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GB

Service Manual
Electronic Analytical Balances

KERN ABT

Version 1.2 10/2012

GB

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Service Manual

Electronic Analytical Balances

Basic Information

Grundlegende Hinweise

The device must be repaired only by trained specialist staff or personnel with professional formation (such as a repair-specialist accredited by law concerning verification).

The service manual is obligatory for repair work.

After repair, original conditions of the device have to be restored.

Only original spare parts should be used.

<u>Instructions about conformity-evaluated scales</u>:

Repair must be carried only at 100% compliance with the type approval.
A violation of this specification will result in a loss of the type approval!

After successful repair the balance will have to be reverified before it can be used again in a statutorily regulated field.

Das Gerät darf nur von geschultem oder beruflich ausgebildetem Fachpersonal (z. B. eichrechtlich anerkannter Instandsetzer) repariert werden.

Die Serviceanleitung ist bindend für Reparaturen.

Das Gerät muss nach erfolgter Reparatur wieder in den Originalzustand zurückversetzt werden.

Es dürfen nur Originalersatzteile verwendet werden.

<u>Hinweis zu konformitätsbewerteten Waagen</u>:

Reparatur darf nur in 100% -iger Übereinstimmung mit der Bauartzulassung erfolgen. Ein Verstoß gegen diese Vorgabe führt zum Erlöschen der Bauartzulassung!

Nach erfolgreicher Reparatur muss eine Nacheichung erfolgen, um die Waage wieder im gesetzlich geregelten Bereich verwenden zu können.

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1 Service Menu

For general operations, please refer to the ABT Series instruction manual.

1.1 Entering the Service Menu

1) Set the balance to display the mass.
2) Press and hold the **[ON/OFF]** key and **[1d/10d]** key together for 3 seconds. The mass display remains unchanged.
3) Within 10 seconds, press and hold the **[CAL]** key and **[PRINT]** key together for 3 seconds.
4) The balance model name is displayed to enter the Service Menu mode.

ROM Version 1.01 E2.32 / 1.01 F2.32 and above

(1) Break the seal on base (left side). By pressing the sealing switch on the display board (a push button on the left from your view of the board), connect the AC adapter and when “CAL 2” is displayed, release the switch.
(2) After a short time the display appears “OFF”.
Press the [ON/OFF] key once. Now you are in weighing mode.
(3) Enter the Service Mode following the same procedure as with standard models (see above, point 2-4).

1.2 Service Menu contents

Pressing the **[CAL]** key changes the display as follows.

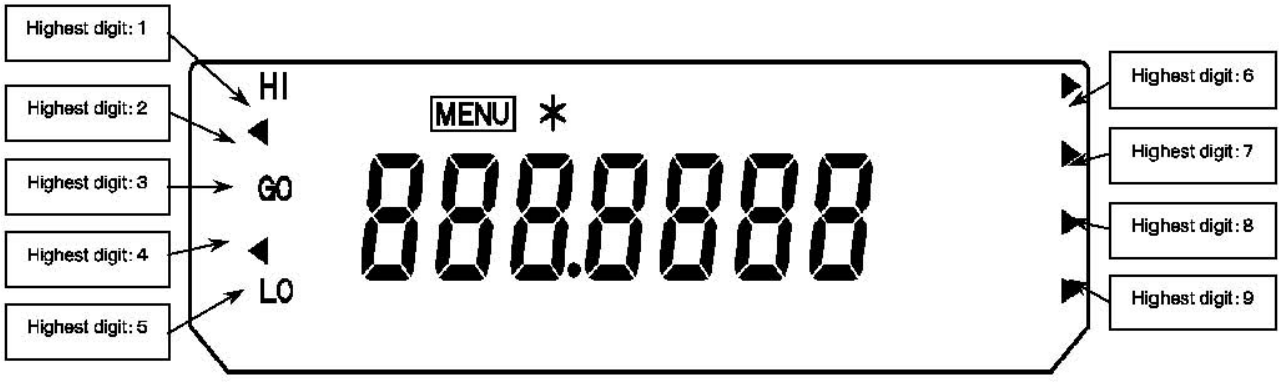
	Display	Content
Example		Model name
(1)	220-4E ↓	All unit signs are displayed in “trAdE:on” specification. “g”,”%”,”PCS”,”ct” and “d” unit signs are displayed in “trAdE:Si” specification. Unit signs are not displayed in “trAdE:oF” specification.
(2)	w.int ↓	Move built-in weights to initialize position (weight lift up)
(3)	w.SEt ↓	Load or unload the built-in weights
(4)	Lin-Adj ↓	Calculate and store the linear coefficient (ABT-5D excluded)
(5)	Lin-SEt ↓	Linear adjustment weight value input (ABT-5D excluded)
(6)	1.00-1.00 ↓	Software version No. (Control CPU (Main board) – Application CPU (Display board))
(7)	-End- ↓	Exit Service menu
(8)	EE oUt ↓	Print out EEPROM content (non-volatile memory)
(9)	CAL (iCAL or ECAL) ↓	Selected calibration mode in the user menu
(10)	CAL SEt ↓	Input value of external weight for calibration
(11)	PCAL SEt ↓	Input value of external weight for built-in weight calibration
(12)	PCAL ↓	Built-in weight calibration
(13)	-wAd- ↓	Load adjustment value (see **1.3** wAd Map) (* Displayed by average mode selected in the user menu.)
(14)	-tAd- ↓	Temperature adjustment value Load adjustment value after temperature correction (see **1.3** wAd Map)

(15)	-oAd-	(* Displayed by average mode selected in the user menu.)
	↓	Load adjustment value after temperature/linear correction (see **1.3** wAd
(16)	-Lad-	Map)
	↓	(* Displayed by average mode selected in the user menu.)
(17)	-wG-	Absolute load value
	↓	(* Displayed by average mode selected in the user menu.)
(18)	-bAt-	Power source voltage AD value
	↓	
(19)	Edit	Edit EEPROM data
	↓	
(20)	trAdE:on ⇔ trAdE:Si	Set to export specification. (countries except for Japan)
	[UN IT] key	"trAdE:on" All units are usable.
		"trAdE:Si" "g","%","PCS" and "ct" are usable.
	↓	
(21)	trAdE:oF	Set to domestic specification. (for Japan)
	↓	
(22)	Pun Adj *	Control parameter adjustment

*** Attention! Never select this menu item [Pun Adj]. If this adjustment performed, new linearity adjustment will be necessary.**

1.3 wAd Map

In the wAd, 0 Ad, LAd displays, the highest digit (10,000,000) is indicated by the illumination of each symbol.



2 Performance Check

- Leave the power on in mass display and let stand for 8 hours or more.
- Conduct the performance check in a location without drafts, vibration or sudden changes in room temperature.
- Place weights inside the balance weighing chamber in advance to conduct performance check without a temperature difference between the weights and weighing chamber.
- Use long-nose tweezers for loading and unloading weights – do not put hands inside weighing chamber.

2.1 Repeatability

Load a weight shown in Table 1 (of any preference) on the center of the pan and take it off 6 times and record each reading.
Determine the repeatability uniformity *Rx, Ry* of the zero point status and loaded weight status.

$R_x = X_{max} - X_{min}$: $X_1, X_2 \ldots X_6$
$R_y = Y_{max} - Y_{min}$: $Y_1, Y_2 \ldots Y_6$

2.2 Corner Load

1) Prepare one of each weight shown in Table 1.
2) Place a weight in the pan center (1) and then in each position in order (2)(3)(4)(5) at distance of 1/2 x pan radius, as shown in Fig. 1. Return the weight to position (1) and record the displayed values.
3) If the differences between the value measured in the center location and each of the other locations is within the standard value, the balance cornerload performance is considered normal.
   Example: ((3) position difference) = ((3) display value) – (average value of 2 x (1) display value)

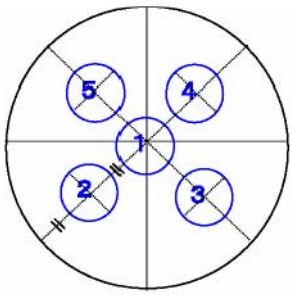


Fig. 1

2.3 Linearity

1) Conduct “ECAL” (Span Calibration by External Weights) according to the instruction manual procedure.
2) Load weights in order shown in Table 1 and record the readings when the display has stabilized.
3) Calculate the error of each loaded weight.
   (Error) = (display value of each loaded weight) – (average zero-point reading before and after linear adjustment) – (true value of weight (corrected values))
4) If the error is large, conduct ’**5.2**, **5.3** Linearity Adjustment’.

2.4 Tilt Error

1) Press [TARE] to set display to 0g. (→ A)
2) Insert a 1mm thick plate under the fixed foot at the center rear of the balance.
   When the display has stabilized record the reading. (→ B)
   (Error) = B – A
3) If the error is large, conduct ‘**5.1.2** Tilt Error Adjustment’.

Table 1: ABT Series Inspection Standards Table

Model		**120-4M**	**220-4M**	**320-4M**
Weight [g]		120	220	320
Minimum display [mg]		0.1	0.1	0.1
Repeatability	Standard [mg]	1	1	1
	Weight used [g]	100	200	300
Four-corner error	Standard [mg]	±0.5	±1	±1.5
	Weight used [g]	50	100	150
Instrumental error	Standard [mg]	≤50g : ±0.5 50g< : ±1	≤50g : ±0.5 50g< : ±1	≤50g : ±0.5 ≤200g : ±1 200g< : ±1.5
	Weight used [g]	0 120 0 20 50 100 0 120 0	0 200 0 50 100 150 0 200 0	0 300 0 50 100 200 0 300 0

≤

Model		120-5DM		220-5DM	
	Weight [g]	120	42	220	82
Minimum display [mg]		0.1	0.01	0.1	0.01
Repeatability	Standard [mg]	1	0.3	1	0.3
	Weight used [g]	100	40	200	80
Four-corner error	Standard [mg]	±0.5	±0.2	±1	±0.3
	Weight used [g]	50	20	100	50
Instrumental error	Standard [mg]	d50g : ±0.5 50g< : ±1	d5g : ±0.1 d20g : ±0.2 20g< : ±0.3	d50g : ±0.5 50g< : ±1	d20g : ±0.2 20g< : ±0.3
	Weight used [g]	0 120 0 20 50 100 0 120 0	0 40 0 5 10 20 0 40 0	0 200 0 50 100 150 0 200 0	0 80 0 20 40 60 0 80 0

3 Representative Troubles and Error Messages

3.1 Representative Troubles and Remedies

Symptom	Probable cause (Causes are listed not in the order of probability, but in the order of ease of checking.)	Remedy
(a)Nothing appears in the display.	Correct power is not supplied.	Check the power supply and connect correctly.
	Wrong AC adapter or failure of AC adapter	Replace the AC adapter.
	Cable (C43) is disconnected.	Connect the Cable (C43) correctly.
	Display Board Assy (C40) is failed.	Replace Display Board Assy.
(b)Missing numbers and/ or symbols in the display.	Display Board Assy (C40) is failed.	Replace Display Board Assy.
(c)Keys do not operate.	Display Board Assy (C40) is failed.	Replace Display Board Assy.
(d)"oL" or "-oL" is displayed.	Pan (5) and/or Pan supporter assy(4) are not installed.	Install Pan supporter assy and Pan correctly.
	Pan is loaded exceeding the weighing capacity.	Use the balance within its capacity.
	Foreign object is contacting Pan (5) and Anti-draft ring (6).	Clear the gap between Pan and Anti-draft ring.
	Anti-draft plate (11) is not fixed correctly. Dust exists between Anti-draft plate and Pan supporter shaft (XX).	Remove dusts and position and fix Anti-draft plate correctly.
	Cable (U26) is disconnected.	Connect Cable (U26) correctly.
	Cable (U43) is disconnected.	Connect Cable (U43) correctly.
	Pt-Ni band (U14) is twisted/bent/badly soldered.	Replace Pt-Ni band (U14) / Solder Pt-Ni band correctly.
	The hole of Stopper plate (U6) is contacting with Lever pin (U51).	Position and lock Stopper plate correctly without contacting with Lever pin.
	Lever stopper (U7) and/or Detector Board assy (U4) are not correctly positioned.	Position Lever stopper correctly and adjust hight of Detector Board assy correctly.
	Main Board Assy (C42) is failed.	Replace Main Board Assy.
	Force Coil assy (L4) wire break/ earth leak	Rplace Force Coil assy.
	Force Coil assy (L4) and Magnet assy (U41) are contacting directly or with dusts.	Remove dusts and position Force Coil assy correctly.
	Unit Assy (2) is damaged.	Replace Unit Assy.
(e)Large linearity error	Linearity adjustment was incorrect. Inputted calibration weight value was not correct in linearity adjustment.	Perform linearity adjustment correctly using accurate calibration weights.
	Essentially poor repeatability is causing the symptoms.	Check repeatability and refer to (i) (Repeatability)
	Essentially large drift is causing the symptoms.	Check drift and refer to (f) (Drift)
	Essentially large corner load error is causing the symptoms.	Check corner load performance and refer to (h) (Corner load error)

	Span calibration has not been performed correctly.	Perform span calibration.
	Damaged EEPROM data.	Input the data with the Adjustment S/W.
	Unit Assy (2) is damaged.	If the error is under XXXX, replace Unit assembly.
(f)Zero drift, sensitivity drift are large.	Warm up is insufficient.	Warm up sufficiently.
	Direct sunlight, or air current from heater or cooler exist.	Change the balance installation site. Remove sunlight / air current.
	The installation site has been changed.	Warm up sufficiently and perform span calibration.
	The sample or sample container is magnetically charged, or the sample is vaporizing or absorbing moisture etc.	Shield, cover, or demagnetize the sample.
	Cable (U26) is disconnected.	Connect Cable(U26) correctly.
	Temp Sensor assy (U47) is failed.	Replace Temp Sensor assy.
	Damaged EEPROM data.	Input the data with Adjustment S/W.
	Unit Assy (2) is damaged.	Replace Unit Assy.
(g)Sensitivity is not correct.	Span calibration has not been performed correctly.	Perform span calibration.
	Warm up is insufficient.	Warm up sufficiently.
	Level adjustment has not been done.	Adjust level correctly.
	The installation site has been changed.	Warm up sufficiently and perform span calibration.
	Dust or dirt is stuck to Calibration weight (26).	Clean Calibration weight.
(h)Large corner load error	Unit Assy (2) is damaged.	Corner load adjustment on UniBloc / Replace Unit assembly (2).
(i)Poor measurement repeatability / large display value fluctuation / The stability mark does not readily appear.	Effects of air current / vibraiton / movement of persons.	Change the balance installation site. Remove air current / vibraiton / movement of persons. Set High-stability mode.
	The sample or sample container is charged with static electricity.	Cover the sample with metal, such as foil.
	The sample or sample container is magnetically charged.	Demagnetize the sample and container.
	Foreign object is contacting Pan (5) and Anti-draft ring (6).	Clear the gap between Pan and Anti-draft ring.
	Essentially large corner load error is causing the symtoms.	Check corner load performance and refer to (h) (Corner load error)
	Essentially large drift is causing the symtoms.	Check drift and refer to (f) (Drift)
	Cable (U26) is disconnected / damaged.	Connect Cable (U26) correctly / Replace Cable (U26).
	Pt-Ni band(U14) is twisted/bent/badly soldered.	Replace Pt-Ni band / Solder Pt-Ni band correctly.
	Temp Sensor Assy (U47) cable is badly soldered.	Solder Temp Sensor Assy(U47) cable correctly.
	The hole of Stopper plate (U6) is contacting with Lever pin (U51). Dusts exist between them.	Clean the hole of Stopper plate and Lever pin and position and lock Stopper plate correctly.

	Lever stopper (U7) and/or Detector Board assy (U4) are not correctly positioned. Lever stopper (U7) is contacting Lever limit bar(U52). Dusts exist between them.	Clean the Lever stopper and Lever limit bar and adjust the height of Detector Board assy (U4).
	Force Coil assy (L4) wire break/ earth leak	Replace Force Coil assy.
	Detector Board Assy (U4)is failed.	Replace Detector Board Assy.
	Main Board Assy(C42) is failed.	Replace Main Board Assy.
	Force Coil Assy (L4) and Magnet Assy (U41) are contacting directly or with dusts.	Remove dusts and position Force Coil Assy correctly.
	Damaged EEPROM data.	Input the data with Adjustment S/W.
	Unit Assy (2) is damaged.	If the error is under XXXX, Replace Unit assembly.

3.2 Error Messages

Error message display	**Message**	**Condition to display message**	**Remedy**
CAL E2	Large drift of zero point is detected during span calibration	From the time of last span calibration, the zero point is recognized to be drifted: 1) first span calibration after power on: over ±20g, 2) usual span calibration: over ±1g (based on the wAd value)	Refer to **3.3.1**
CAL E3	In PCAL, the inputted value of calibration weight does not meet the actually placed calibration weight.	Inputted value and actual calibration weight differ over ±2g (based on the wAd value)	Refer to **3.3.2**
CAL E4	In span calibration, the inputted value of calibration weight does not meet the actually placed calibration weight.	Inputted value and actual calibration weight differ over ±2g (based on the wAd value)	Refer to **3.3.3**
CAL d	Instability during span calibration	After calibration weight is loaded or removed, stability cannot be reached over 25 seconds (approx.)	Refer to **3.3.4**
Err01	Temperature Sensor failure	tAd is under 100,000 or over 700,000.	Refer to **3.3.5**
Err24	Abnormal power voltage	Power voltage is under 9.5V.	Supply correct power.
Err20	Incorrect numerical input attempted	Invalid value is inputted in settings	Input correct value.
oL	Loaded exceeding the capacity	Loaded +90d over the capacity (based on the wAd value)	**See 3.1 (d)**
-oL	Load is below zero (for example: pan or pan supporter is not placed or swapped with another unit's)	Load is under -10g. (based on the wAd value)	**See 3.1 (d)**

3.3 Troubleshooting at Error Message and Interface Failure

3.3.1 "CAL E2" Display

Error content: Zero point drift during Span calibration
This error message is generated when the zero point drifts ± 20g or more while conducting Span calibration directly after switching the power ON, or when the zero point drifts ± 1g or more while conducting Span calibration a second time after the power is switched ON. The primary intention of this error message is to prevent obtaining wrong measurement result brought by incorrect span calibration or hardware failure.

How to cancel the **"CAL E2":** Press **[ON/OFF]** key

Main causes:

CAL E2 is displayed due to incorrect operation and/or hardware failure.

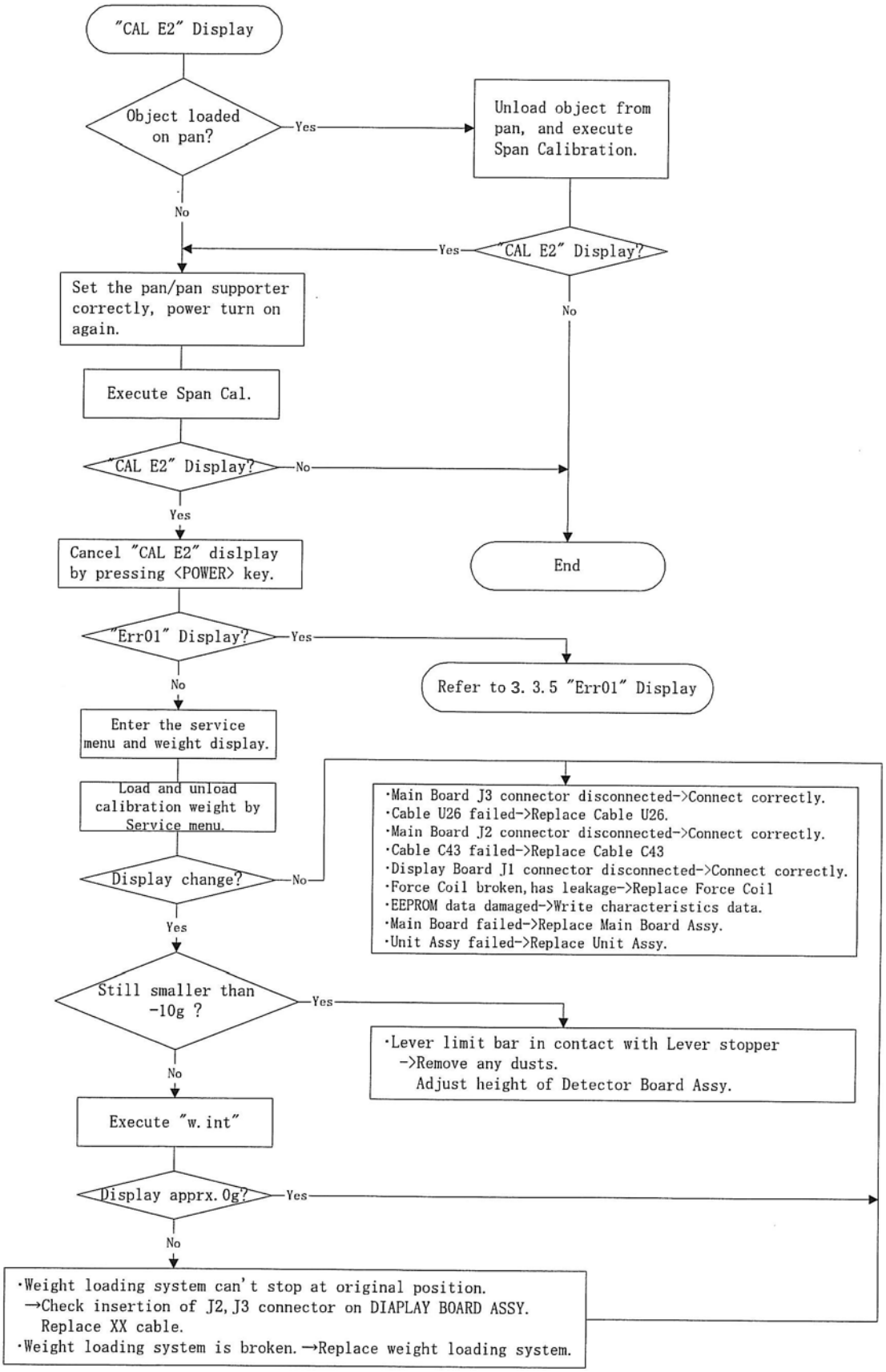
(A) Incorrect operation
1) Objects are loaded on the pan during span calibration.
1a) Level adjustment is performed during span calibration after power on
2) Pan or pan supporter assy is incorrectly set.

(B) Hardware failure
3) Cable (U26) is disconnected or broken.
4) Force Coil Assy (L4) or wiring has broken or leaking.
5) Main Board Assy (C42), Detector Board Assy (U4) or Display Board Assy(C40) is failed.
6) Mechanical balance of Unit Assy (2) is unstable.
7) Stopper plate (U6) is contacting Lever pin (51).
8) The method of use is incorrect. Directly after the power was switched ON a horizontal adjustment was attempted during span calibration.

Remedies:
1) Unload the object from Pan, execute span calibration.
2) Set Pan, Pan supporter assy correctly and execute span calibration.
3) Connect, replace Cable (U26).
4) Replace, solder Force Coil Assy (L4) or wiring.
5) Replace the defective board(s).
6) Adjust mechanical balance of Unit Assy (2).
With Pan in the load-free status, adjust the mechanical balance until the wG display (Service Menu) reading is approx. '0'g, or until the wAd reading (Service Menu) is displaying the value shown in Table 1 of **5.1.3** Balancing Adjustment.
7) Adjust the position of Stopper plate (U6).
8) Do not operate the balance during span calibration.

CAL E2 ⇗ Plug off and on ⇗ Check Stopper plate ⇗ CAL E2

Flowchart: “CAL E2” Display



3.3.2 “CAL E3” Display

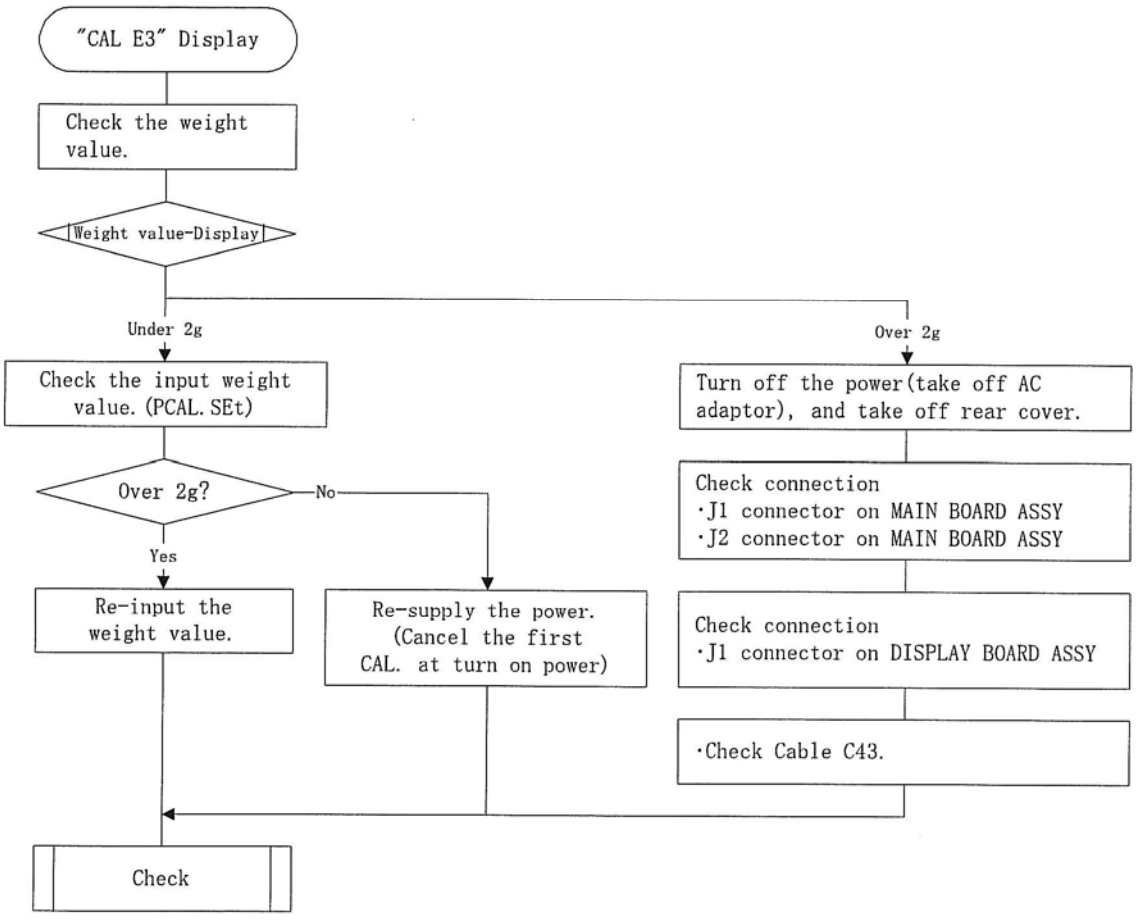
Error content: Incorrect external weight value used when calibrating the built-in weights (PCAL)
This error is generated when the difference in the actual external weight value and the set weight value is greater than ± 2g.

How to cancel the **“CAL E3”:** press **[ON/OFF]** key

Main cause: The external calibration weight setting (used for calibrating the built-in weights) is incorrect.

Remedies: Check and correct the set value of the external weight, execute built-in weight calibration (PCAL).

Flowchart: “CAL E3” Display



3.3.3 “CAL E4” Display

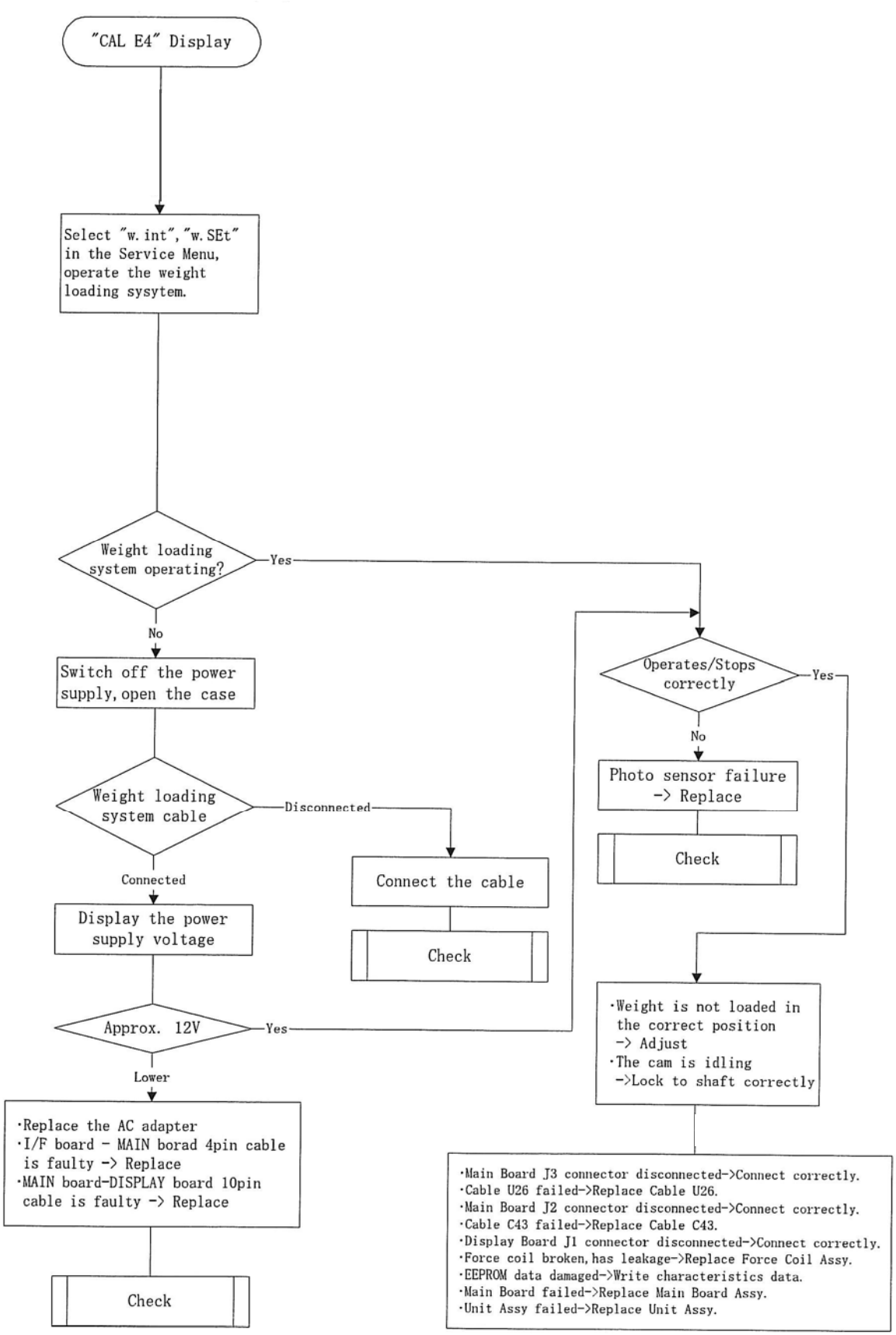
Error content: The weight loading point cannot be measured correctly when conducting span calibration.
This error is generated when the built-in calibration weight cannot be correctly loaded/unloaded; when the measurement result differs from the set weight value used for span calibration due to a hardware failure, the set weight value has drifted ± 2g or more.

How to cancel the “**CAL E4**”: press **[ON/OFF]** key

Main causes:
1) The set weight value is incorrect.
2) The weight loading system is not operating properly.
3) The power supply voltage is low.
4) The sensor board assembly (W15) of Weight Loader Assy (B11) is failed.

Remedies:
1) Check the calibration weight value and the set weight value.
   -> If the values differ, correct the set weight value, execute span calibration.
2) Replace the weight loading system cable, lock the motor shaft.
3) Replace the faulty AC adapter; 4-pin cable (C46) between Interface Board (C41) and Main Board (C42); 10-pin cable (C43) between Main Board (C42) or Display Board (C40).
4) Replace the sensor board assembly (W15), photo sensor of the weight loading system.

Flowchart: “CAL E4” Display



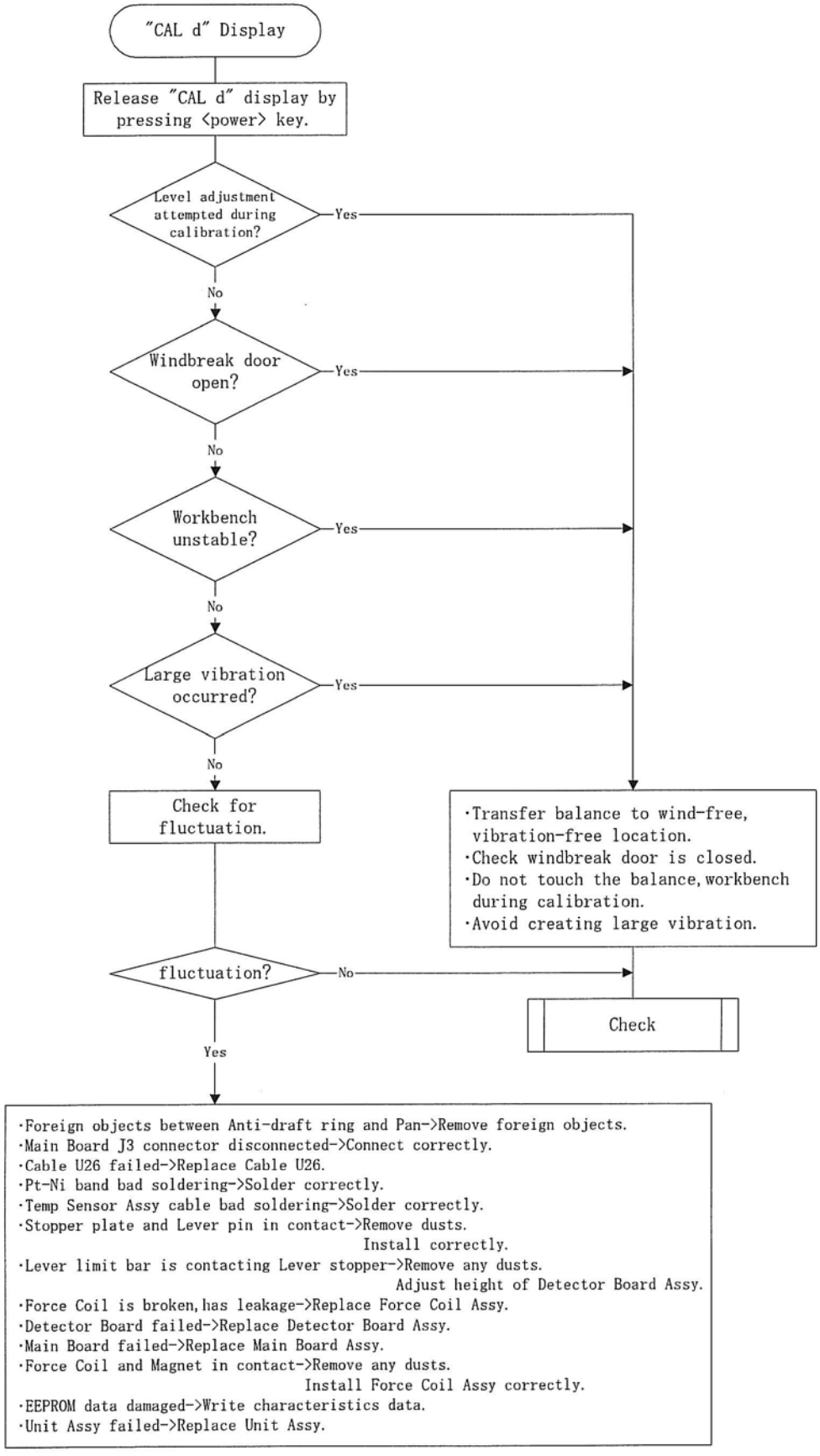
3.3.4 “CAL d” Display

Error content: Instability/fluctuation occurred when conducting span calibration
This error was generated because the balance was shaken or influenced by wind or vibration during span calibration. It is possible to skip this error message and use the balance by pressing the **[ON/OFF]** key when **“CAL d”** is displaying.

Main causes:
1) Level adjustment was attempted during span calibration.
2) The weighing chamber glass door was opened during span calibration.
3) The workbench on which the balance is set up was shaken during span calibration.
4) Large vibration occurred during span calibration.
5) Detector Board Assy (U4) is failed.
6) Dusts are stuck to Force Coil Assy (L4) or Magnet Assy (U41).
7) Dusts are stuck to Unit Assy (2).
8) Unit Assy (2) is failed.

Remedies:
1) Do not touch the balance during span calibration.
2) Close the weighing chamber glass door when executing span calibration.
3) Place the balance to a vibration resistant workbench.
Do not touch or shake the workbench during span calibration.
4) Wait until vibration has stopped, execute span calibration.
5) Replace Detector Board Assy (U4).
6) Remove dust from Force Coil Assy (L4) and Magnet Assy (U41).
7) Remove dust from Unit Assy (2).
8) Replace Unit Assy (2).

Flowchart: “CAL d” Display



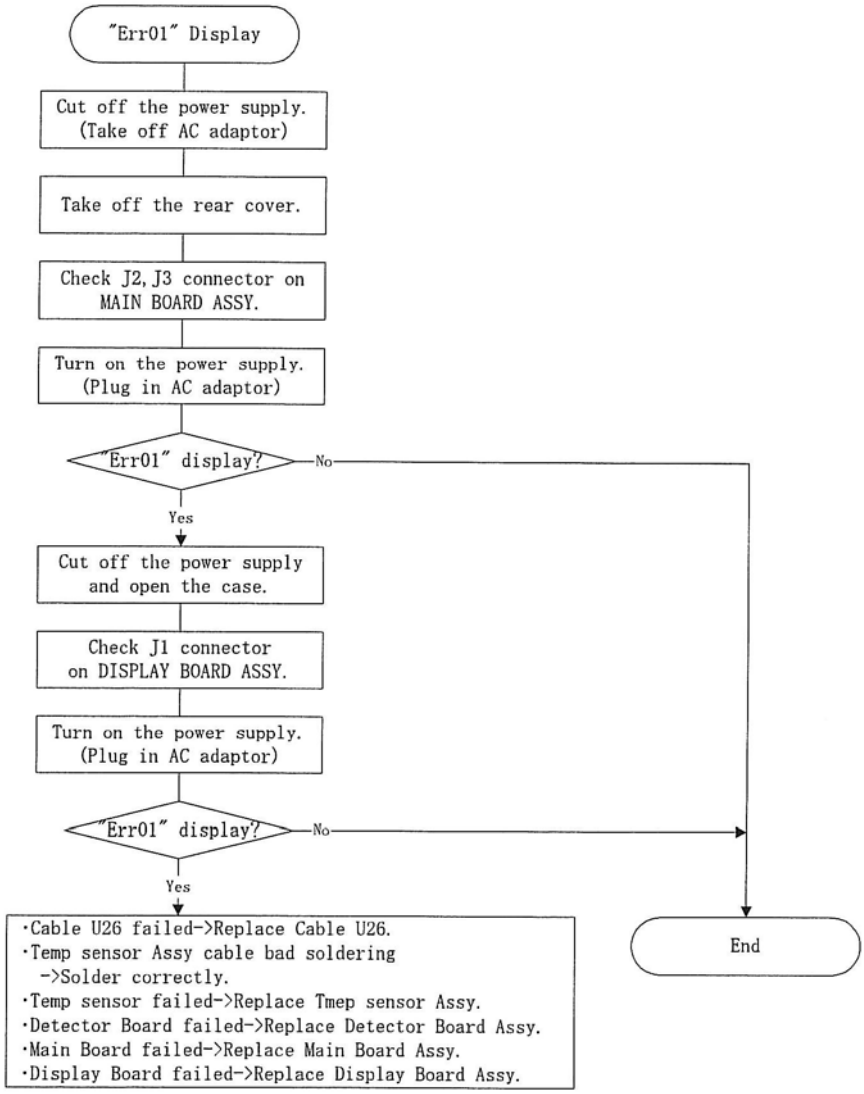
3.3.5 “Err01” Display

Error content: Temperature sensor error

Main causes:
1) Detector Board Assy (U4) is failed.
2) Temp Sensor Assy (U47) is failed.
3) Detector Board Assy (U4) and Temp Sensor Assy (U47) is not properly connected.
4) Cable (U26) is not properly connected with Detector Board Assy (U4) and Main Board Assy (C42).
5) Cable (U26) is damaged.
6) Main Board Assy, Display Board Assy is failed.

Remedies:
1) Replace Detector Board Assy (U4).
2) Replace Temp Sensor Assy (U47).
3) Solder Temp Sensor Assy (U47) cable properly.
4), 5) Replace Cable (U26)
6) Replace Main Board Assy (C42) and Display Board Assy (C40).

Flowchart: “Err01” Display

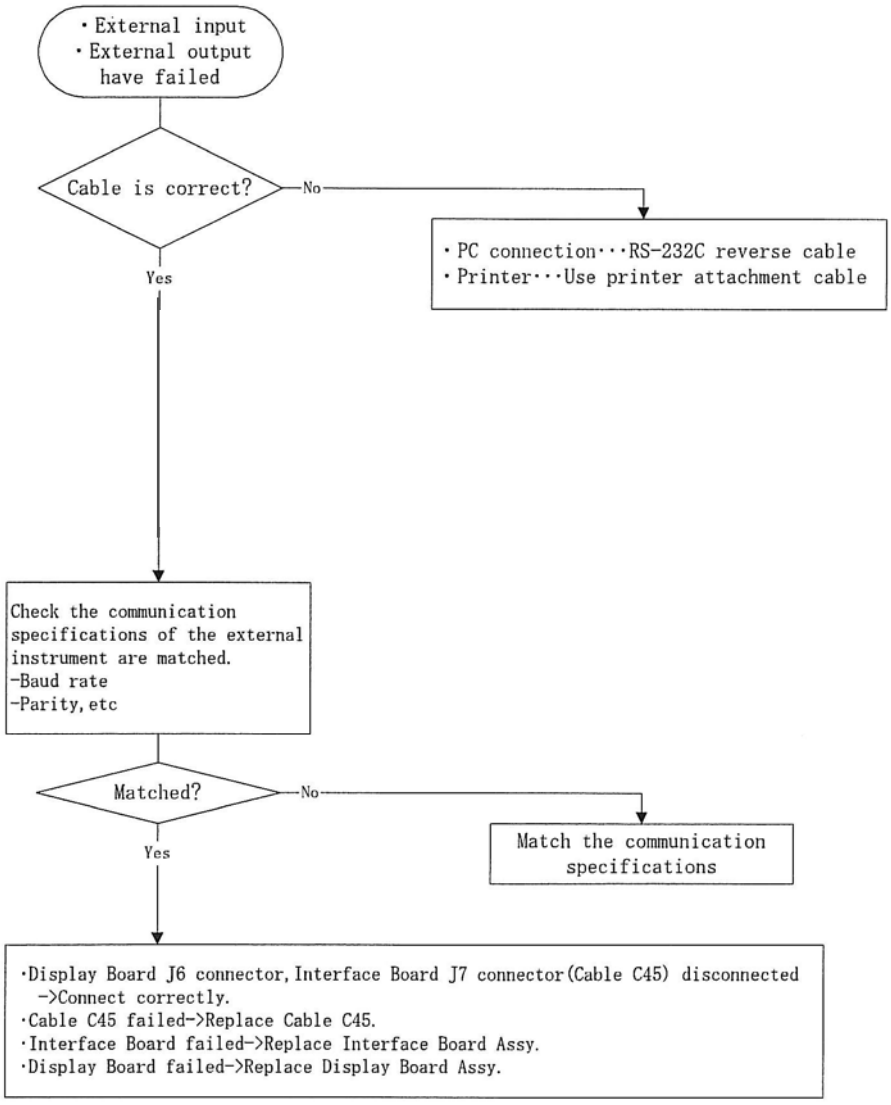


3.3.6 External Input / Output Failure

Main causes:
1) The cable used to connect the external instrument is incorrect.
2) The communication specifications of the balance and external instrument do not match.
3) Cable (C44), Cable(C45) between Display Board Assy (C40) and Interface Board Assy (C41) are failed.
4) Interface Board Assy (C41), Display Board Assy (C40) are failed.

Remedies:
1) Use an RS-232C Null modem cable, printer attachment cable.
2) Ensure the communication specifications are matched,
3) Replace Cables.
4) Replace Interface Board Assy (C41), Display Board Assy (C40).

Flowchart: External input/output failure



4 Parts Replacement

4.1 General Precaution and Information when Disassembling and Assembling

[Disassembling/Assembling]

1) When disconnecting the cables, pull the connector straight out. Avoid bending the cable/connector when disconnecting. (Fig. 1)
Warning! If the connector is not pulled straight out, there is a risk of bending the terminal pins, therefore, the connector may not be reinserted again.

2) When disassembling/assembling the balance, for the protection of the sensitive flexures of UniBloc cell, insert UniBloc protection pin (J1) into the lever locking hole up to the scribed line. (Fig. 2)
Warning! Insert UniBloc protection pin(J1) as carefully lifting Lever Assy (U1) so that the lever part of UniBloc is held horizontally. Avoid touching the flexures (thin parts) of UniBloc.

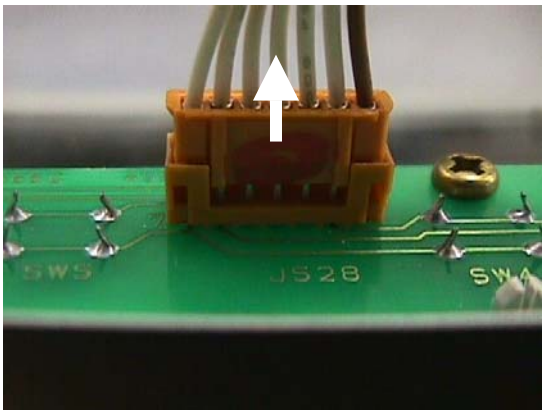


Fig. 1

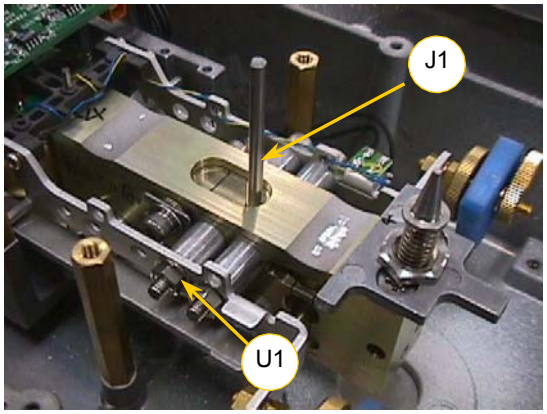


Fig. 2

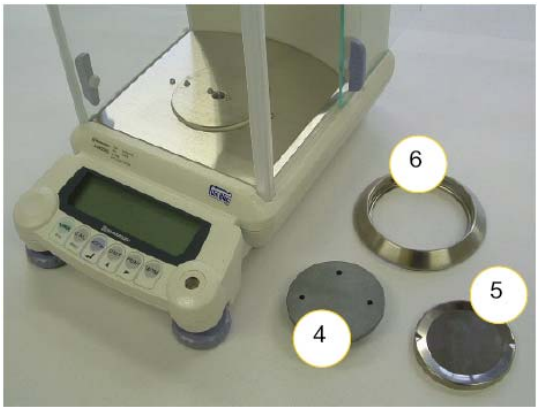
3) Apply the standard tightening torque in the table below using a torque driver when tightening, unless specified differently.

Screw Type	Tightening Torque [kgf x cm]
M2 or smaller	**2.5**
M2.5	**6**
M3	**9**
M4	**18**
M4 Hexagon socket head bolt	**30**
M5 Hexagon socket head bolt	**40**

[Moving the Balance]

1) Take out Anti-draft ring (6), Pan (5), and Pan supporter assy (4) when moving the balance (Fig.3). Make certain not to give any impact when placing the balance on the table.

Fig. 3



4.2 Balance Internal Inspection

[Preliminary Check]

1) Check the balance performance to confirm whether it is working correctly.

2) Enter the service menu (refer to **1.1**), check the following.

[**Check1**]: Check the bAt reading (power source voltage AD value).

bAt = 11.0 to 13.0

→ If the reading is out of this standard range, the power source voltage of the AC adapter/electrical system is abnormal.

[**Check2**]: Check the tAd reading (temperature AD value). If it is within the standard range, check if the reading drifts gradually according to the temperature.

tAd = 400,000 to 700,000 (+8000 [tAd] = -1[°C])

→ If the reading has drifted from the standard range, or if the reading does not change, the temperature sensor is not working correctly.

[**Check3**]: Check the **wAd** reading. Check the 'Zero' and sensitivity are within the below ranges; check the repeatability/deviation.

Model	wAd	
	Zero	Loaded
ABT 220-5DM	Approx. 6,000,000-7,000,000	Approx. 46,000,000-47,000,000 (200g)
ABT 120-5DM	Approx. 12,000,000-14,000,000	Approx. 52,000,000-54,000,000 (100g)
ABT 320-4M	Approx. 8,000,000-9,000,000	Approx. 56,000,000-57,000,000 (300g)
ABT 220-4M	Approx. 6,000,000-7,000,000	Approx. 46,000,000-47,000,000 (200g)
ABT 120-4M	Approx. 12,000,000-14,000,000	Approx. 52,000,000-54,000,000 (100g)

→ This table shows the criterion for inspection before shipping. If the mechanical or electrical failure exists, wAd values will be largely out of the range and do not change smoothly corresponding to the load on the pan.

[Procedure of Internal Inspection]

1) Disconnect the AC adapter. Remove the anti-drift ring (6), pan (5), and pan supporter assy (4) from the weighing chamber.
2) Remove the two M2.5 x 6 SEMS screws (9), detach the anti-draft plate (11) (Fig. 5).
3) Remove the four M3 x 5 Truss screws (28) locking the balance rear panel (8), detach the rear panel (8). Disconnect the cable (sensor, 12-pin)(U26) from the main board assembly(C42) (Fig. 6).
4) Remove the single M4 x 45 hexagon socket head bolt (17) from the case assy rear panel (Fig. 7).

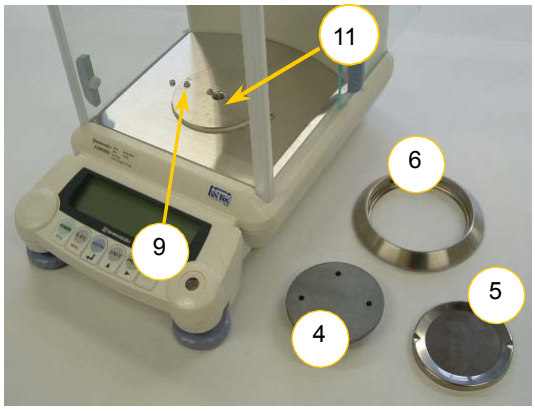


Fig.4

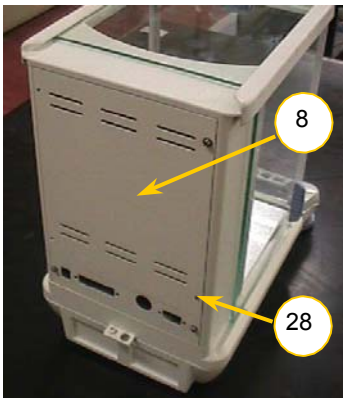


Fig.5

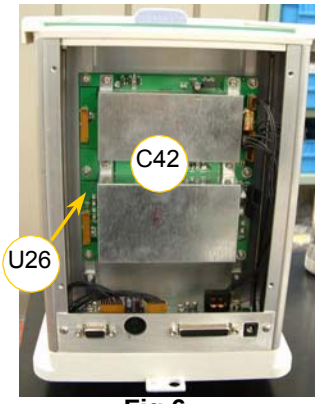


Fig.6

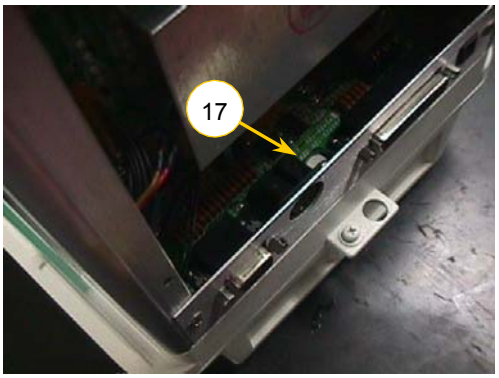


Fig.7

5) Position the balance on top of a workbench with the front display section protruding just over the edge, as shown in Fig. 8. Remove the two M4 x 30 SEMS screws (16) from the balance bottom panel. Disconnect the cable (W13) and cable (W17) from Display Board (C40) and dismount the Weight Loader Assy (B11) and Case Assy (3). (Fig. 8)

Warning! After M4X30 screws removing, move the balance to initial position.
Warning! Be careful not to drop Case Assy when disconnect cable (W13), and cable (W17).

6) Remove the eight M3 x 6 SEMS screws (B19), detach the unit cover (B14) (Fig. 9).

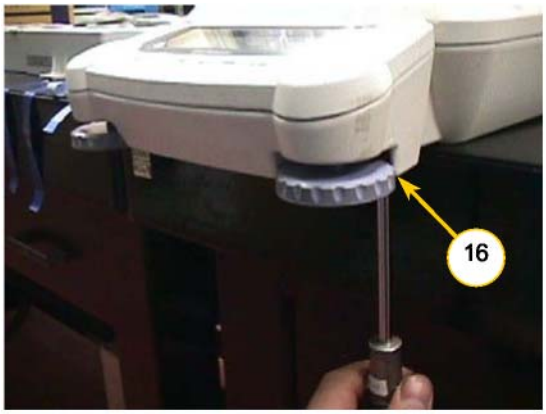


Fig.8

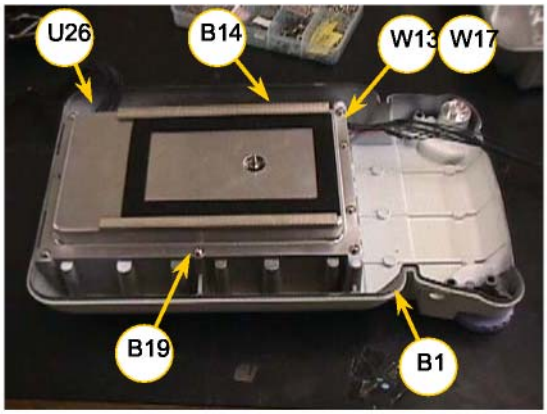


Fig.9

[Check4]: Check the Stopper plate (U6) and Lever pin (U51) do not come into contact with each other and there is no dust between them. (Fig. 10)

→ If there is contact or dust, loosen the two M3 x 6 screws (U20) and adjust the Stopper plate (U6) position. Remove any dust.

[Check5]: Check there is no earth leakage from Force coil assy (L4) and the wires are intact and not broken. (Connect multimeter test leads to the coil frame and relay terminals, check there are no signs of earth leak or broken wires.)
→ If there is an earth leak or broken wires, replace with a new Force coil assy (L4).
(See 4.4. Unit Assy Disassembling/Assembling)

[Check6]: Check the solder of Detector Assy (U4) and Temperature sensor (U47) is in good condition. (Fig. 10)
→ If the solder condition is poor, rewire the Detector Assy / Temperature sensor.
Warning! MT: Yellow wire / MG: Blue wire

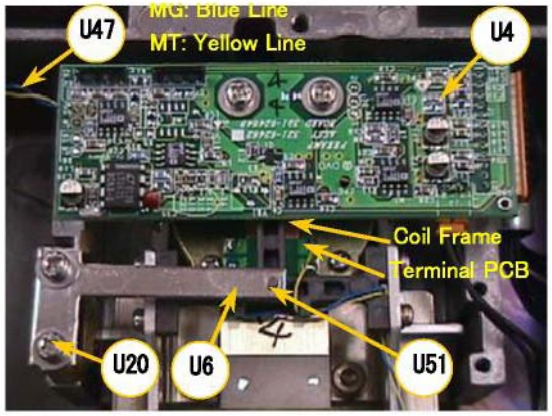


Fig.10

7) Remove the two M4 x 8 SEMS screws (B29), Remove the Weight stopper (B22) and take out Calibration weight (26) beneath it. (Fig. 11)
Warning! Do not damage Unit Assy (2) when removing Calibration weight (26).
Warning! Do not scratch or contaminate Calibration weight (26).

8) In Unit Assy (2), insert UniBloc protection pin (J1) of the Jig set into the lever-locking hole down to the scribed line (Fig. 13).
Warning! Insert the UniBloc protection pin (J1) by carefully lifting the Lever Assy (U1).
Avoid touching the elastic fulcrum.

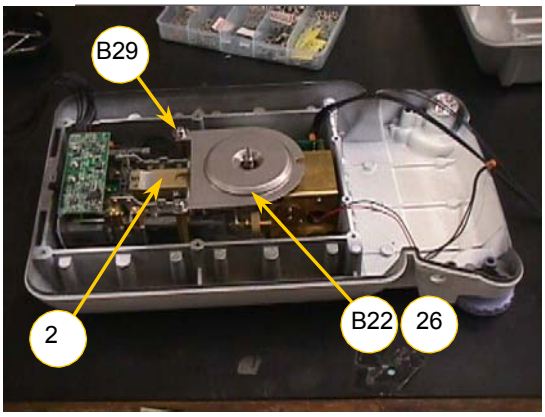


Fig.11

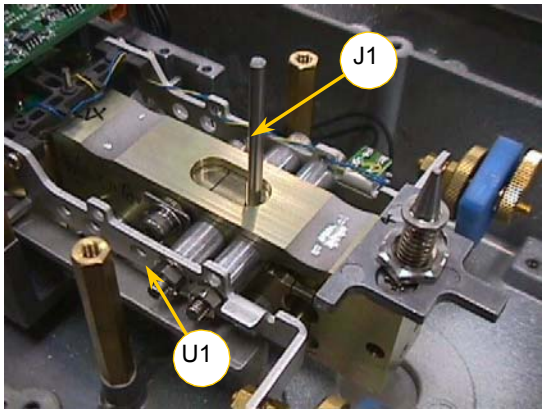


Fig.12

[Check7]: Check the Pt-Ni band (U14) solder is in good condition and the band is not twisted or bent (Fig. 13).
→ If the solder condition is poor, or if the band is twisted or bent, replace with a new Pt-Ni band.

[Check8]: Check Unit Assy (2) fulcrum spring, force point spring, and parallel guides are not bent or damaged (Fig. 13).
→ Replace Unit Assy (2). (See **4.3.5** Replacing Unit Assy (2).)

[Check9]: Check the calibration weight (26) is free of dust.
→ Remove dust.

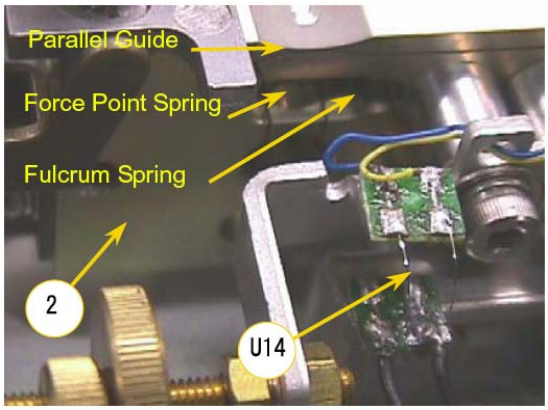


Fig. 13

[Assembling (after internal inspection)]

1) Remove UniBloc protection pin (J1) from the lever-locking hole in Unit Assy (2).
Warning! Remove the pin by carefully holding the lever assy (U1) horizontally. Do not touch or press the elastic fulcrum.

2) Gently place the calibration weight (26) around the Unit Assy's pan supporter shaft (53) and lock the weight stopper (B22) by the two M4 x 8 SEMS screws (B29) (Fig. 14).
Warning! Do not give any impact to the Unit Assy when removing or placing the calibration weight.
Warning! Do not scratch or contaminate the calibration weight.

3) Pull out cable (weight loader sensor, 7-pin)(W13), cable (weight loader motor, 2-pin)(W17), cable (detector, 12-pin)(U26) from the grooved section of the Base Assy (B1), as shown in Fig. 15. Lock unit cover (B14) to base (B1) by the eight M3 x 6 SEMS screws (B19). Avoid trapping the cables. (Fig. 15)

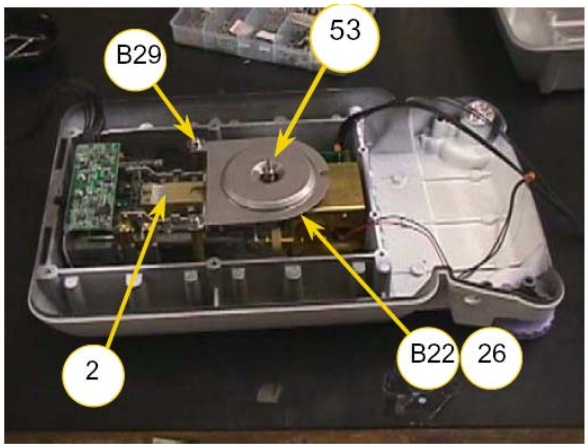


Fig. 14

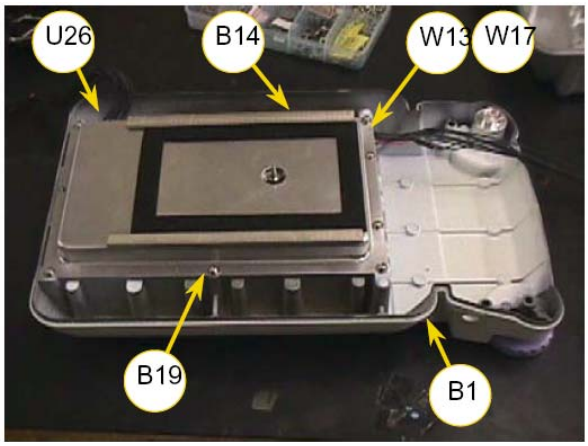


Fig. 15

4) Position Case Assy (3) on the left side of Base Assy (B1). Connect cable (weight loader sensor, 7-pin), (W13), and cable (weight loader motor, 2-pin)(W17) to Display board (C40) of Case Assy. Insert cable (detector, 12-pin)(U26) through the slot-hole in the rear panel of Case Assy (3).

5) Lower Case Assy (3) towards Base Assy (B1) - avoid trapping the cables. Position the balance on top of a workbench with the front display section protruding just over the edge, as shown in Fig. 16. Lock the balance bottom panel by the two M4 x 30 SEMS screws (16). (Fig. 16)

6) Connect cable (detector, 12-pin)(U26) to the Main Board Assy (C42)(Fig.17).

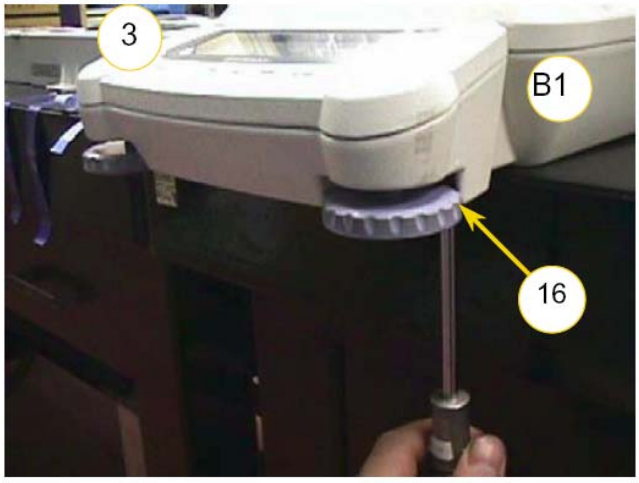
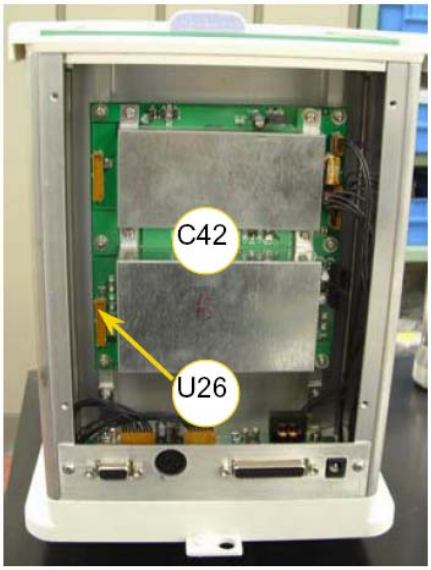


Fig. 16

Fig. 17



7) Lock Case Assy (3) by the single M4 x 45 hexagon socket head bolt (17) inside the rear case assembly frame. (Fig. 18)

8) Lock the rear panel (8) to rear frame of Case Assy (3) by the four M3 x 5 Truss screws (28). (Fig. 19)

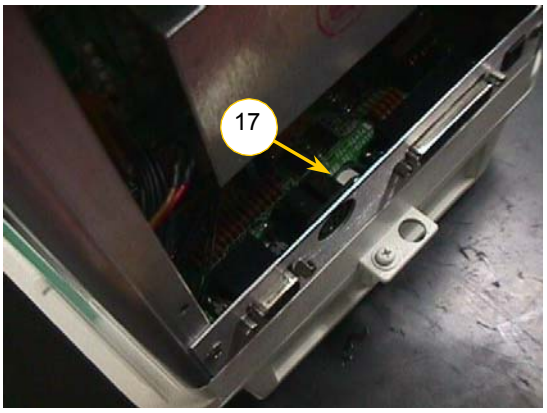


Fig.18

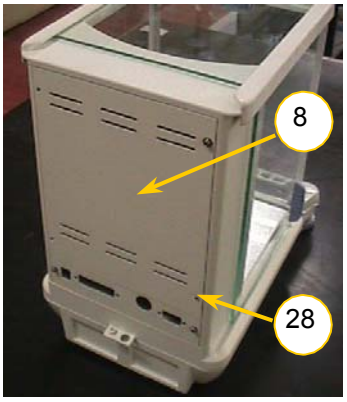


Fig.19

9) Position the anti-draft plate (11) with the positioning jig (J4), lock it by the two M2.5 x 6 SEMS screws (9). (Fig. 20)

10) Set the pan supporter assy (4), pan (5), and anti-draft ring (6) inside the weighing chamber. (Fig. 21)

11) Adjust the two level screws (B2) until the bubble of the level indicator is in the center of the red circle and the balance is level. Connect the AC adapter to the balance and check the balance operation.

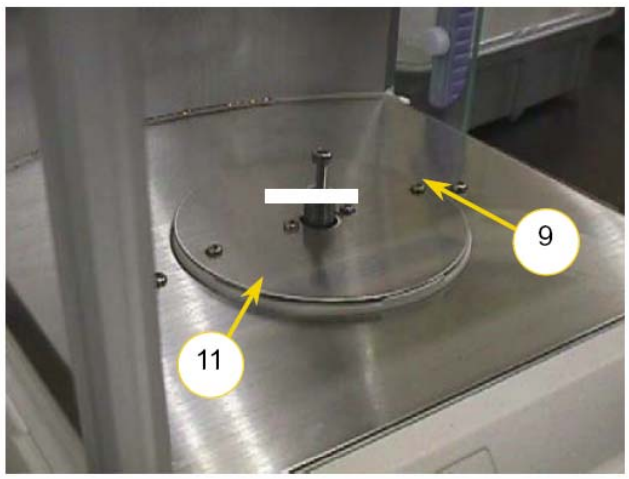


Fig. 20

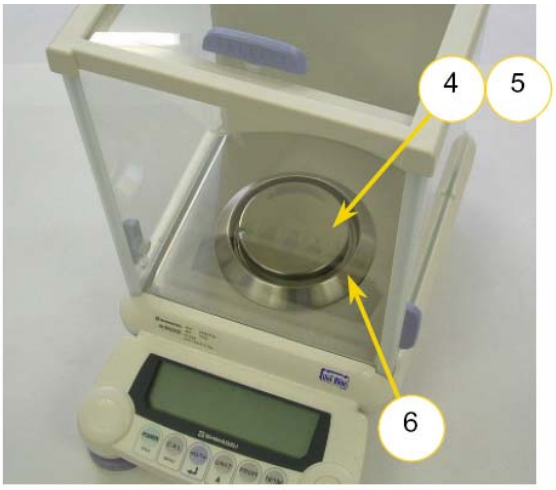


Fig. 21

4.3 Replacing Components

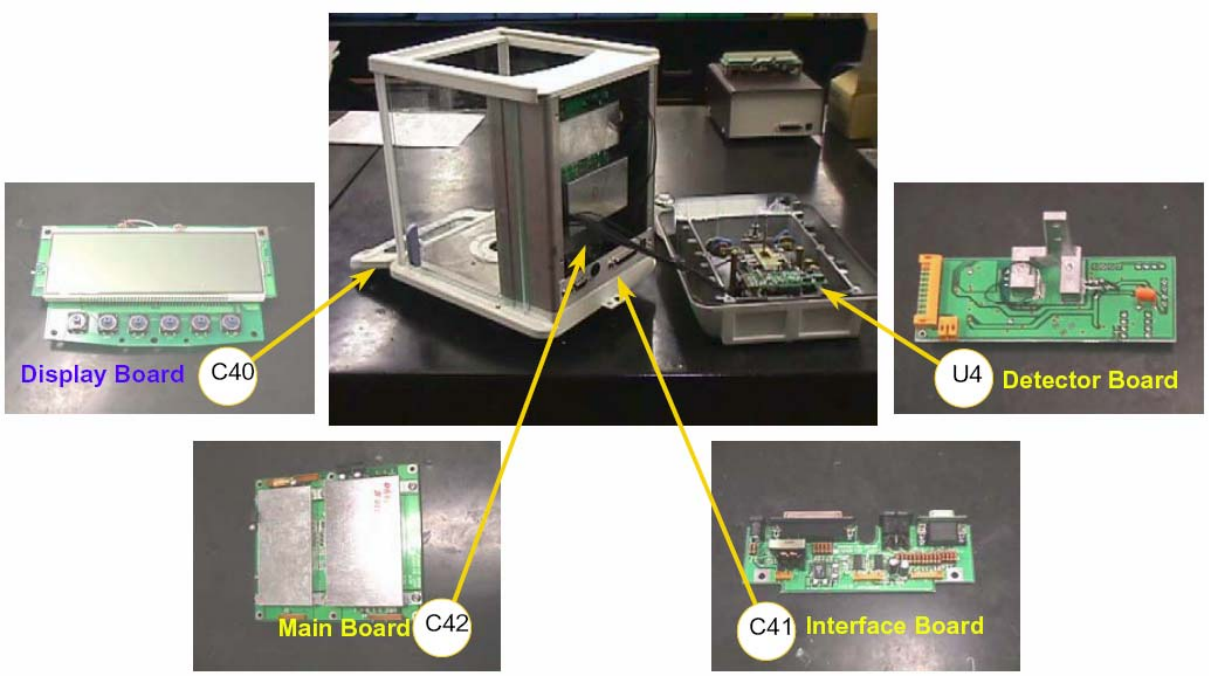


Fig.22

Table.2

Replacement Component	Adjustment / Inspection Requirements				
	Coarse-fine ratio adjustment	Calibration of built-in weights	Linearity	Tilt error	Calibration temperature characteristics
Main Board (C42)	Required	Required	Required	Not required	Not required
Interface Board (C41)	Not required	Not required	Not required	Not required	Not required
Display Board (C40)	Not required	Not required	Required (*1)	Not required	Required (*1)
Weight Loader Assy (B11)	Not required	Required	Not required	Not required	Not required
Unit Assy (2)	Not required	Required	Required	Not required	Required (*2)
Detector Assy (U4)	Not required	Required	Required	Not required	Not required
Force coil assembly (L4)	Not required	Required	Required	Required	Not required

*1: When you replace the display board (C40), install the EEPROM from the original display board (C40).
*2: When you replace Unit Assy (2), the characteristics data of it must be input to the balance. (See '**5.6** Using Data Edit Mode (Edit).)

4.3.1 Replacing Main Board Assy(C42)

1) Disconnect the AC adapter. Remove the pan (5), anti-draft ring (6), and pan supporter assy (4) from inside the weighing chamber.
2) Remove the four M3 x 5 Truss screws (28) locking the balance rear panel (8), detach the rear panel (8). (Fig. 23)
3) Disconnect the main board (C42) cable (4-pin)(C46), cable (10-pin)(C43), and cable (detector, 12-pin)(U26).
4) Remove the six M3 x 8 SEMS screws (C23), take out the main board (C42). (Fig. 25)
5) Attach the new main board (C42) by reversing above procedures 1) to 4)
6) Perform control parameter adjustment of Service Menu. (See.**1.2** Service Menu contents)
7) Adjust the linearity, calibrate the built-in weights, and perform span calibration.
(See '**5.2** Linearity Adjustment', '**5.4** Calibration of Built-in Weight (PCAL)', '**5.5** Span Calibration')

4.3.2 Replacing Interface Board Assy(C41)

1) Disconnect the AC adapter. Remove the pan (5), anti-draft ring (6), and pan supporter assy (4) from inside the weighing chamber.
2) Remove the four M3 x 5 Truss screws (28) fixing the balance rear panel (8), detach the rear panel (8). (Fig. 23)
3) Remove the two M3 x 5 Truss screws (28) fixing the balance rear I/F panel (15). (Fig. 24)
4) Remove the two M3 x 8 SEMS screws (C23) inside the balance rear frame. (Fig. 24)
5) Pull out Interface Board (C41). Disconnect the cable (4-pin)(C46), cable (9-pin)(C44), and cable (8-pin)(C45). (Fig. 25)
6) Remove the four connector screws (C26) fixing the external key connector (15-pin) and RS-232C connector (D-Sub25 pin) and remove the I/F panel (15). (Fig. 25)
7) Attach the new interface board (C41) by reversing above procedures 1) to 6).

4.3.3 Replacing Display Board Assy (C40)

1) Separate Base Assy (B1) and Case Assy (3) by following the procedures 1) to 5) in '**4.2** Balance Internal Inspection' [Disassembling].
2) Remove the four M3 x 5 Truss screws (28) fixing the balance rear panel (8), detach the rear panel (8). (Fig. 23)
3) Disconnect the cable (9-pin)(C44), cable (8-pin)(C45) and cable (10-pin)(C43) from Display Board (C40). (Fig. 26)
4) Remove the five M3 x 8 SEMS screws (C23) from Case Assy (3) display unit, detach the Display Board (C40). (Fig. 26)
5) Remove the six switch spacers (pipe shaped) from Display Board (C40).
6) Move the EEPROM from the original display board (C40) to the new display board (C40).
7) Mount the new display board by reversing above procedures 2) to 5).
Warning! When mounting Display Board, place it in the direction of the arrow in Fig. 26.

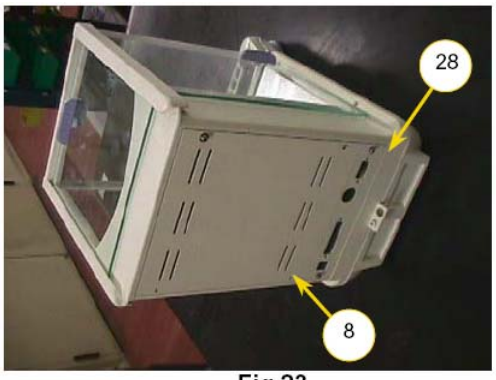


Fig.23

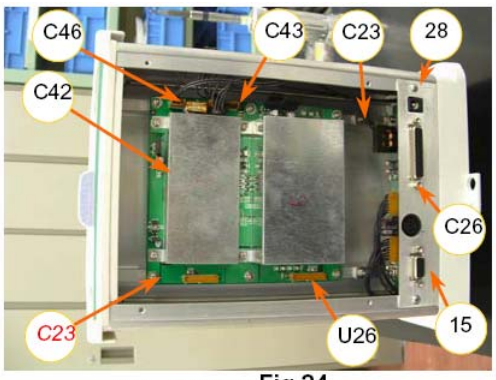


Fig.24

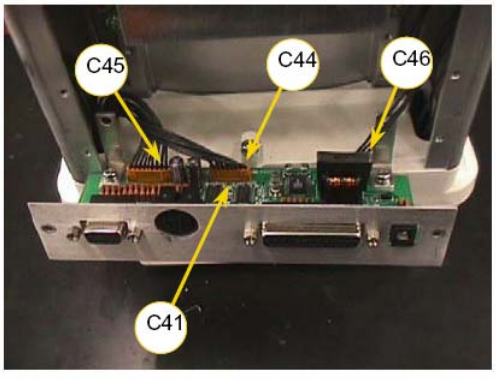


Fig.25

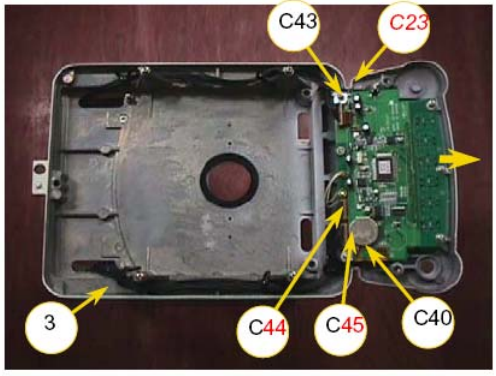


Fig.26

4.3.4 Replacing Weight Loader Assy (B11)

1) Separate the base assembly (B1) and case assembly (3) by following procedures 1) to 8) in '**4.2** Balance Internal Inspection [Assembling,(after internal inspection)] and remove Calibration weight.
2) Unscrew the four M4 x 8 SEMS screws (B29), take out the weight loader assembly (B11). (Fig. 28)
3) Attach the new Weight Loader Assy (B11) by reversing above procedures 1) to 2).
   Warning! Attach the Weight Loader Assy (B11) by using Unit Assy (2) cell width as a left/right position location guide(Fig.27-1.

4.3.5 Replacing Unit Assy (2)

1) Separate Base Assy (B1) and Case Assy (3) by following procedures 1) to 8) in '**4.2** Balance Internal Inspection' [Disassembling], remove Calibration weight.
2) Rest the balance on its rear panel, remove the three M5 x 12 (B16) hexagon socket head bolts from Base Assy (B1), and dismount Unit Assy (2). (Fig. 28)
   Warning! Hold Unit Assy only in the rear part, which is fixed to Base Assy.
3) Set the new Unit Assy and then lock it by the three M5 x 12 (B16) hexagon socket head bolts to the Base Assy. (Fig. 28)
4) Couple and fix Base Assy (B1) and Case Assy (3) by reversing procedures 4) to 9) in '**4.2** Balance Internal Inspection' [Assembling].
   Warning! Attach Unit Assy (2) by using the lever of Weight loader assy (B11) as a left/right positioning guide.
5) Adjust the linearity, calibrate the built-in weights, and perform span calibration. (See **'5.2** Linearity Adjustment', **'5.4** Calibration of Built-in Weight (PCAL)', **'5.5** Span Calibration')

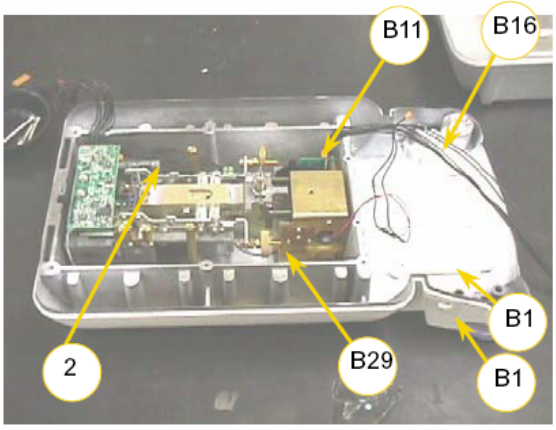


Fig.27

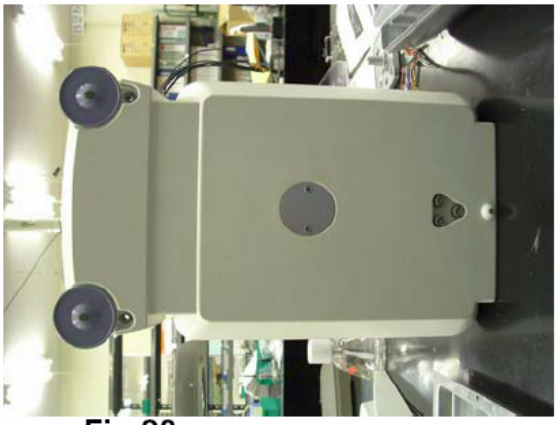
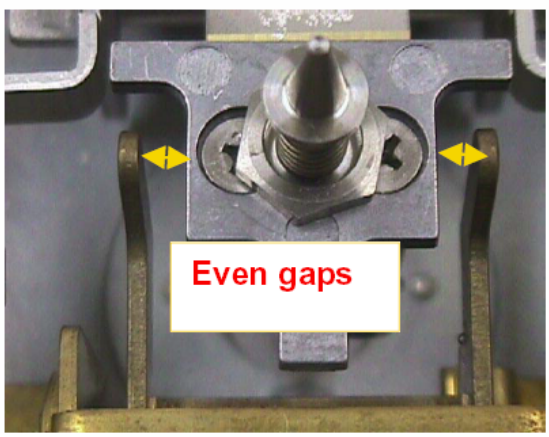
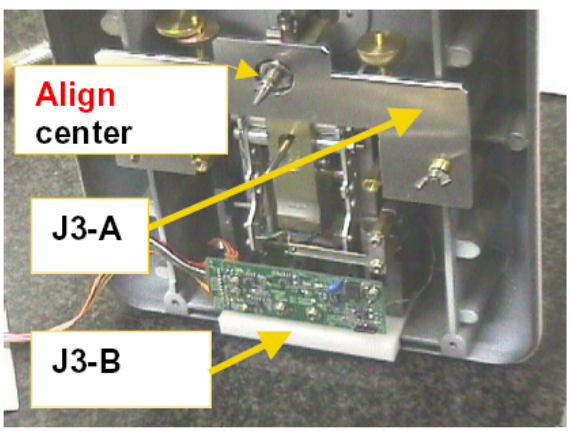


Fig.28

Fig.27-1

Fig.28-1





4.4 Unit Assy (2) Disassembling/Assembling (Force Coil Assy (L4), Detector Board Assy (U4) Replacement)

[Disassembling]

1) Dismount Unit Assy (2) from Base Assy (B1) by the procedure described in '**4.3.5** Replacing the Unit Assembly (2)'.
2) Disconnect the cable (sensor, 2-pin)(U35) from Detector Board assy (U4), connect the cable (detector, 12-pin)(U26) to Main Board assy (C42). (Fig. 30)

[Check10]: Turn ON the power, connect a voltmeter to the check pins (CP1 and CPG) of Detector Board assy (U4) and check the outputs.
→ If the output symmetry has drifted from the standard value, adjust the height of Detector Board assy (U4). (Fig. 31)
Criteria: Difference of absolute values of voltage + and - sides : within 0.5 V

Warning! Connect the test leads as shown in Fig. 31. While pressing and holding down the balance weight shaft end ((A) in Fig.31) of Unit Assy gently, adjust the height of Detector Board assy until the output reading shows '-(minus value)'.
Reference:. Detector output (CP1,CPG)= (+,-) 0.5 - 3.0V

3) Remove the solder of the cable of temperature sensor (U47) connected to the Detector Board assy (U4). (Fig. 31)
4) Release the wire clamp (U27) holding the cable (sensor, 2-pin)(U35) and cable (sensor,12-pin)(U26). Remove the two P3 M3 x 8 SEMS screws (U36), take off the Detector Board assy (U4). (Fig. 30,31)
Warning! When removing Detector Board assy, be careful not to damage the elastic fulcrum by hitting the end of the lever assembly (U1) with Detector Board assy.
5) Remove the solder from the two Pt-Ni bands (U14) on Lever Assy (U1) side. (Fig. 30)
Warning! Do not bend or scratch the Pt-Ni band.

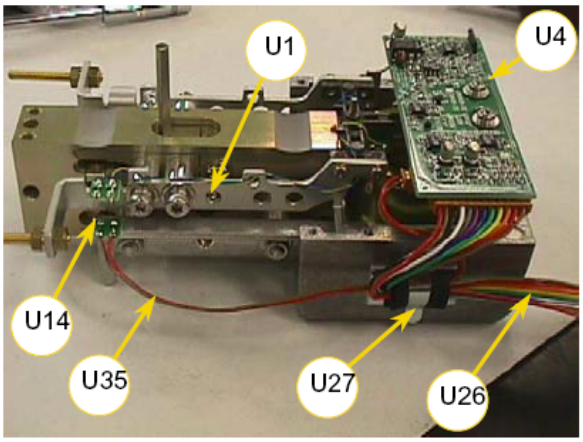


Fig.30

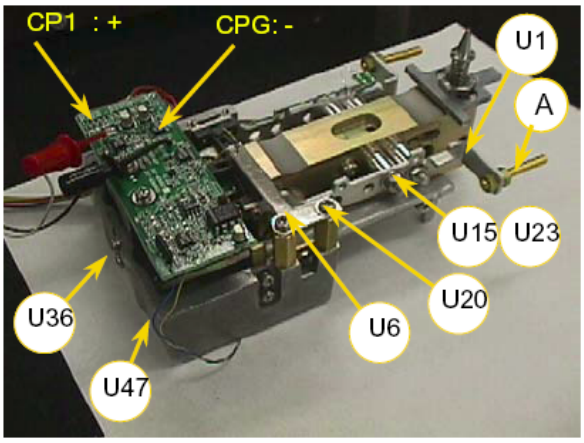


Fig.31

(Photos are for parts identification purpose only.)

6) Remove the four M2.5 x 6 screws (U30), slide out the four Magnet covers (U29). (Fig. 32)

[Check11]: Check if the Force Coil Assy (L4) and Magnet Assy (U4 (beneath U29)) are not in contact with each other and there is no dust between them.

→ If it is in contact, align the center of Force Coil Assy (L4) to the center of Magnet Assy (U41). If there is any dust on them, dismount them, clean and then reassemble.

7) Loosen the two M4 x 55 (U15) hexagon socket head bolts and M4 nuts (U23). (Loosen only.)

8) Remove the two M3 x 6 screws (U20), take off the stopper plate (U6). (Fig. 31)

9) Remove the two M3 x 8 SEMS screws P4 (U19), take out the Lever stopper (U7). (Fig. 32)

10) Remove the two M4 x 55 (U15) hexagon socket head bolts and M4 nuts (U23), take out Lever Assy (U1) from the top of the unit.

11) Remove the solder from the twisted wire (L14) connected to Force Coil Assy (L4). (Fig. 33)

12) Remove the M2.5 x 6 screw (L10), PB SPG M2.6 washer (L11), take out Force Coil Assy (L4). (Fig. 33)

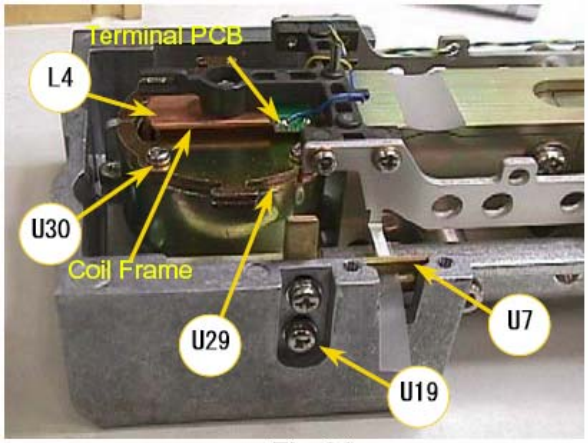


Fig.31

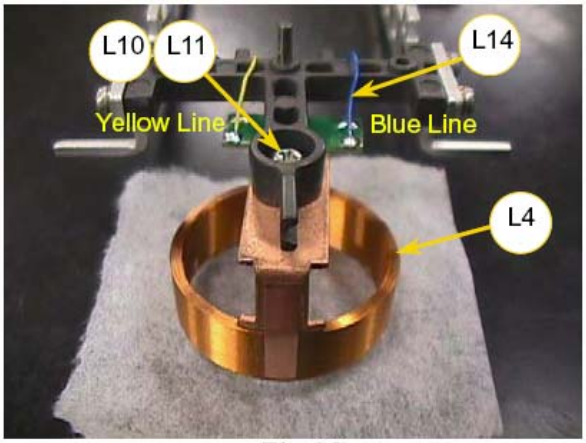


Fig.32

[Assembling]

Warning! UniBloc protection pin (J1) must be inserted in the (new) UniBloc sensor (Refer to disassembling).

1) Attach the new Force Coil Assy (L4) temporarily to Lever Assy (U1) by the M2.5 x 6 screw (L10) and PB SPG M2.6 washer (L11), solder twisted wires (L14) to the Force Coil Assy (L4). (Fig. 32)

Warning! Force Coil Assy's left-side: Yellow wire / right-side: Blue wire (Fig.32).

2) Remove any dust off Force Coil Assy (L4) using adhesive tape.

3) Check if there is no electric leakage from Force Coil Assy (L4) and the wires are not broken.

(Connect a multimeter test leads to the coil frame and relay terminal patterns, check there are no sign of leakage or broken wires.) (refer to CHECK 5)

4) With the Force Coil Assy (L4) located at the correct height using the Force coil positioning jig (J2), insert Lever Assy (U1) from the top of the unit, then,

5) Inserting the gap setting shim (J3) between Lever limit bar (U52, Compenents2) and Lever stopper (U7), temporarily lock Lever stopper (U7) in position by the two M3 x 8 screws (U19). (Fig.34)

6) Position the hole of Stopper plate (U6) at the center of Lever pin (U51, Components2). Lock Stopper plate (U6) temporarily in the position by the two M3 x 6 screws (U20). (Fig. 37)

7) Lock Lever Assy (U1) in the position with the two M4 x 55 hexagon socket head screws (U15) and M4 nuts (U23). (Fig. 35)
Warning! Insert the M4 x 55 hexagon socket head screws (U15) in the direction shown in Fig. 35 (Bolt head should be this side in the photo.)
Warning! :Tightening torque:18kgxcm

8) Look through the top of the unit. Align the centers of Magnet Assy (U41) and Force Coil Assy (L4). Lock Force Coil Assy (L4) by the M2.5 x 6 screw (L10) and PB SPG M2.6 washer (L11). (Fig. 33)

9) Remove any dusts on the four Magnet covers (U29). Slide each one into position and lock them by the four M2.5 x 6 screws (U30). (Fig. 34)

10) Depending on the needs, loosen and lock Lever stopper (U7) in position by the two M3 x 8 screws (U19) again (Fig. 34), inserting the gap setting shim (J3) between Lever limit bar (U52, Compenents2) and Lever stopper (U7).

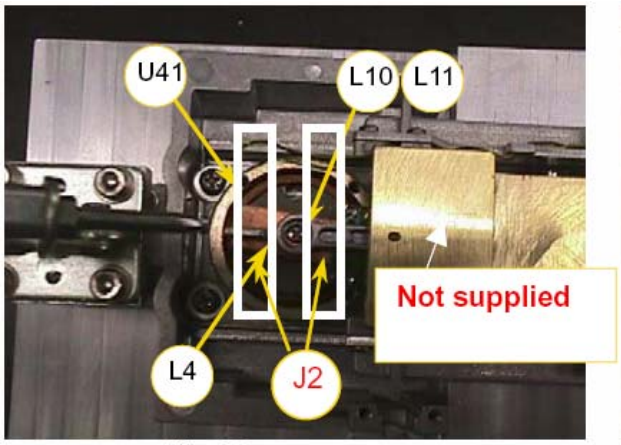


Fig.33

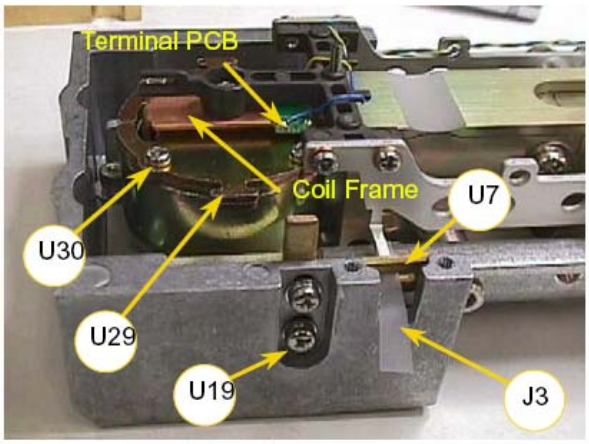


Fig.34

11) Solder the two Pt-Ni bands (U14) on the Lever Assy (U1) side. (Fig. 35)
Warning! When soldering, tilt it upward to avoid the Pt-Ni band contacting Lever Assy (U1).

12) Loosen Stopper plate (U6) again. Remove UniBloc protection pin (J1) from Unit Assy (2). Then, position the hole of Stopper plate (U6) at the center of Lever pin (U51). (Fig. 36) Tighten the two M3 x 6 screws (U20) gradually while moving Lever Assy up and down at the balance weight shaft end (A in Fig.36) so that Stopper plate (U6) can be fixed without contact with Lever pin (U51). Lock it in position by the screws (U20).

13) Attach Detector Board Assy (U4) temporarily by the two P3 M3 x 8 SEMS screws (U36), clamp cable (detector, 12-pin)(U26) and cable (sensor, 2-pin)(U35) by the wire clamp (U27). (Fig. 35)
Warning! Clamp the cable (detector, 12-pin) (U26) so that it does not move even when pulled by the end.

14) Solder the temperature sensor (U47) cable to Detector Board Assy (U4). (Fig. 36)
Warning! MT: Yellow wire / MG: Blue wire

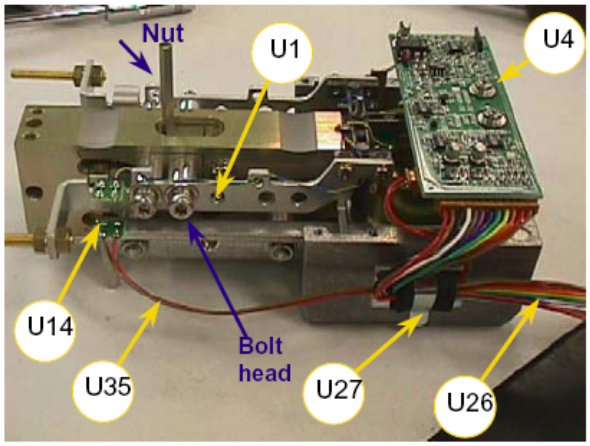


Fig.35

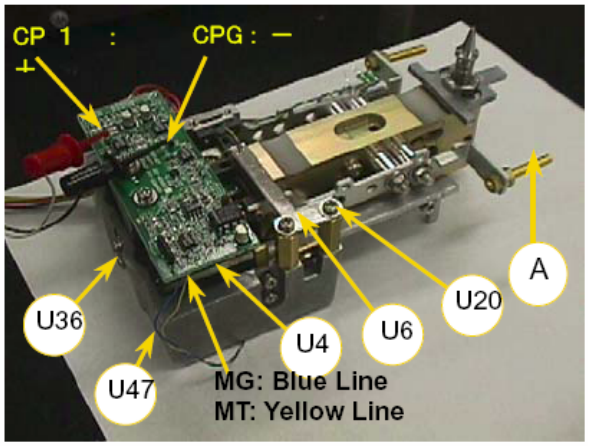


Fig.36

15) Gently shake Unit Assy (2) holding the outer die-cast part. If the Lever Assy (U1) makes a clear sound with resonance as it strikes Lever stopper (U7), the assembling of Unit Assy (1) is complete.
Warning! If a clear sound cannot be heard, it is possible that Lever pin (U51) and Stopper plate (U6), or Force Coil Assy (L4) and Magnet Assy (U41) are contacting or having dusts. In such cases, readjusting the positions are required.

16) Proceed to '**5.1.1** Adjusting the Height of Detector Board Assembly (U4)'.
17) Attach Unit Assy (2) to Base Assy (B1) by reversing the procedures described in '**4.3.5** Replacing Unit Assy'.
18) Proceed to '**5.1.2**, **5.1.3**, **5.1.4**' (adjustments).
19) When Unit Assy (2) has been replaced, input the characteristics data of the new Unit Assy (2) into the balance. (See '**5.6** Using Data Edit Mode (Edit).)
20) Adjust the linearity, calibrate the built-in calibration weight, and perform span calibration.
(See **'5.2** Linearity Adjustment', **'5.4**. Calibration of Built-in Weight (PCAL)', **'5.5** Span Calibration…')

4.5 Case Assy (3) Components Replacement

[Disassembling]

1) Open the Glass door. Take out Knob (C39) of the other Glass door(s) from inside the weighing chamber. Remove the side Glass Door Assy (left)(C4), (right)(C5) and Glass Door Assy (top) (C38) from the rear of Case Assy (3).
2) Remove Door Rail (left)(C9), (right)(C8) from Case Assy (3).
3) Separate Base Assy (B1) and Case Assy (3) by following procedures 1) to 5) in '**4.2** Balance Internal Inspection' [Disassembling].
4) Turn over Case Assy (3). Remove the two M4 nuts (C22) and separate the case (C1) and case roof (C51). (Fig. 38)
Warning! Be careful not to let Front Pillar (C35) and Front Glass (C3) fall over during operation.

[Assembling]

1) Turn the case over on its roof (C51). Insert Front Glass (C3) into the grooved section in the case roof (C51) and the two Front Pillars (C35) into both sides in the direction shown in Fig. 37.
2) Place the case (C1) on the case roof, lock it by engaging the M4 nuts (C22) with the two threaded rods (C52). (Fig. 37)
Note: Tightening torque 18 [kgf·cm]
3) Lock Base Assy (B1) and Case Assy (3) by following procedures 4) to 9) in '**4.2** Balance Internal Inspection' [Assembling].
4) Mount Door Rails (left)(C9), (right)(C8) to the rail grooves in Case Assy (3).
5) Insert Glass Door Assy (left)(C4), (right)(C5), roof glass set (C38) from the rear of Case Assy (3). Attach Knob(s) (C39) inside the weighing chamber.

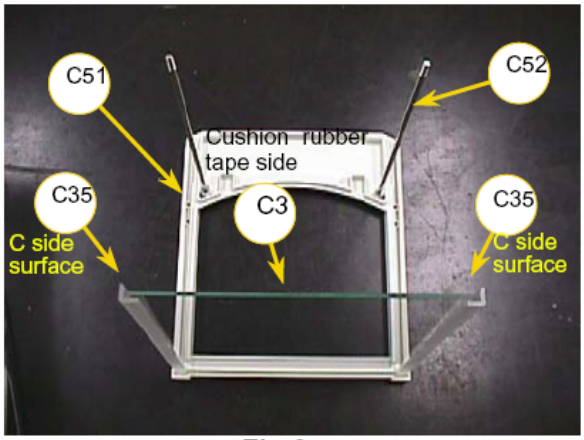


Fig.37

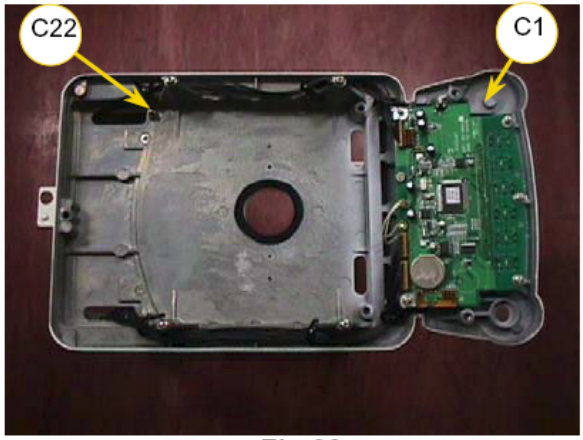


Fig.38

5 Adjustments

5.1 Physical Adjustments of Unit Assy

5.1.1 Adjusting the Height of Detector Board Assy (U4)

1) Remove Unit Assy (2) from Base Assy (B1) by following the procedure described in '**4.3.5** Replacing the Unit Assembly (2)'.

2) Disconnect Cable (sensor, 2-pin)(U35) from Detector Board Assy (U4), connect Cable (detector,12-pin)(U26) to Main Board Assy (C42).

3) Connect the voltmeter (+) terminal to Detector Board Assy (U4) CP1 pin and the voltmeter (-) terminal to the CPG pin.

4) Remove UniBloc protection pin (J1) from the lever-locking hole in UniBloc of Unit Assy (2).

5) Connect the AC adapter to the balance, turn ON the power.

6) Slightly loosen the two P3 M3 x 8 SEMS screws (U36) fixing Detector Board Assy (U4). Move Lever Assy (U1) up and down gently holding the balance weight shaft (A in Fig.31, **4.4**). Movement is limited as Lever limit bar (U52) hits Lever stopper (U7). Lock Detector Board Assy (U4) by the two P3 M3 x 8 SEMS screws (U36) in the position where the voltmeter reading changes (+)/(-) between the "up" and "down" positions of Lever Assy. (Fig. 1) When pressing Lever Assy down, it must show (-) value in voltage.

Detector Board Assy output adjustment standard: The difference of the absolute values of (+) and (-) sides must be within 0.5V.
(Acceptable voltage: 0.5V – 3.0V)
Warning! Connect the test leads as shown in Fig. 40. First, press down balance weight shaft, and adjust until the output reading shows '-'.

7) Disconnect the voltmeter test leads from Detector Board Assy (U4).

8) Disconnect the balance AC adapter, disconnect Cable (detector, 12-pin)(U26) from Detector Board Assy (U4). Connect the cable (sensor, 2-pin)(U35).

5.1.2 Tilt Error Adjustment

1) Separate Base Assy (B1) and Case Assy (3) by following procedures 1) to 8) in '**4.2** Balance Internal Inspection' [Disassembling] and remove Calibration weight.

2) Connect Cable (detector, 12-pin)(U26) to Main Board Assy (C42).

3) Remove UniBloc protection pin (J1) from the lever-locking hole in UniBloc of Unit Assy (2). Set Pan (5), Pan Supporter Assy (4) on the pan supporter shaft (53) of Unit Assy (2).

4) Adjust the two Level Screw (B2) until the bubble of Level indicator comes to the center of the red circle. Connect the AC adapter to the balance.

5) Insert a 1mm thick plate under the foot at the center rear of the balance. Steady the balance (with the right Level Screw raised off the workbench surface) and read the display.

6) If the adjustment standard (see '**2** Performance Check' 'Table 1. Inspection Standard List') is not met, insert UniBloc protection pin (J1) into the lever locking hole in UniBloc of Unit Assy (2), loosen the balance weight (L16) locking the gravity centering counterbalance (L15) (eccentric shaped counterweight) of Lever Assy (U1).

7) If the reading is (+), shift the gravity centering counterbalance (L15) eccentricity down. If the reading is (-), shift the gravity centering counterbalance (L15) eccentricity up.

8) When adjustment is complete, lock the gravity centering counterbalance (L15) by the balance weight (L16). (Fig. 2)

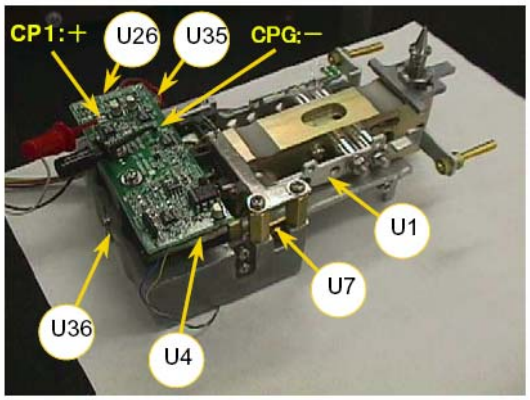


Fig.1
(Photos are for parts identification purpose only.)

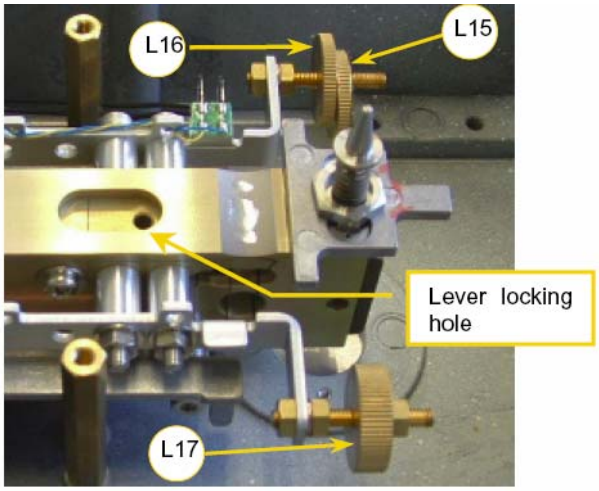


Fig.2

Warning!: After completion of the adjustments, the adjustment conditions of both "Tilt error adjustment" and "Balancing adjustment" must be met at the same time.

5.1.3 Balancing Adjustment

1) Separate Base Assy (B1) and Case Assy (3) by following procedures 1) to 8) in '**4.2** Balance Internal Inspection' [Disassembling] and remove Calibration weight(26).

2) Connect Cable (detector, 12-pin)(U26) to Main Board Assy(C42).

3) Remove UniBloc protection pin (J1) from the lever-locking hole in UniBloc of Unit Assy (2). Set Pan supporter assy (4) and Pan (5) on Pan supporter shaft(53) of Unit Assy (2).

4) Adjust the two Level Screws (B2) until the bubble comes to the center of the red circle. Connect the AC adapter to the balance.

5) Enter Service Menu and display "wAd". (See '**1.1** Entering Service Menu'.)

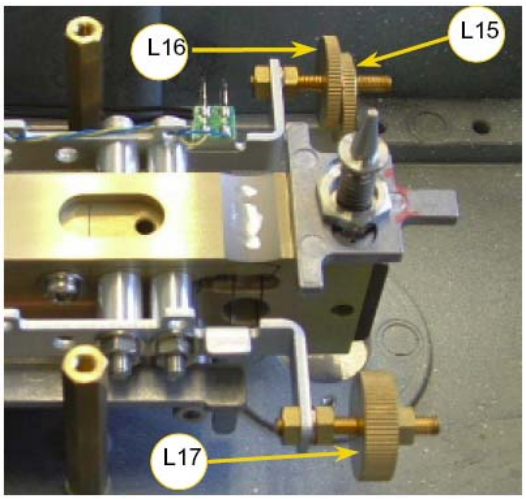
6) If the values are outside the "Balance Adjustment Guide" in Table 1, insert UniBloc protection pin (J1) into the lever locking hole in UniBloc of Unit Assy (2), loosen the nut locking the balance weight (L17) of Lever Assy (U1).

7) If the display reading is (+) slide the balance weight (L17) to the right (in Fig. 2). If the display reading is (-) slide the balance weight (L17) to the left.

8) When the adjustment is complete, lock the balance weights (L17). (Fig. 2)

Table 1 Balancing Adjustment standard

Model	wAd	
	Zero	Weight loaded
ABT 220-5DM	Approx. 6,000,000-7,000,000	Approx. 46,000,000-47,000,000 (200g)
ABT 120-5DM	Approx. 12,000,000-14,000,000	Approx. 52,000,000-54,000,000 (100g)
ABT 320-4M	Approx. 8,000,000-9,000,000	Approx. 56,000,000-57,000,000 (300g)
ABT 220-4M	Approx. 6,000,000-7,000,000	Approx. 46,000,000-47,000,000 (200g)
ABT 120-4M	Approx. 12,000,000-14,000,000	Approx. 52,000,000-54,000,000 (100g)



Warning!: After completion of the adjustments, the adjustment conditions of both "Tilt error adjustment" and "Balancing adjustment" must be met at the same time.

5.1.4 Corner Load Adjustment

(1) Follow steps 1) to 8) of '**4.2** Balance Internal Inspection' [Disassembling] to separate Case Assy (3) and Base Assy (B1). Remove Calibration weight (26). (Place Pan (5) back after this.)
(2) Connect Cable (detector, 12P) to Main Board (C42), and plug the balance to the power skipping the calibration.

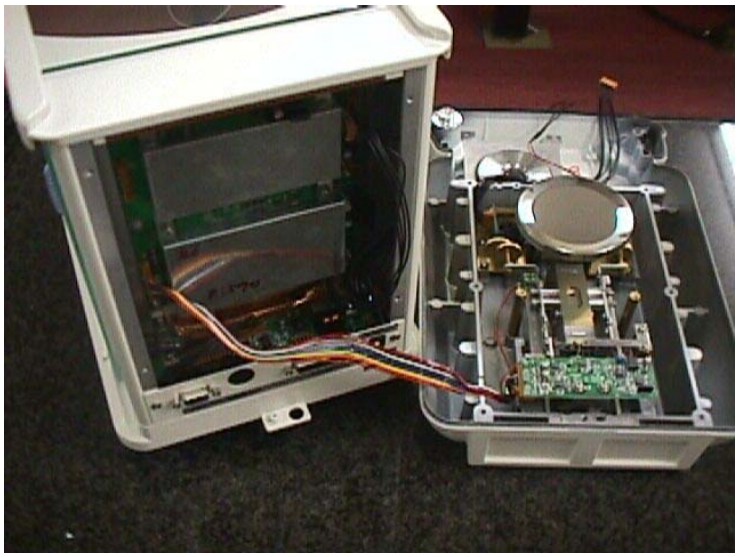


Fig.5

(3) Place external calibration weight(s) for corner load adjustment in the center of the pan, then press **[TARE]** key to zero the display. Zero tracking function must be turned off. For ABTxx-5DM series, only large range (0.1mg readability) is required for corner load adjustment. When reading the display, cover the mechanism to prevent influence of air flow (Fig.6).

(4) Move the weight(s) to the directions of left, right, front, back and record the readings. (L) (R) (F) (B)

For each position, place the weight just inside the inner circle of Pan. (Fig.6)

Warning: When UniBloc has been irreversibly damaged, this corner load adjustment will not bring it back to adjustment standard. In such case, replacement of Unit Assy is necessary. Excessive grinding in this adjustment also damages UniBloc irreversibly. **If both B and F or both L and R show plus value corner load errors or both minus, it is NOT adjustable**. When repeatability at zero or zero-return performance is not normal, corner load adjustment cannot be effective.

(5) Grind slightly the flexure(s) of upper parallel part of UniBloc in Unit Assy according to the result of the above checking. Refer to Table A for the calibration weight value and adjustment standard of each capacity model. First adjust with the larger weight value so that Step 1 standard is met, then proceed to Step 2 with reduced weight value. Check and if necessary adjust further until Step 2 standard is met. Also follow the below-described procedure and warnings. The position(s) of UniBloc corresponding to the corner load error observed are to be ground off slightly by using the tool for corner load adjustment (J8 and J9 in the jig set). (Fig.7)

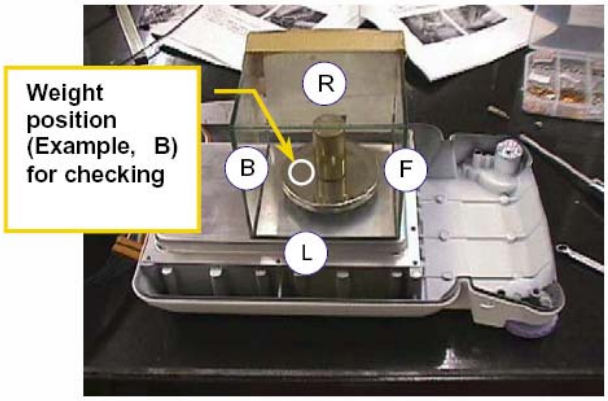


Fig.6

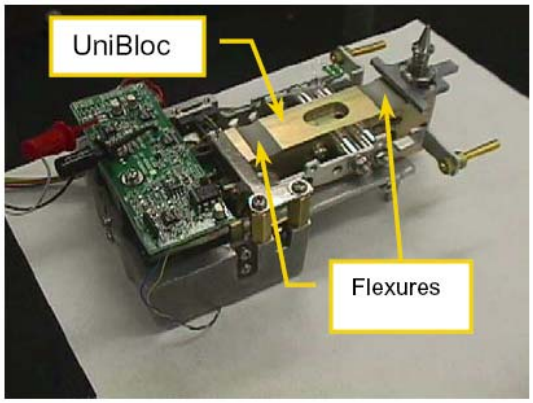


Fig.7

Adjustment procedure and warnings

Warning: Do not grind the areas within 3mm from the side edge of UniBloc, in order to prevent deformation of the edges.
Warning: Be careful not to bend the flexures of the block.
Warning: Metal dusts generated in this operation must be removed without falling and entering into the gaps of the mechanism. Use adhesive tape to remove them.

Warning: DO NOT grind at "X" positions! (within 3mm from the edge)

First, B---F direction, then, L---R direction. Start with a very slight grinding at "2" or "5" position and observe the change in corner load checking.

Warning: In this adjustment, the UniBloc is relatively less sensitive in the B---F direction. Corner load Shifts in the B---F direction require more grinding to the flexures than L---R direction's. The effect of adjustment of each axis is not completely independent to the other. Therefore, adjust B---F direction before L---R direction.

If a positive value shift is observed at B on the pan, grind at "2" first. If a positive value shift is observed at F on the pan, grind at "5" first.

After bringing the positive value shift at B or F within standard, proceed to adjustment in L---R direction.

If a positive value shift is observed at L on the pan, grind at "3" and "6". If a positive value shift is observed at R on the pan, grind at "1" and "4".

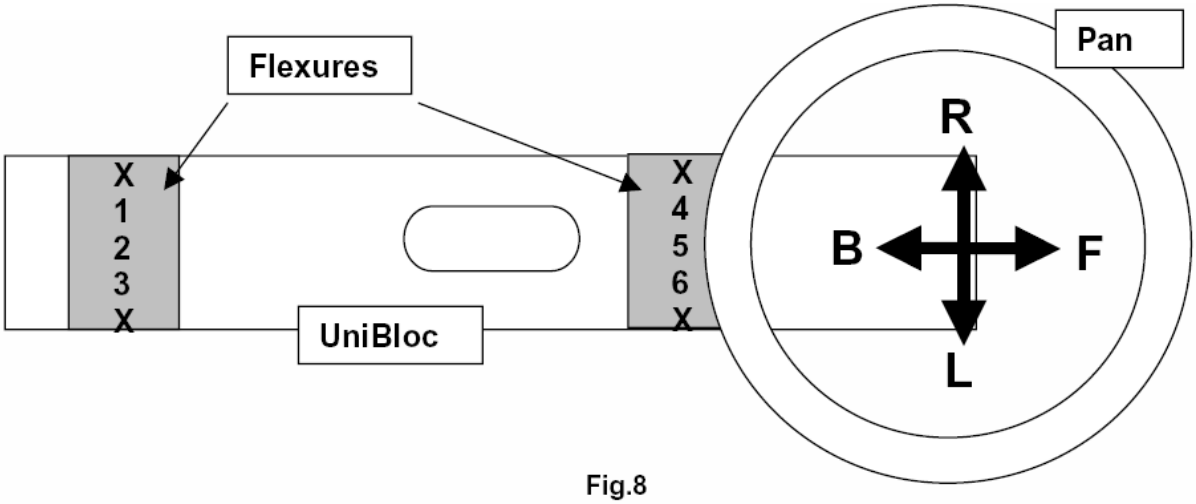


Fig.8

Table A (First adjust so that Step 1 standard is met, then proceed to Step 2 with reduced weight value)

Capacity	Calibration weight value for adjustment (**Step 1**)	Adjustment standard (**Step 1**) (Difference between L and R, between B and F must be within…)	Calibration weight value for adjustment (**Step 2**)	Adjustment Standard (**Step 2**) (Difference between L and R, between B and F must be within…)
320g	200g	0.5mg	150g	0.3mg
220g including ABT 220-5DM	200g	0.5mg	100g	0.3mg
120g including ABT 120-5DM	200g	0.5mg	50g	0.3mg

Warning: After Corner load adjustment: When corner load adjustment has been performed, mechanical balance of Unit Assy changes. Check Tilt error and mechanical balancing (according to **5.1.2** and **5.1.3**) after corner load adjustment and perform necessary adjustments. Linearity adjustment is also necessary after corner load adjustment. If the mechanism has not been stabilized, linearity adjustment may not be effective. After corner load adjustment, leave the balance for more than one hour to stabilize it before conducting linearity adjustment.

5.1.5 After Physical Adjustments

When parts have been replaced and necessary physical adjustments (instructed in **5.1**) have been performed, adjustments by software have to be performed. The procedure is:

a) Temporarily disable the error message function (to skip unnecessary error messages during adjustments, that would block further adjustment operation)
b) Control parameter adjustment (only when Main Board Assy has been replaced)
c) Linearity adjustment (external calibration weights are necessary, ABTxx-5DM models require computer connection and special software.)
d) Perform PCAL (calibration of the built-in calibration weight)
e) Power reset (the balance has to be plugged off once)
f) Resume error message function

<How to disable error messages>

1) Enter Service Menu (refer to **1.1**) and select “Edit”.
“00:XXXX” appears. (One “X” represents one hexa-decimal number, 0 to F)
The two digits left of “:” indicate the address in EEPROM. The right four digits are the data of the indicated address and the next address.
2) Pressing **[CAL]** key once moves to the display of the next two addresses. Repeat it until the address shown is “4A”.
3) The data here, “0100” has to be changed to “0000” to disable the error message function. The blinking digit can be changed. Use **[PRINT]** key to move the blinking digit. Use **[UNIT]** key to increase the number of the blinking digit. It changes in the order of “0,1,2,3…..9, A, b, C, d, E, F, 0,1, 2….”.
4) When “4A: 0000” is made up in the display (EEPROM has been rewritten already), press **[ON/OFF]** key to exit from “Edit”.
5) To exit from Service Menu, select “End” in Service Menu.

Note: Post a note saying “Error message is off!” until it is resumed later.

<How to perform control parameter adjustment>

1) Enter Service Menu (refer to **1.1**) and select “Pun Adj”.
2) Wait It automatically complete adjustments taking about two minutes, and rewrite the new parameters.
Never perform this adjustment when not necessary. If it is done, new linearity adjustment would be needed.

<How to perform linearity adjustment>

See **5.2** for ABTxx-4M series, **5.3** for ABTxx-5DM series.

<How to perform PCAL>

See **5.4**

5.2 Linearity Adjustment of ABTxx-4M Series Balances

5.2.1 Inputting the Linearity Adjustment Weight Values

1) Prepare the weights shown in Table 3.
2) Remove object(s) from the pan.
3) When "Lin-Set" is displaying in the service menu, press the **[TARE]** key to display the weight values in the order shown in Table 3.
4) Input the true values (corrected values) of the weights to be used by using the **[UNIT]** key and **[PRINT]** key.
5) After inputting the numeric value, press the [TARE] key to enter.
6) The next weight value is displayed. Input all the weight values by the same procedure.
Warning! Always input the weight value before conducting linear adjustment.

5.2.2 Linearity Adjustment

1) Prepare the weights shown in Table 3 to be used for conducting linear adjustment. Place the weights inside the weighing chamber in advance.
2) Remove object(s) from the pan.
3) When "Lin-Adj" is displaying in the service menu, press the **[TARE]** key to display the weight values in the order shown in Table 3.
4) Using long nose tweezers, load the displayed weight on the pan. When the stability mark illuminates press the **[TARE]** key.
5) Use the long nose tweezers to unload the weight from the pan. When the stability mark illuminates press the **[TARE]** key.
6) The display changes automatically. Span calibration is completed when the display returns to mass display.

Table 3 Calibration weights

Model	ABT 120-4M	ABT 220-4M	ABT 320-4M
Weights for Linearity Adjustment	30g 60g 90g 120g 130g	50g 100g 150g 200g 250g	50g 100g 150g 200g 250g 300g 350g

5.3 Linearity Adjustment of ABTxx-5DM Series Dual-range Balances

For the linearity procedure on all ABT 120-5DM and ABT 220-5DM semi micro balances, a special developed adjustment software is necessary.

The installation, the configuration and the adjustment itself require extensive service training.

In case a linearity process needs to be conducted, it is advisable to send the device back to KERN for the proper adjustment procedure.

5.4 Calibration of Built-in Weight (PCAL)

5.4.1 Inputting Conventional Mass Values of the External Calibration Weights to be Used in PCAL

(1) Prepare the calibration weight(s) to be used in calibrating shown in Table 4. Use calibration weights that have information of their conventional mass value.
(2) In Service Menu, select “PCAL SEt”. Press the **[TARE]** key at the “PCAL SEt” display. The currently set weight value is shown.
(3) Input the conventional mass values (marked values) of the weights to be used by using the **[UNIT]** key and **[PRINT]** key. When more than one calibration weight are used, the total conventional mass values that make up the designated load should be input. For ABTxx-5DM models, input the conventional mass value down to five decimals.
(4) After inputting the numeric value, press the **[TARE]** key to enter.

5.4.2 Performing Calibration of the Built-in Weight (PCAL)

Caution!: Input the conventional mass values of the external weights before calibrating the built-in weight (PCAL).
(1) Prepare the weights whose convention mass values have been inputted. Leave the weights inside the weighing chamber in advance.
(2) Confirm the pan is cleared.
(3) In Service Menu, select “PCAL”. Press the **[TARE]** key at the “PCAL” display. Then, the pre-set conventional mass value is shown.
(4) Using long nose tweezers, load the displayed weight on the pan. When the stability mark illuminates, press the **[TARE]** key.
(5) Use the long nose tweezers to unload the weight from the pan. When the stability mark illuminates press the **[TARE]** key.
(6) The display changes automatically thereafter. Calibration is completed when the display returns to mass display.

Table 4 Span Calibration Weight Values

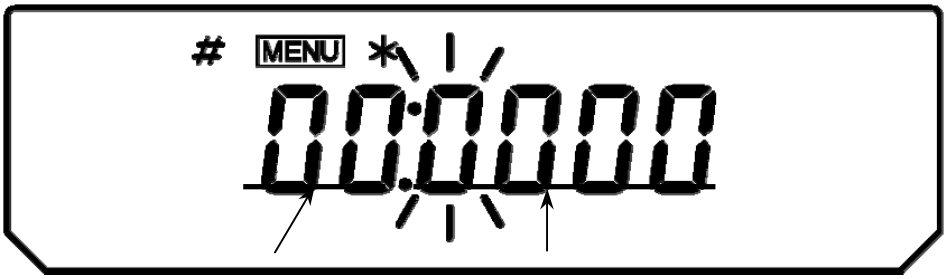
Model	ABT 120-4M	ABT 220-4M	ABT 320-4M	ABT 120-5DM	ABT 220-5DM
Span calibration weight values (PCAL) [g]	100g	200g	300g	40g	80g

5.5 Span Calibration by Built-in Weight (iCAL)

(1) Built-in weight calibration (PCAL) has to be performed prior to this calibration.
(2) Confirm the pan is cleared.
(3) Select ‘iCAL’ in Service Menu and press the **[TARE]** key at “iCAL” display.
(4) The display changes automatically as automatic span calibration is being performed. When span calibration is complete, the display returns to mass display.

5.6 Using Data Edit Mode (“Edit” in Service Menu)

(1) Entering Data Edit Mode
When “Edit” is displaying in the service menu, press the **[TARE]** key to select Edit mode. The Data Edit display shown in the figure below appears.



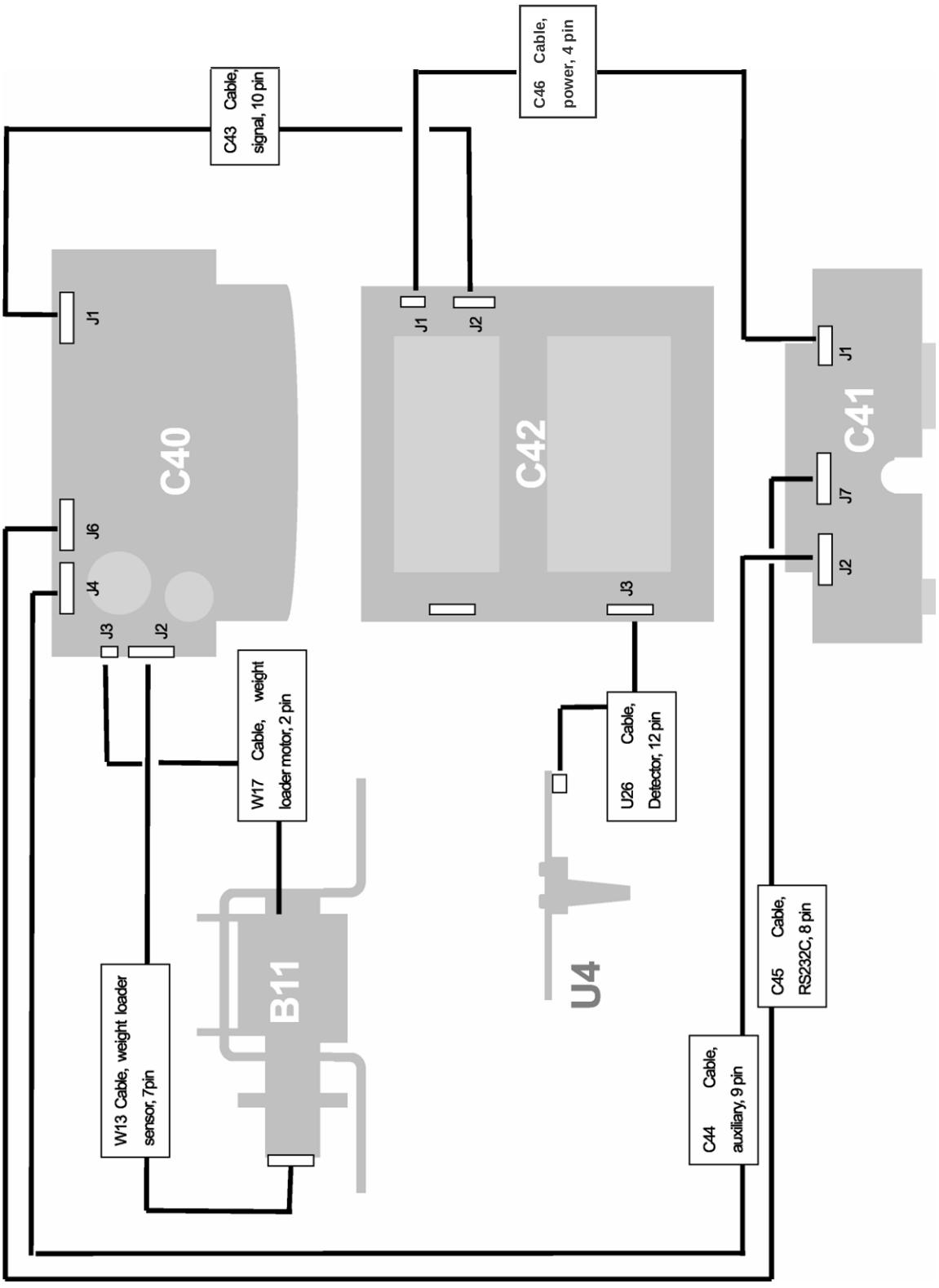
The address and a two-byte data segment from the address are displayed. The left digit of the data segment is displayed blinking.

(2) Data Editing Procedure

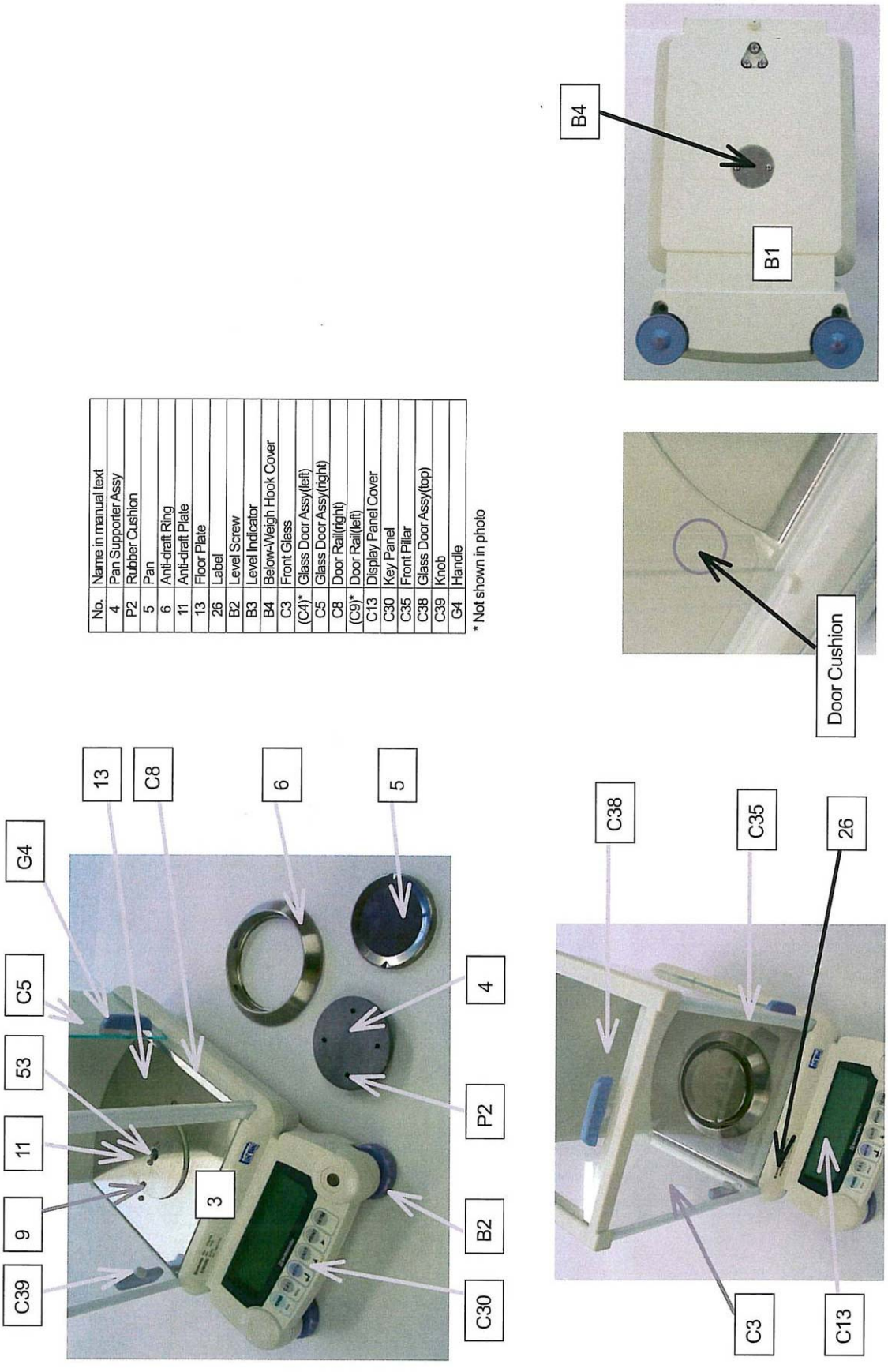
Select data address:	Press the **[CAL]** key to increase the value of the address segment by two. The editable data address range is 00 - 15F. When “15F” is displaying in the address segment, press the **[CAL]** key to return to “00”.
Change data:	Press the **[UNIT]** key to increase the numeric value of the blinking digit by 1. The changeable range is 0 - F. When “F” is displaying press the **[UNIT]** key to return to “0”.
Move data digit:	Press the **[PRINT]** key to move the blinking digit 1 place to the right. When the right end digit in the data segment is displayed blinking, press the **[PRINT]** key to move the blinking digit to the left end of the data segment.
Enter data:	Press the **[TARE]** key to enter the data of the displayed address segment. The next 2-byte data address and data appear.
Exit data edit mode or cancel editing:	Press the **[ON/OFF]** key to interrupt editing and return to the “Edit” display.

6 Structure and Components

Numbers in the figures are referred to in the main texts and Maintenance Parts List (**7**).



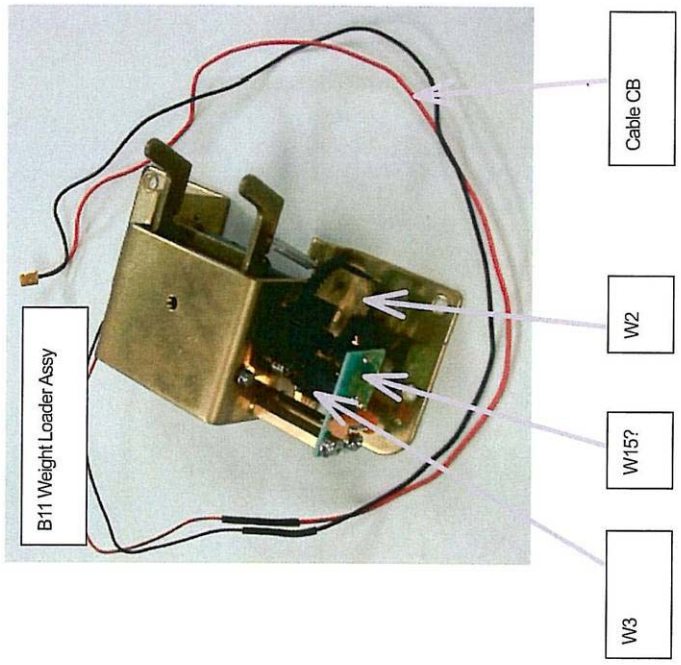
Components 1

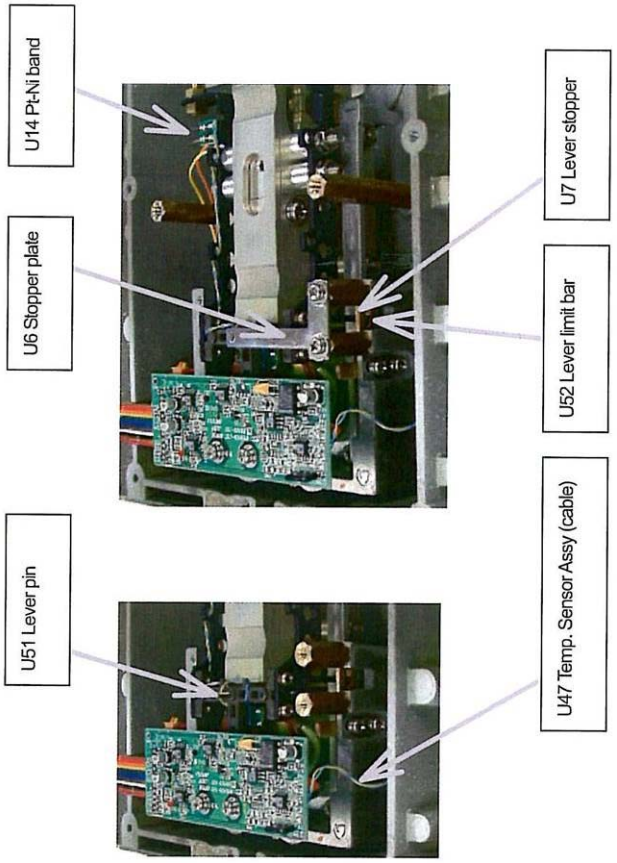


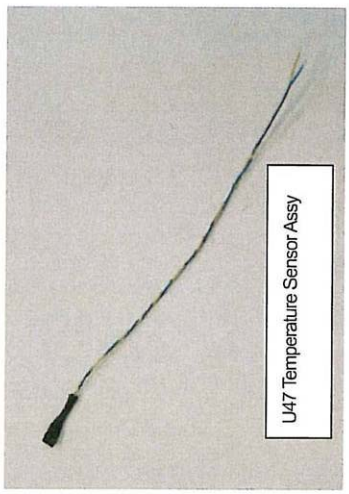
No.	Name in manual text
4	Pan Supporter Assy
P2	Rubber Cushion
5	Pan
6	Anti-draft Ring
11	Anti-draft Plate
13	Floor Plate
26	Label
B2	Level Screw
B3	Level Indicator
B4	Below-Weigh Hook Cover
C3	Front Glass
(C4)*	Glass Door Assy(left)
C5	Glass Door Assy(right)
C8	Door Rail(right)
(C9)*	Door Rail(left)
C13	Display Panel Cover
C30	Key Panel
C35	Front Pillar
C38	Glass Door Assy(top)
C39	Knob
G4	Handle

* Not shown in photo

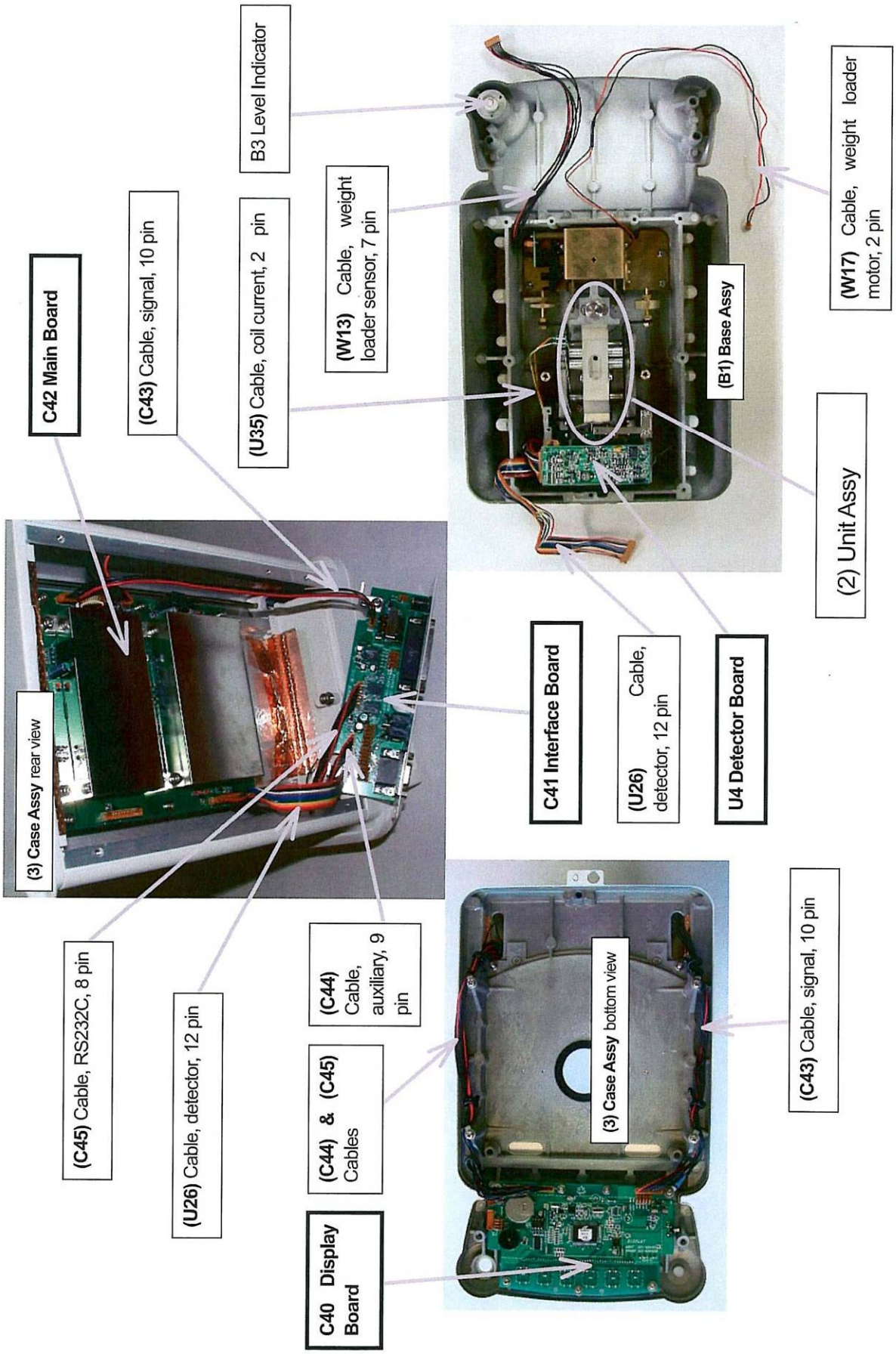
Components 2







Components 3



7 Maintenance Parts List and Special Jigs

No.	Name in the manual text	Part name for ordering (part name on drawing)	Part No.	Remarks
2	Unit Assy	Weighing Unit (Single Cell) ABT 120-4M	RABT-1001	Detector Assy included
2	Unit Assy	Weighing Unit (Single Cell) ABT 220-4M	RABT-1002	Detector Assy included
2	Unit Assy	Weighing Unit (Single Cell) ABT 320-4M	RABT-1003	Detector Assy included
2	Unit Assy	Weighing Unit (Single Cell) ABT 120-5DM	RABT-1004	Detector Assy included
2	Unit Assy	Weighing Unit (Single Cell) ABT 220-5DM	RABT-1005	Detector Assy included
4	Pan Supporter Assy	Pan Supporter Assy	RABT-6002	
P2	Rubber Cushion	Rubber Cushion	RABT-6003	
5	Pan	Weighing Plate Ø 80mm	RABT-6001	
6	Anti-draft Ring	Wind Shield Ring	RABT-6004	
11	Anti-draft Plate	Wind Shield Plate Ø 83mm	RABT-6005	
13	Floor Plate	Cover Plate	RABT-6006	
26	Label	Model Name Label ABT 120-4M	RABT-4002	
26	Label	Model Name Label ABT 220-4M	RABT-4003	
26	Label	Model Name Label ABT 320-4M	RABT-4004	
26	Label	Model Name Label ABT 120-5DM	RABT-4005	
26	Label	Model Name Label ABT 220-5DM	RABT-4006	
B2	Level Screw	Level Adjuster	RABT-8001	
B3	Level Indicator	Level (Set)	RABT-8015	Level Cover RABT-8002
B11	Weight Loader Assy	Weight Loader Assy	RABT-2008	
C3	Front Glass	Front Glass	RABT-8004	Without Front Pillar
C4	Glass Door Assy(left)	Side Glass Set Left	RABT-8007	
C5	Glass Door Assy (right)	Side Glass Set Right	RABT-8008	
C8	Door Rail(right)	Side Rail Right	RABT-8013	
C9	Door Rail(left)	Side Rail Left	RABT-8014	
C13	Display Panel Cover	Display Panel	RABT-8003	
C30	Key Panel	Sheet Panel, ABT Series	RABT-4001	
C35	Front Pillar set	Front Pillar (2 piece set)	RABT-8005	
C38	Glass Door Assy(top)	Roof Glass Set	RABT-8006	
C39	Knob set	Knob	RABT-8010	
C40	Display Board (Assy)	Display Board Assy	RABT-2001	
C41	Interface Board (Assy)	Interface Board Assy	RABT-2006	
C42	Main Board (Assy)	Main Board Assy ABT 120-4M, ABT 120-5DM	RABT-2002	
	Main Board (Assy)	Main Board Assy ABT 220-4M	RABT-2003	
	Main Board (Assy)	Main Board Assy ABT 220-5DM	RABT-2004	
	Main Board (Assy)	Main Board Assy ABT 320-4M	RABT-2005	
G4	Handle	Handle	RABT-8009	Without knob

U4	Detector Board (Assy)	Detector Board Assy	RABT-2007	
U14	Pt-Ni Band	Pt-Ni Band,5mg-cm	RABT-5001	
U47	Temp. Sensor Assy	Temp. Sensor Assy	RABT-5002	
L4	Force Coil Assy	Force Coil Assy	RABT-5003	
	Label Tamper Evident	Label Tamper Evident Ø 20mm	RABT-4007	
	Door Cushion	Door Cushion	RABT-4008	
	Upper Case	Upper Case	RABT-8011	
	Lower Case	Lower Case	RABT-8012	

Special Jigs

No.	Name in the manual text	Part name for ordering	Part No.	Remarks
		Jig set for service (ABTxx-4M)	321-62983	J1–J8 set
J1	UniBloc protection pin	OPF fixing pin	774-41089 774-41089-10	-10: diameter is smaller than dash nothing
J2	Force coil positioning jig	Coil spacer	774-41211	
J3	Gap setting shim	Unit ASSY alignment jig	774-41101	
J4	Positioning jig	Spacer 0.15mm	774-41357	
J5		Spanner hexagon 0.9	086-03801-02	
J6		Hexagon bit M5	774-49034	
J7		Driver bit A20 7x55	774-49030	Used for assembling Case Assy
J8		Handle for corner load adjustments	321-69205	Used for corner load adjustments
J9		Grind stone	321-69206	Used for corner load adjustments