration point, otherwise the display will show **"ERROR HI"**.
- If the high temperature calibration point is selected, the entered temperature must be at least 10 degrees above the one stored for the low temperature calibration point, otherwise the display will show **"ERROR LO"**.
- If the entered temperature is within range, the display will show the message **"LOAD 0"**.
- Ensure that the weight pan is clear, then press **[Setup/Enter]**.
- After measuring the no-load weight, the display will prompt to load the external calibration mass. Load the required mass and press **[Setup/Enter]**.

- If temperature calibration at the other temperature has already been performed successfully, after measuring the weight of the calibration mass the instrument will display the current temperature correction in parts per million per degree Celsius as **"PPM CORR xxx"** until any key is pressed to return to the **TEMP CAL** menu option. If temperature calibration at the other temperature has not been performed, the instrument will return immediately to the **TEMP CAL** menu option.

- Pressing the **[Mode]** key at any time escapes back to the **TEMP CAL** menu option.

- Pressing the **[Esc]** key at any time returns to weighing.

- If any measurement errors are encountered, an appropriate error message will flash on the display until any key is pressed, when the instrument will return to the **TEMP CAL** menu option.

- If any errors are encountered or the **[Mode]** or **[Esc]** keys are pressed during temperature calibration, the procedure will be aborted with no new data stored, and any previous temperature correction data will be retained.

B. LINEAR CAL

- Display will ask to load the required weights in turn. Place the weights onto the weighing pan in turn and press the **[Setup/Enter]** key. Please note that the weights are not selectable

- Pressing the **[Mode]** key at any time escapes back to the **LINEAR CAL** menu option.

- Pressing the **[Esc]** key at any time returns to weighing.

- If any measurement errors are encountered, an appropriate error message will flash on the display until any key is pressed, when the instrument will return to the **LINEAR CAL** menu option.

- If any error is encountered or the **[Mode]** or **[Esc]** keys are pressed during linearity calibration, the procedure will be aborted with no new data stored and any previous linearity calibration data will be retained.

TABLE 12: MASSES NEEDED FOR LINEARITY CALIBRATION

BALANCE MODEL	MASSES FOR LINEARITY CALIBRATION
PW 124	10g, 20g, 30g, ….up to 130g
PW 184	10g, 20g, 30g, ….up to 190g
PW 214	20g, 40g, 60g…..up to 220g
PW 254	20g, 40g, 60g…..up to 260g

NOTE : For better accuracy, only use Class E2 weights for linearity calibration.

8.0 INTERNAL CALIBRATION MASS ADJUSTMENT

TABLE 13: LIST OF INTERNAL CALIBRATION WEIGHTS

Balance model	***Internal Calibration mass (approx)***
PW 124	100g
PW 184	100g
PW 214	100g
PW 254	100g

NOTE: The value of the internal mass is not an exact number, such as 100g. It must be set by comparing with an external mass. The exact value can be set using the Supervisor Parameter section as described in the User Manual (section 13.5), provided this feature is enabled at the factory.

PROCEDURE

- Make sure the balance is level and has been ON for 4 hours or more at a stable temperature.
- Calibrate the balance twice. This helps to reduce any stresses in the mechanics.
- To verify the accuracy of this internal calibration, place an external mass approximately equal to the same internal calibration mass. Record the result.
- Enter the Internal Calibration section using the Supervisor passcode as per the following procedure-
- Pressing the **[Setup/Enter]** key while in normal weighing gives access to the Supervisor Menus.
- When **[Setup/Enter]** is pressed and passcode is not enabled the display will show the Supervisor menus. If passcode is enabled, the balance will ask for it by displaying "**PASSCODE 0**"
- If a wrong code is entered an "**ERROR CODE**" message will flash and the balance will return to weighing mode
- If the passcode has been enabled and entered, the balance will allow the user to access the Supervisor's menus by which the user can enable/disable weighing units or modes, set balance parameters for the conditions, set time and date, set parameters for the RS-232 interface, calibration parameters and security parameters
- The display will show the first menu "**UNITS**". The **[Up]** and **[Down]** keys will cycle through the main menus, pressing the **[Setup/Enter]** key will enter the menu and

sub-menu or options can be set. Press **[Mode]** to come out of a sub-menu or **[Esc]** to return to normal weighing

- Press **[Setup/Enter]** when "**CAL SETUP**" is displayed to select the calibration parameters

- The options for each parameter can be scrolled through by using the **[Up]** or **[Down]** key

- When "**INT CAL**" is displayed select "**YES**" by pressing the **[Setup/Enter]** key. . The value of the internal mass set in the factory will be displayed.

- A new internal value can then be reset to make the external mass value display correctly. If the reading for the external mass is greater than the actual value of the mass then reduce the internal mass value by the difference. Enter this reduced value when prompted by the display.

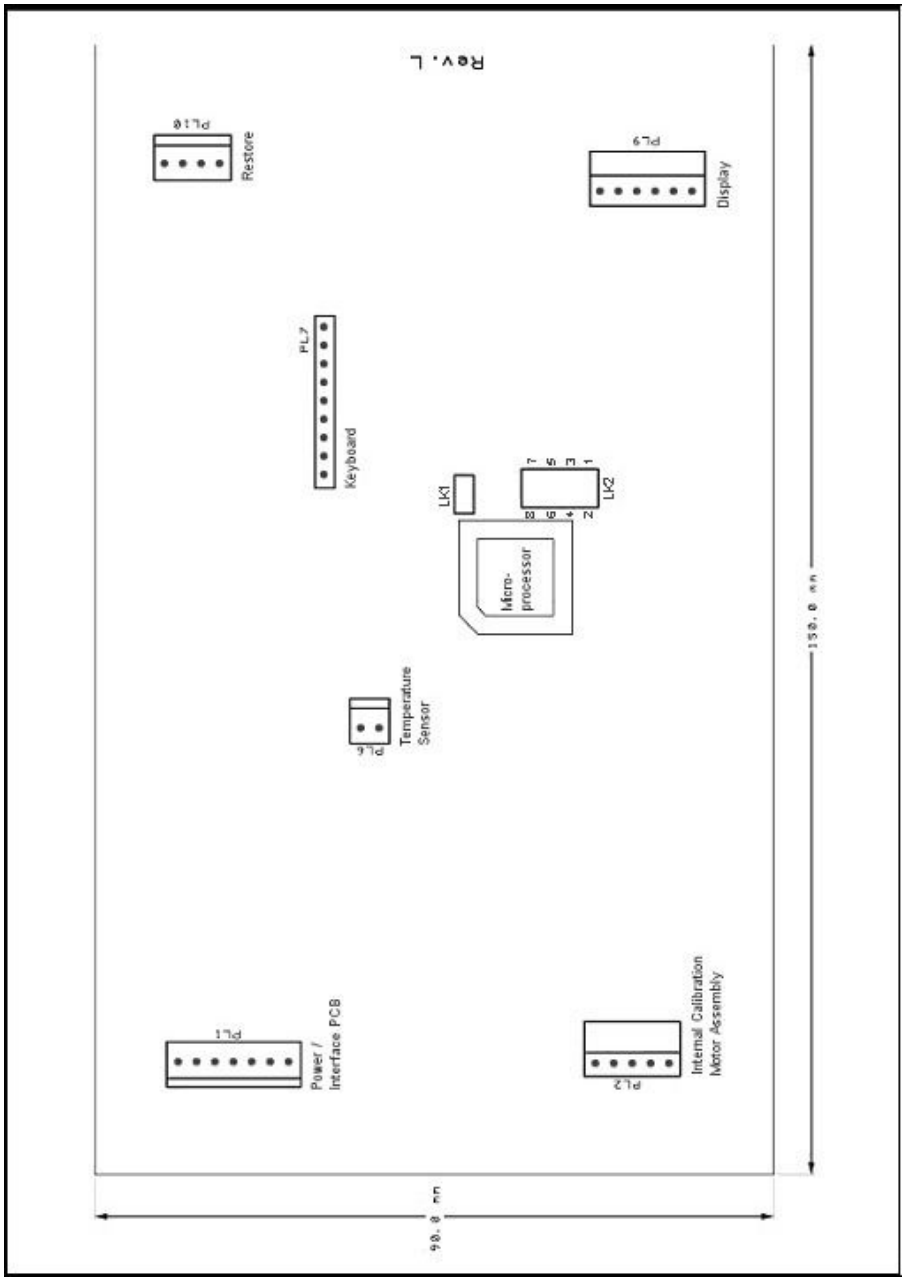
  For example, if the internal mass previously set is 100.054g and the display reads 100.050g when using an external mass of 100g, then reduce the internal mass value by 0.050g. Enter the new revised value of 100.004 (in place of 100.054g) when prompted. The adjustment can be done for up to ±100mg.

- Repeat the calibration and check the value of the external mass again.

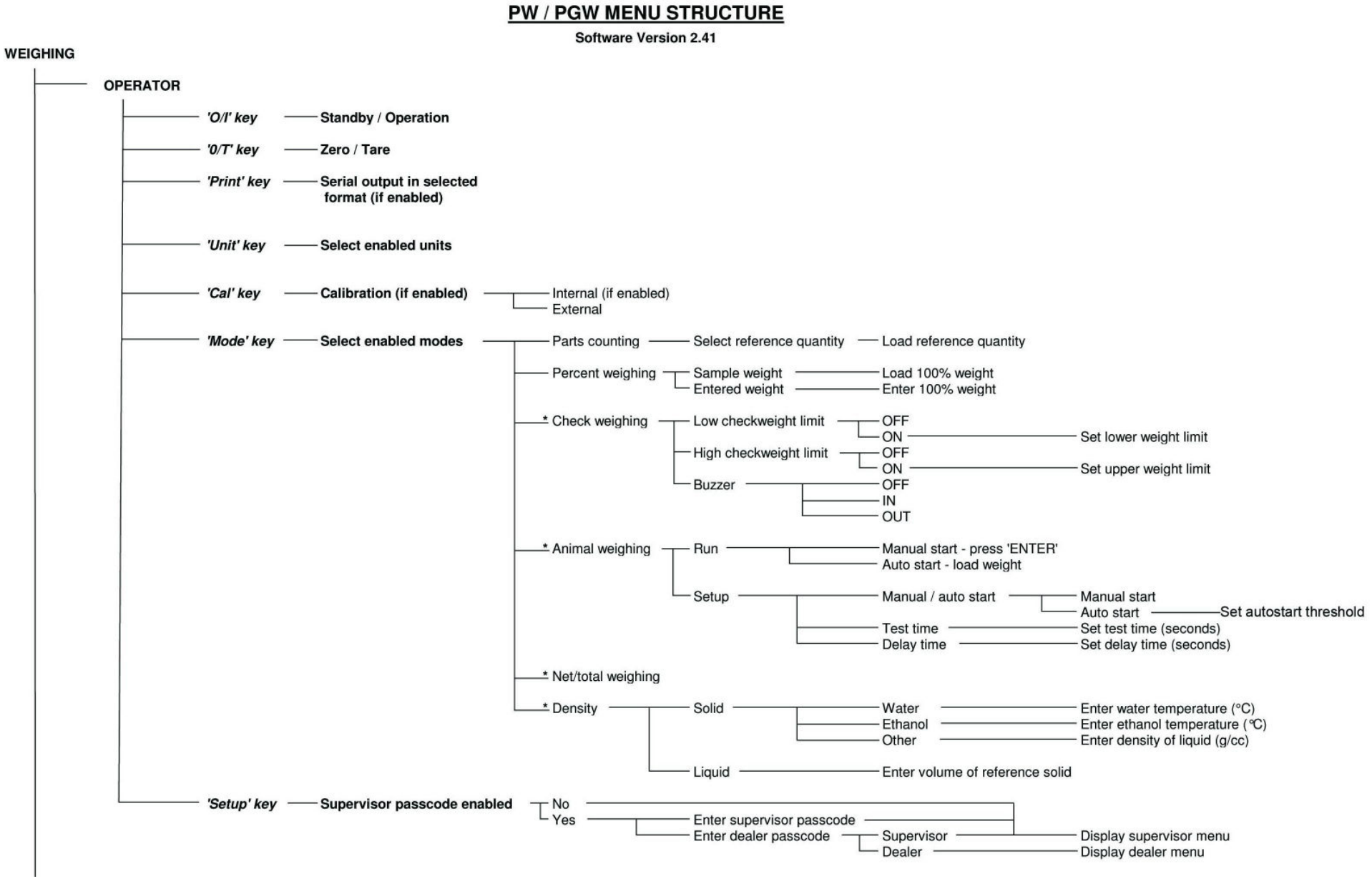
- Repeat this procedure until the value displayed is correct for the mass used.

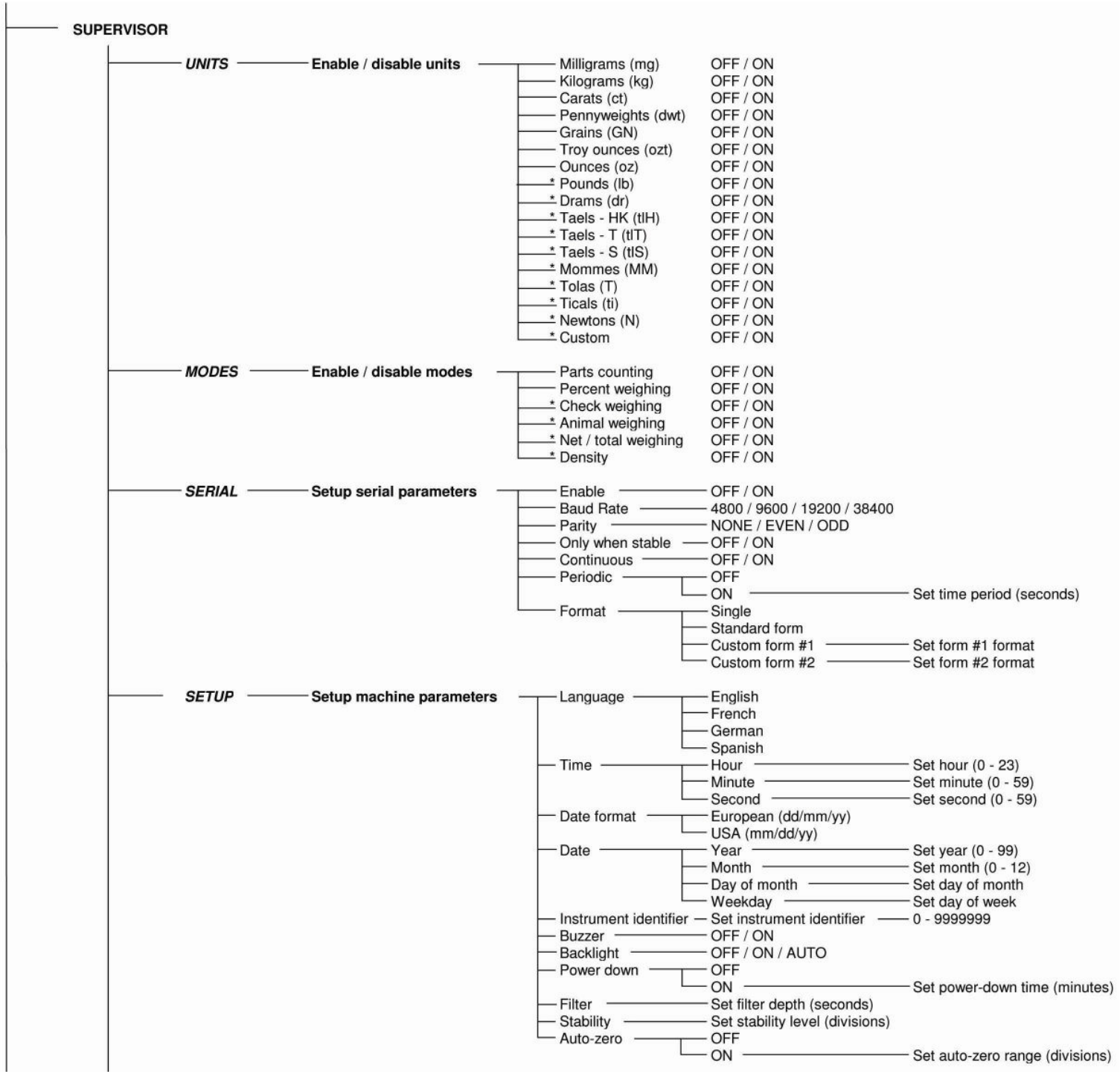
- Press **[Esc]** to return to normal weighing.

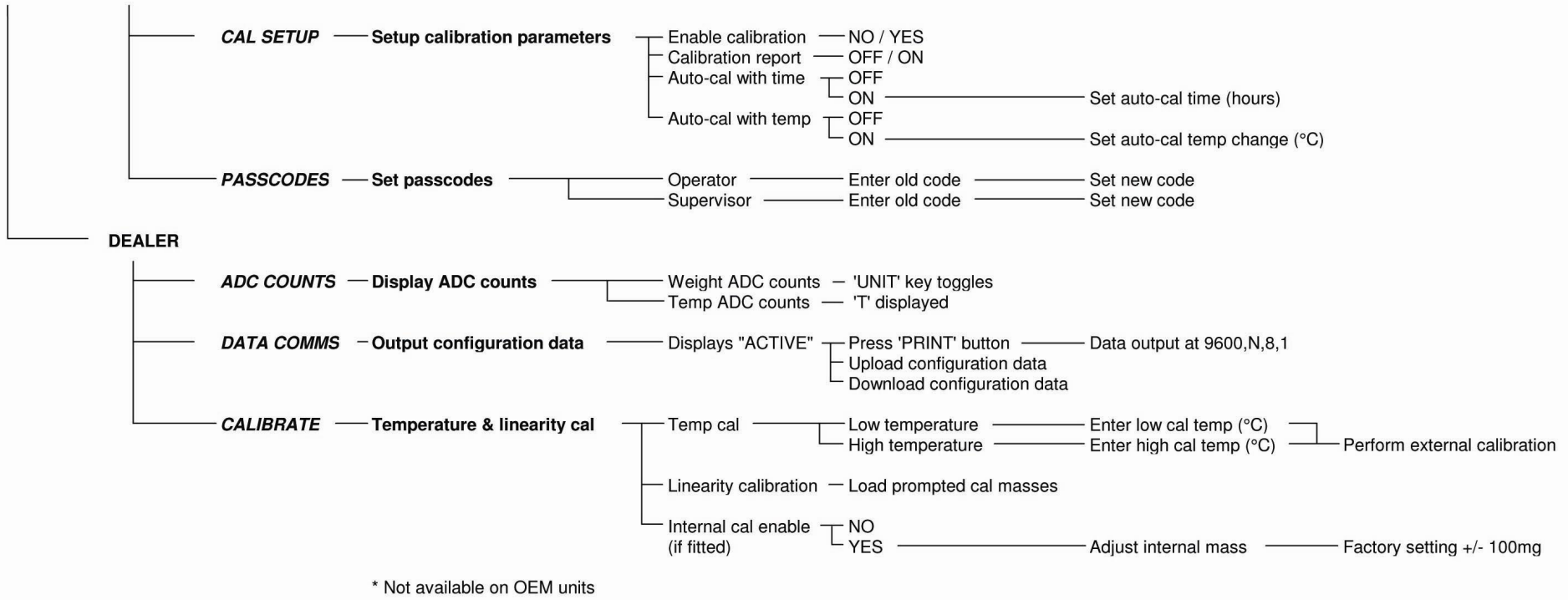
9.0 CABLES AND CONNECTIONS



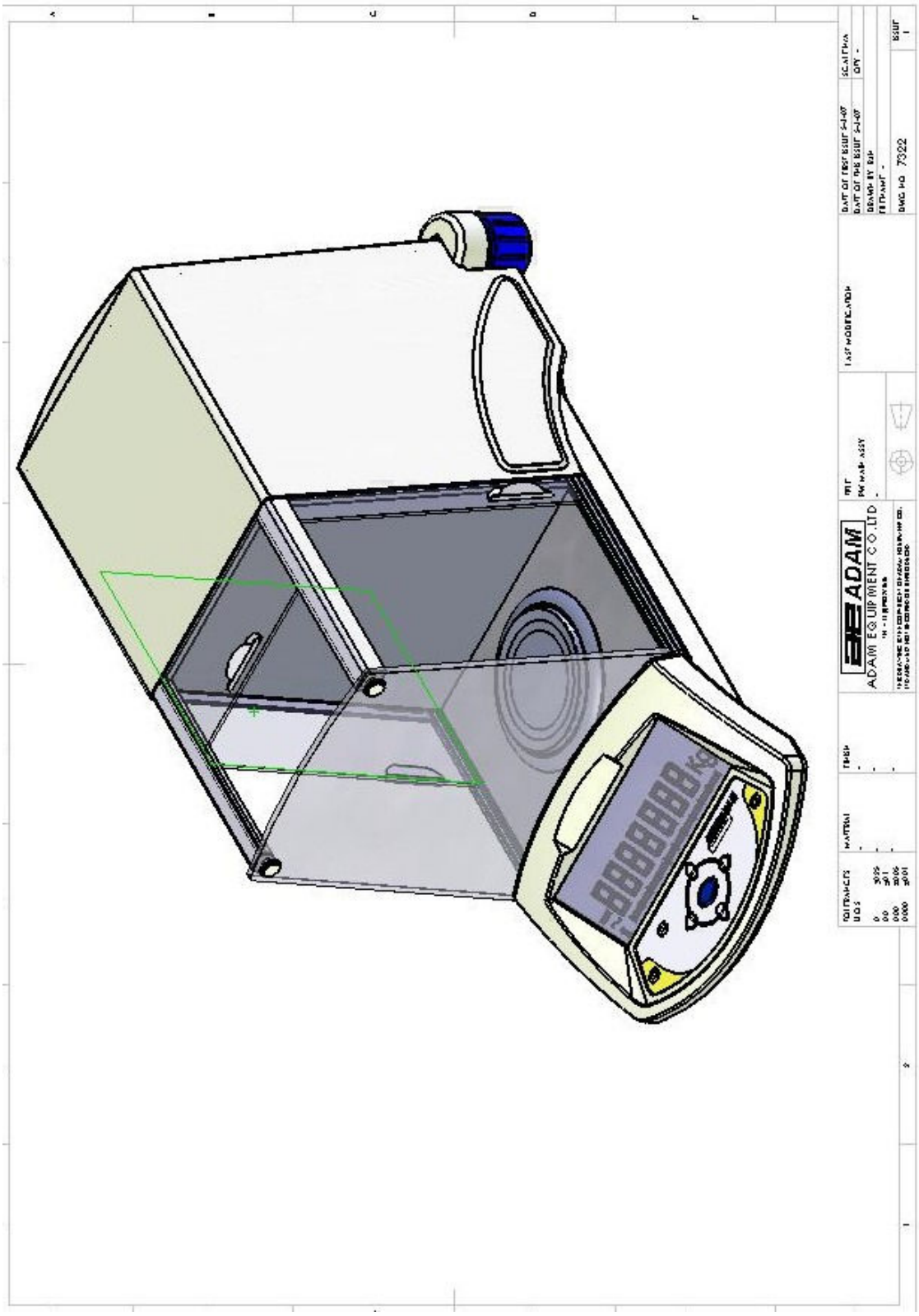
10.0 BALANCE MENU DIAGRAMS

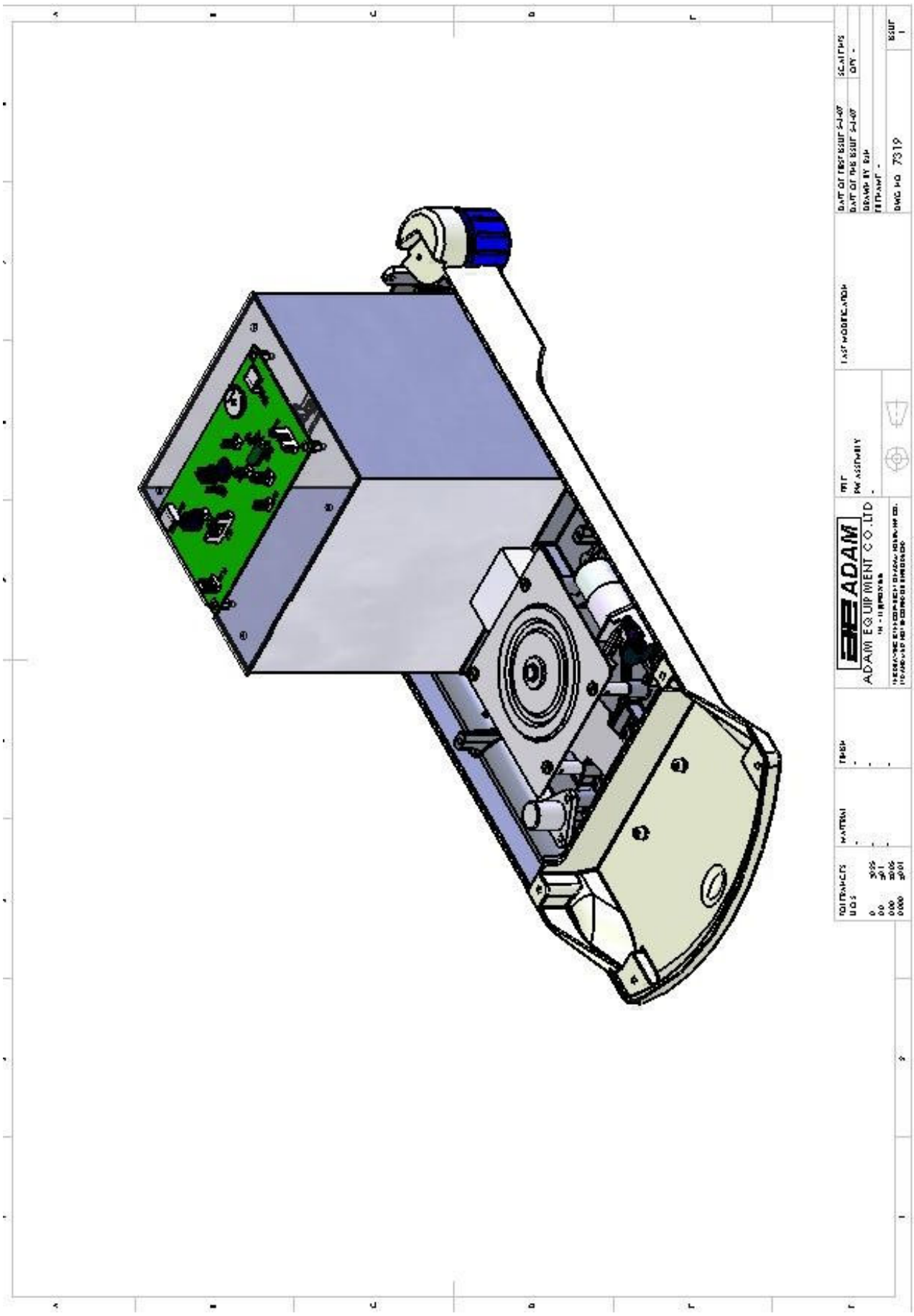


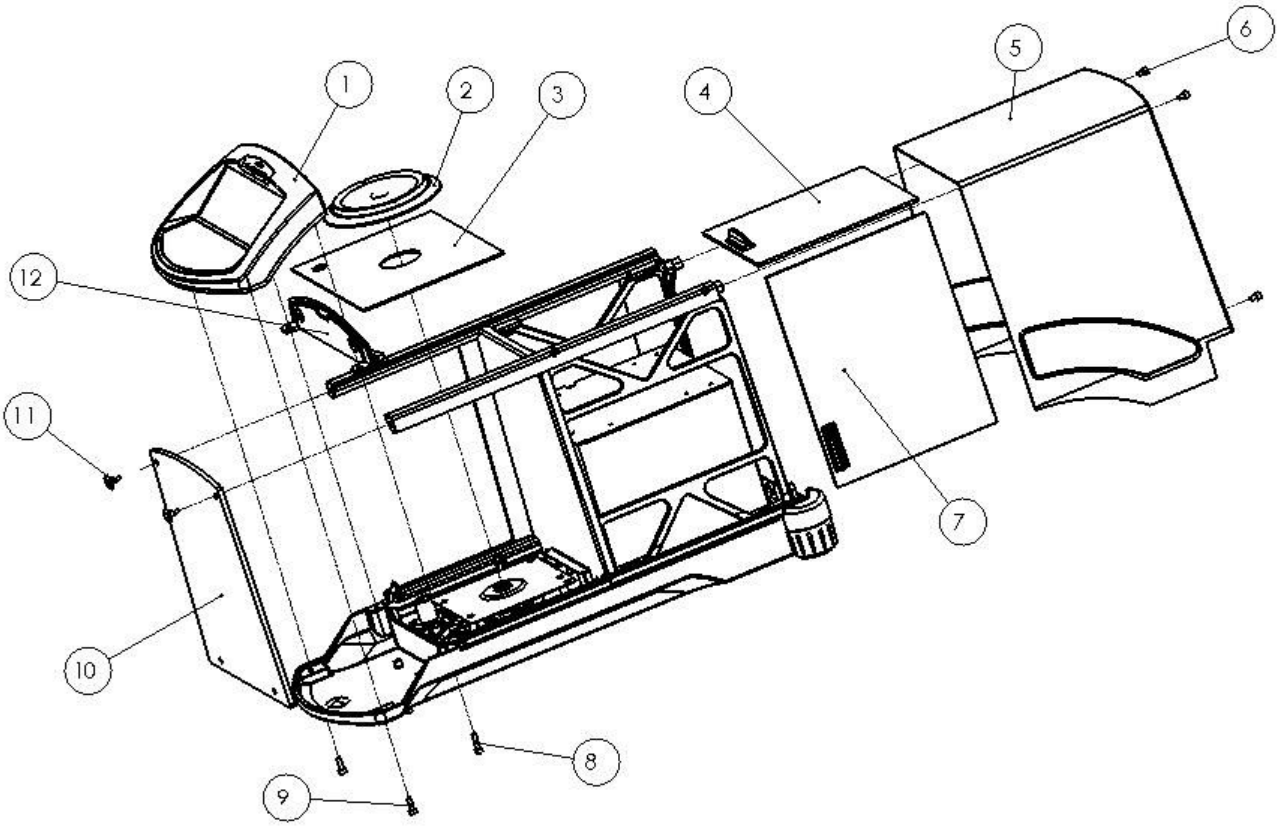

SUPERVISOR
UNITS
Enable / disable units
Milligrams (mg) OFF / ON
Kilograms (kg) OFF / ON
Carats (ct) OFF / ON
Pennyweights (dwt) OFF / ON
Grains (GN) OFF / ON
Troy ounces (ozt) OFF / ON
Ounces (oz) OFF / ON
* Pounds (lb) OFF / ON
* Drams (dr) OFF / ON
* Taels - HK (tlH) OFF / ON
* Taels - T (tlT) OFF / ON
* Taels - S (tlS) OFF / ON
* Mommes (MM) OFF / ON
* Tolas (T) OFF / ON
* Ticals (ti) OFF / ON
* Newtons (N) OFF / ON
* Custom OFF / ON
MODES
Enable / disable modes
Parts counting OFF / ON
Percent weighing OFF / ON
* Check weighing OFF / ON
* Animal weighing OFF / ON
* Net / total weighing OFF / ON
* Density OFF / ON
SERIAL
Setup serial parameters
Enable OFF / ON
Baud Rate 4800 / 9600 / 19200 / 38400
Parity NONE / EVEN / ODD
Only when stable OFF / ON
Continuous OFF / ON
Periodic OFF
ON Set time period (seconds)
Format Single
Standard form
Custom form #1 Set form #1 format
Custom form #2 Set form #2 format
SETUP
Setup machine parameters
Language English
French
German
Spanish
Time Hour Set hour (0 - 23)
Minute Set minute (0 - 59)
Second Set second (0 - 59)
Date format European (dd/mm/yy)
USA (mm/dd/yy)
Date Year Set year (0 - 99)
Month Set month (0 - 12)
Day of month Set day of month
Weekday Set day of week
Instrument identifier Set instrument identifier 0 - 9999999
Buzzer OFF / ON
Backlight OFF / ON / AUTO
Power down OFF
ON Set power-down time (minutes)
Filter Set filter depth (seconds)
Stability Set stability level (divisions)
Auto-zero OFF
ON Set auto-zero range (divisions)



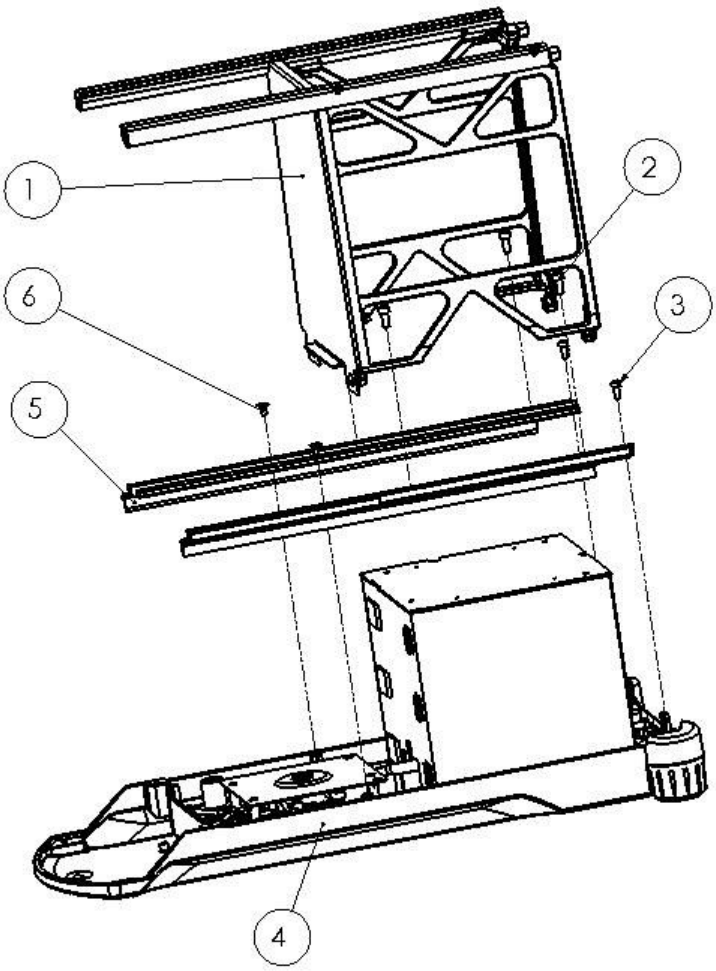
11.0 BALANCE INNER DIAGRAMS



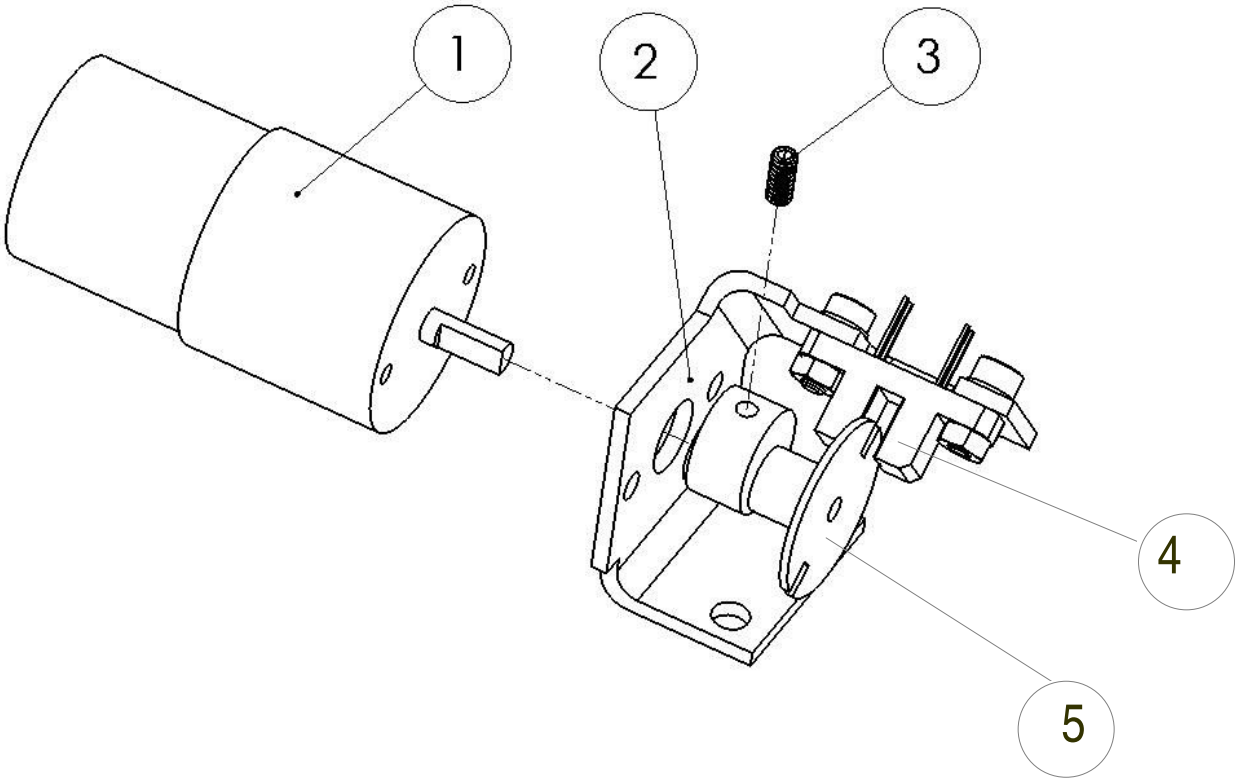

ADAM
ADAM EQUIPMENT CO.,LTD



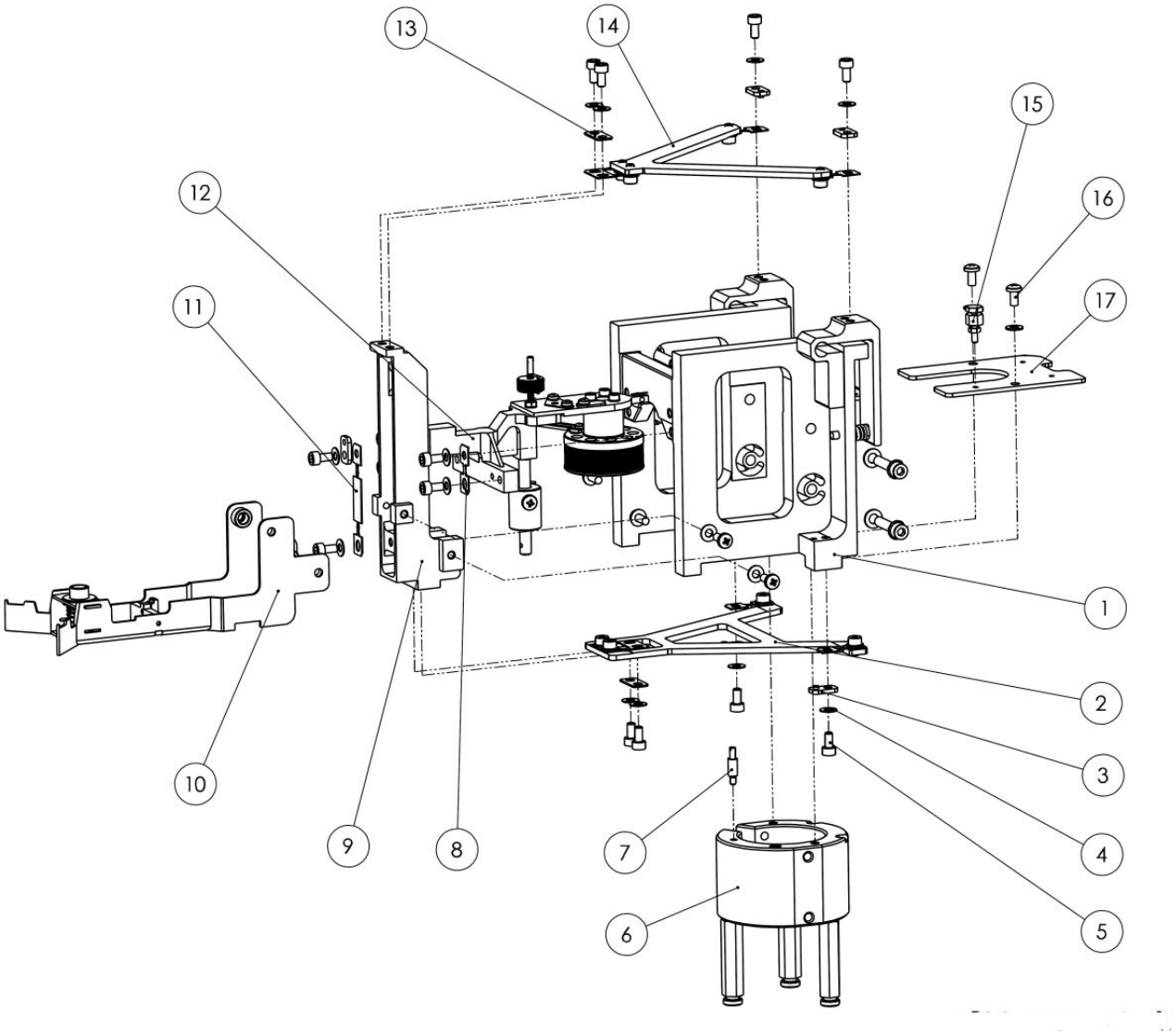
1.	Display Casing
2.	Pan surround ring
3.	Chamber Plate
4.	Top Glass Sliding Door
5.	Balance Metallic Case
6.	Top and bottom fixing Screws
7.	Side Glass Door
8.	Display Casing Screws
9.	Display Casing Screws
10.	Front Glass Shutter
11.	Front Glass fixing Screws
12.	Glass Securing Casting



1.	Aluminium Closing Plate
2.	Support Frame Securing Screws
3.	Securing Screw for the Frame
4.	Main Base Casting
5.	Sliding Door Lower Runner
6.	Securing Screw for the Frame



1.	Calibration Motor
2.	Support Bracket
3.	Cam Securing Screw
4.	Opto Switch
5.	Cam



1.	Main Chassis
2.	Lower Horizontal Beam
3.	Rear Horizontal Flexure
4.	Flexure Securing Washer
5.	Flexure Securing Screw
6.	Magnet
7.	Anti-knock Post
8.	Pivot
9.	Moving Block
10.	Pan Support Arm
11.	Puller
12.	Coil Beam
13.	Front Horizontal Flexure
14.	Upper Horizontal Beam
15.	Dead-stop Post
16.	Top Cover Securing Screws
17.	Magnet Top Cover

ANNEXURE

TABLE 14: PW SELECTED PART NUMBERS

COMPONENT	PART NUMBER
Main PCB	7067
Filter PCB	8087
Display PCB	6095
Power PCB (includes RS-232)	7068
Flexures- rear horizontal x 4	3205
Flexure- Puller x 1	3206
Flexures- front horizontal x 2	3207
Flexures- Pivots x 2	3204
Feet	7064
Keypad	7073
Stainless Steel Pan, 100mm	3434
Power Supply Adapter	7326
Glass Window- Top	7117
Glass Windows- Side	7116
Front Glass Shield	7115
Drip Tray	7118
Front Glass Retaining Screw x4	7217
Rear Cover Spacer Brass x2	7107
Door Handle x3	7474
Internal Cal Weight Lifter	7223
Internal Cal Weight Cam	7125
Internal Cal Weight Motor	7124
Optical Switch	7034
Keypad Cable	7236
Power Cable	7228
Display Cable	7236
Internal Cal Motor and Opto Cable	7237
Temperature Sensor Cable	

NOTE:

Refer to the drawings for the item number corresponding to this list. If spare parts are required identify the model number and serial number of the balance. Contact your supplier for further details, price and availability of all spare parts.

The circuit boards do not have user serviceable parts.

CE

Manufacturer's Declaration of Conformity

This product has been manufactured in accordance with the harmonised European standards, following the provisions of the below stated directives:

Electro Magnetic Compatibility Directive 89/336/EEC

Low Voltage Directive 73/23/EEC

Adam Equipment Co. Ltd.
Bond Avenue, Denbigh East
Milton Keynes, MK1 1SW
United Kingdom

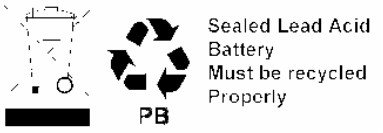
FCC COMPLIANCE

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. The equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Shielded interconnect cables must be employed with this equipment to insure compliance with the pertinent RF emission limits governing this device.

Changes or modifications not expressly approved by Adam Equipment could void the user's authority to operate the equipment.

WEEE COMPLIANCE



Any Electrical or Electronic Equipment (EEE) component or assembly of parts intended to be incorporated into EEE devices as defined by European Directive 2002/95/EEC must be recycled or disposed using techniques that do not introduce hazardous substances harmful to our health or the environment as listed in Directive 2002/95/EC or amending legislation. Battery disposal in Landfill Sites is more regulated since July 2002 by regulation 9 of the Landfill (England and Wales) Regulations 2002 and Hazardous Waste Regulations 2005. Battery recycling has become topical and the Waste Electrical and Electronic Equipment (WEEE) Regulations are set to impose targets for recycling.

ADAM EQUIPMENT is an ISO 9001:2000 certified global organisation with more than 30 years experience in the production and sale of electronic weighing equipment. Products are sold through a world wide distributor network supported from our company locations in the UK, USA, SOUTH AFRICA and AUSTRALIA.

ADAM's products are predominantly designed for the Laboratory, Educational, Medical and Industrial Segments. The product range is as follows:

-Analytical and Precision Laboratory Balances
-Counting Scales for Industrial and Warehouse applications
-Digital Weighing/Check-weighing Scales
-High performance Platform Scales with extensive software features including parts counting, percent weighing etc.
-Crane scales for heavy-duty industrial weighing
-Digital Electronic Scales for Medical use
-Retail Scales for Price computing

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