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Service manual
Analytical balance

KERN ACJ/ACS

Version 1.0
5/2012
GB

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.

Instructions about conformity-evaluated scales:

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.

Hinweis zu konformitätsbewerteten Waagen:

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.

Table of Contents

1. Operations for Adjustment

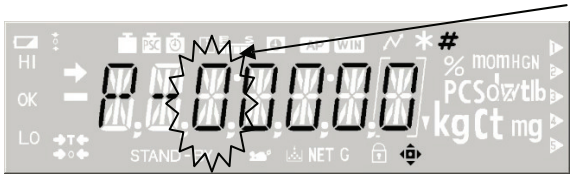
For the general operations method, see the User's Manual for the ACJ/ACS Series.

1.1. Entering the Service Mode

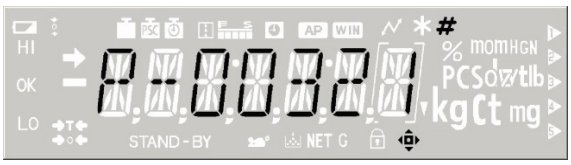
Series ACS

Move from user mode to service mode as follows.

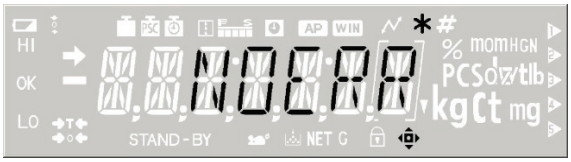
(1) In the user mode mass display state, keep pressing [ON/OFF] and [PRINT] keys together for aprox. 3 seconds.
(2) Release the keys.
(3) Press down on the [CAL] and [MENU] keys together for approx 3 seconds.
(4) The password input display appears. Flashing



Use the arrow keys to input numbers.
Input **00321** as the display maintenance mode password, and press the [TARE] key.



When the password is approved, the service mode opens.



Alternately, you can enter service mode by inputting the display maintenance mode command "@SVC=321" from the PC.

Series ACJ

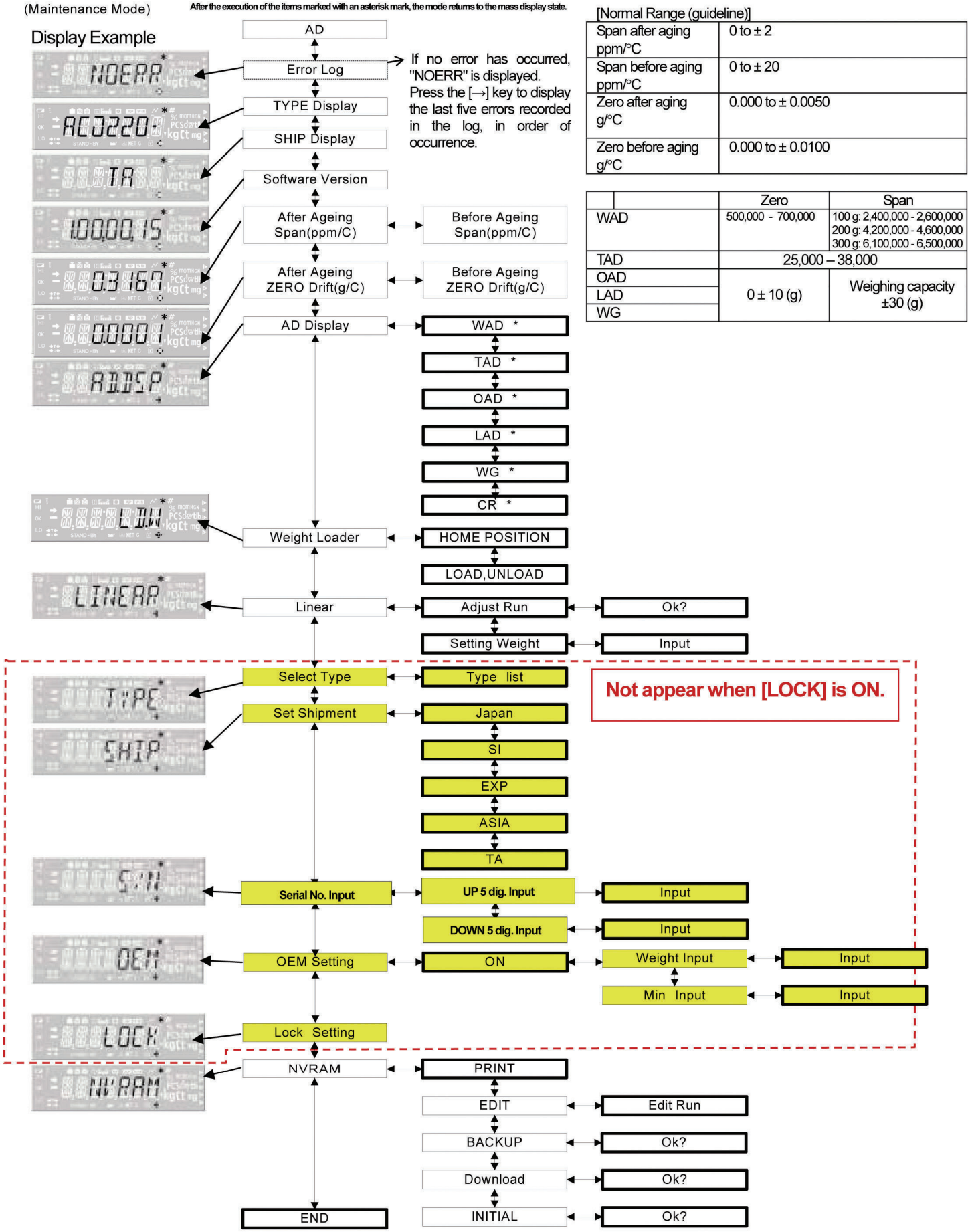
(1) Break the seal on base (left side). By pressing the sealing switch on the display board (a push button on the left from your view of the board), connect the AC adapter and when “CHE 2” is displayed, release the switch.

(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 ACS (see above).

1.2. Contents of Service Menu

The service mode configuration (menu configuration diagram) is shown below.



[Normal Range (guideline)]

Span after aging ppm/°C	0 to ± 2
Span before aging ppm/°C	0 to ± 20
Zero after aging g/°C	0.000 to ± 0.0050
Zero before aging g/°C	0.000 to ± 0.0100

	Zero	Span
WAD	500,000 - 700,000	100 g: 2,400,000 - 2,600,000 200 g: 4,200,000 - 4,600,000 300 g: 6,100,000 - 6,500,000
TAD	25,000 – 38,000	
OAD	0 ± 10 (g)	Weighing capacity ±30 (g)
LAD		
WG		

Items in the figure framed in thick lines denote execution items, while those framed in thin lines denote menu items.

Shaded items are not displayed when the setting information lock is on. Use the arrow keys to move between items.

Key	Explanatio
→ (Print)	Move to an item in a subordinate menu. If the menu item to the left of the arrow has no asterisk mark and is also shaded, pressing the [Enter] key on that item opens a subordinate menu item. (In other words, if the higher menu accepts the [Enter] key even if it has no enable/disable switch, pressing the [Enter] key opens the
ESC (ON/OFF)	Return to the item in the higher menu.
↓ (MENU)	Move to items in order.
↑ (UNIT)	Move to items in reverse order.

* For the release method of setting information lock, see "5.3.1 Releasing the Setting Information Lock."

1.3. Service Mode Functions

Service mode functions are shown below.

Function		Outline
Error display		Displays error codes for errors that have occurred in user mode. If no errors have occurred when service mode is
Model name display		Displays the model name setting.
Destination display		Displays the destination setting. Ex.: • JPN = Japan • SI = Countries and regions that recognize SI units only • EXP = Overseas (excluding Southeast Asia) • ASIA = Southeast Asia • TA = Type Approval
Software Ver. display		Displays the currently mounted software version. Ex.: 1.00, ##, XX In principle, 1.00 is the version number for hardware changes. Next, ## is the version number for manuals and other documentation changes. Finally, XX is the version number for bug fixes and other minor changes.
Span temperature coefficient display		Displays the span temperature coefficient for before and after aging.
Zero drift display		Displays the amount of zero drift before and after aging.
AD value display	Mass data (WAD) display	Displays mass data as received from AD converter. (Data
	Temperature data (TAD) display	Digitally displays voltage of temperature sensor mounted
	Temperature-corrected mass	Displays WAD mass data subjected to temperature correction. (Data subjected to smoothing)
	Linear-corrected mass data	Displays OAD mass data subjected to linearity correction.
	Absolute load (WG) display	Displays mass values shown in g units that are subjected to all correction processing. Displays mass values
Sensitivity calibration		Executes sensitivity calibration using the same operation
Weight loader	Return to initial position	Internal weight loader system returns to initial position.
	Load and unload	Internal weight is loaded or unloaded to unit ASSY.
Linearity adjustment	Linearity adjustment	Executes the adjustment operation for calculation of the
	Weight value input for linearity	Inputs the reference weight value used for linearity adjustment.

Function		Outline
Model selection		Selection of the model name automatically sets the basic information for weighing capacity, minimum display,
Shipping settings	Unit for Japan	Set the units users can use, depending on shipping destination.
	SI unit	
	Overseas unit	
	Unit for Asia	
	Type Approval	
Serial No. input	Top 5 digits	Input the top 5 digits of serial No.
	Bottom 5 digits	Input the bottom 5 digits of serial No.
OEM	On	Sets to OEM model.
	Weighing capacity	Changes the weighing capacity.
	Minimum display	Changes the minimum display.
Setting information lock (error check)		Prevents changes to the model, OEM, shipping, and S/N settings. When the lock is active, all error checks are
NVRAM	Data print	Outputs data saved in EEPROM to a dedicated printer.
	Data edit	Edits data saved in EEPROM on balance display unit.
	Backup	Of the data saved in EEPROM, backs up temperature correction coefficient, linearity correction coefficient,
	Download	Writes to EEPROM the data backed up on a Flash
	All initialize	Initializes all data saved in EEPROM.
END		Ends service mode.

2. Disassembling and Assembling the Balance

2.1. Precautions

1) Pull the connector straight out when disconnecting. Never pull it out at a bent angle.
   * Pulling out at a bent angle could bend the terminal pins, making it difficult to re-insert the connector.

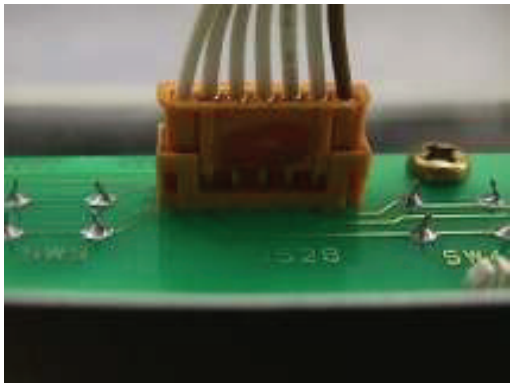


Fig. 2-1

2) When assembling the base unit ASSY (2) and case ASSY (3), check that the power board ASSY (B4) connector is firmly inserted.
   *** An insufficiently inserted connector could lead to instability in the display.**

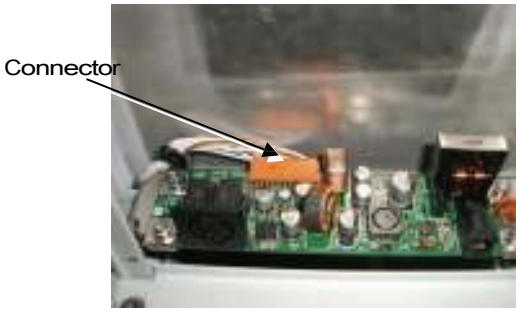


Fig. 2-2

3) When performing disassembly and assembly of the unit ASSY (1), insert the lever fixing pin (J1) into the lever fixing hole on the top of the OPF.
   *** Lift up on the lever ASSY (1) to insert the pin. Proceed carefully to avoid scratching the elastic support.**

4) Use a controlled torque driver to tighten the screws to the torques shown in the table below.

Screw	Torque [kgf•cm]
M2	1
M2.5	2.5
M3 pan head	9
M3 hexagonal socket head bolt	15
M4 pan head	18
M4 hexagonal socket head bolt	30
M5 hexagonal socket head bolt	35

2.2. Inspecting the Balance Interior (Removing the Case and Pan Supporter)

[Disassembly]

1) Extract the AC adapter and remove the pan (6), pan supporter ASSY (4), and wind shield ring (7).
2) Remove the screws on the back surface of the balance (truss M3 × 5 (4 screws)), and remove the rear cover (13).
3) Remove the screw covers (B24), and the screws (2 screws) on the back of the balance, and remove bolt P4 M4 × 25 (2 bolts).
   - **To remove the screw covers (B24), insert something with a sharp tip (tweezers, etc.) into the screw cover (B24) hole, and then lift up.**
   - **When removing the screw covers (B24), be careful to avoid damaging the case (C1) and the screw covers (B24).**

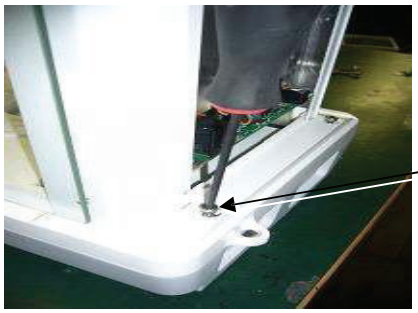


Fig. 2-3

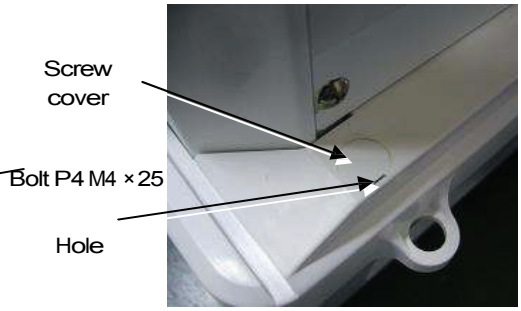


Fig. 2-4

4) Remove screw P3 M4 × 20 (2 screws) (B23) on the bottom and front of the balance.

Fig. 2-5

5) With the case ASSY (3) lifted up, extract the connector inserted into the switch board ASSY (C4), and remove the case ASSY (3).
   - *** Be careful to avoid deforming the case (C1) when positioning.**
     - **Be careful to avoid deforming the rib on the inside.**
     - **Be careful to avoid deforming the front display.**
   - *** The display board ASSY (B2) and power board ASSY (B4), etc., can be inspected while in this position.**

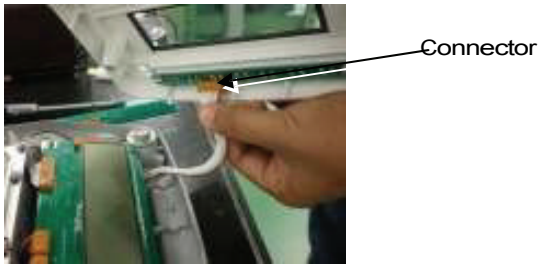


Fig. 2-6

6) Remove screw P4 M4 × 8 (7 screws), and remove the unit cover (B5).
   *** The unit ASSY (1), analog board ASSY (B3), and the weight loader ASSY (27), etc., can be inspected while in this position.**

[Assembly]

1) With the unit cover (B5) as the base, use screw P4 M4 × 8 (7 screws) to tighten.
   * **With the unit cover (B5) rear screw as the base, align with the center of the pan supporter axis and the 15.5-dia. hole to amount the other screws. (Fig. 2-7)**
   * **Mount the unit cover (B5) so that the cable is flat. At this time, be careful to avoid pinching the cable.**
   * **Check that there is no gap between the base ASSY (B1) and the unit cover (B5).**

Fig. 2-7

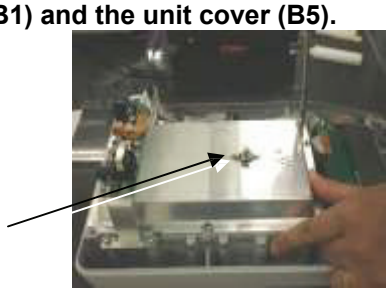


Fig. 2-8

2) With the case ASSY (3) lifted up, insert the connector into the switch board ASSY (C4), and set the case ASSY (3) into the base unit ASSY (2).
   * **Be careful to avoid damaging the power board ASSY (B4) and cable when covering the base unit ASSY (2) with the case ASSY (3).**
   * **Be careful to ensure that the case ASSY (3) does not touch the pan supporter axis when covering the base unit ASSY (2) with the case ASSY (3).**
   * **Check the connector connection conditions on the power board ASSY (B4).**
3) Tighten the case ASSY (3) and base unit ASSY (2) in two locations in back (bolt P4 M4 × 25) and two locations on the bottom front side (P3 M4 × 20).
4) Attach the screw covers (B24) in two locations on the back of the balance.
   * **When attaching the screw covers (B24), insert the protrusion on one side of the screw cover (B24) into the case (C1) hole and then push down on the top of the screw cover (B24) to attach.**
   * **Attach so that the screw cover (B24) hole is on the back side.**

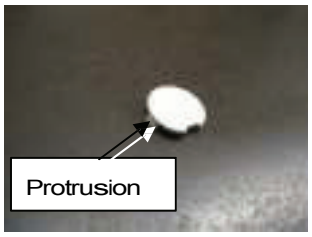


Fig. 2-9

Fig. 2-10

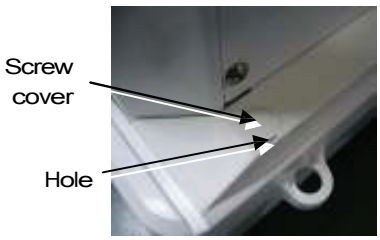


Fig. 2-11

5) Mount the rear cover (13) (truss M3 × 5 (4 screws)).
6) Align the anti-blow ring (11) and the center of the pan supporter axis, and mount the anti-blow ring (11) and wind shield plate (12). (Fixing screw: Anti-blow ring (11) → Screw P3 M2.5 × 6 (2 screws), Wind shield plate
   (12) → Screw P4 M3 × 6 (2 screws))

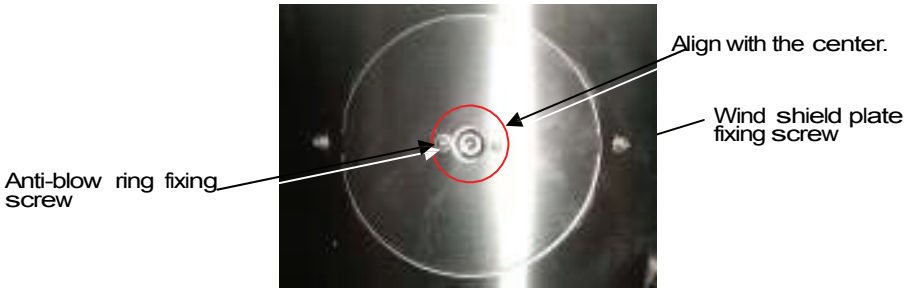


Fig. 2-12

7) Set the pan (6), pan supporter ASSY (4), and wind shield ring (7).
8) Perform horizontal adjustment, and connect the AC adaptor.

2.3. Replacing Components

2.3.1. Replacing the Front Glass ASSY (C8)

1) Extract the AC adaptor, and remove the pan (6), pan supporter ASSY (4), and wind shield ring (7).
2) Remove the inside knob (C10), and remove the roof glass ASSY (C5) and side glass ASSY (C6, C7).
   *** While supporting the front glass ASSY (C8), remove the screws.**
3) Remove the screws on the back of the balance (truss M3 × 5 (4 screws)), and remove the rear cover (13).
4) Remove the two cover screws (B24) on the back side of the top of the balance, remove the screw P4 M4 × 12 (2 screws), and remove the case roof (C3).
   *** After removing the case roof (C3), take care to prevent the front glass ASSY (C8) from falling.**
5) Remove the front glass ASSY (C8).
6) If the cushion (C13) adhering to the front pillar (C12) is damaged, replace it with a new cushion (C13), (4 cushions).

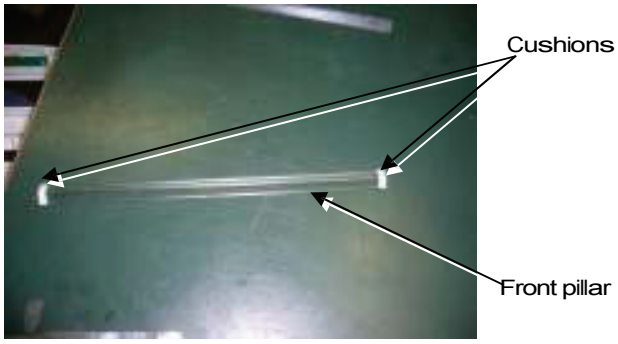


Fig. 2-13

7) Follow this procedure in reverse to mount the new front glass ASSY (C8).
   * Insert into the case roof (C3) groove so that the cushion adhesion side faces toward the front.

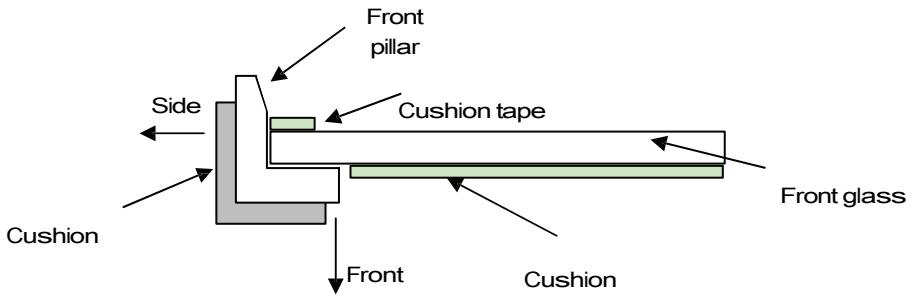


Fig. 2-14

2.3.2. Replacing the Side Glass ASSY (C6, C7)

1) Extract the AC adaptor, and remove the inside knob (C10).
2) Remove the side glass ASSY (C6, C7).
3) Insert the new side glass ASSY (C6, C7), and mount the knob (C10).
4) Open the side glass ASSY (C6, C7), and coat lubricant (OT1) on the upper and lower glass edges (5 cm from the edge).

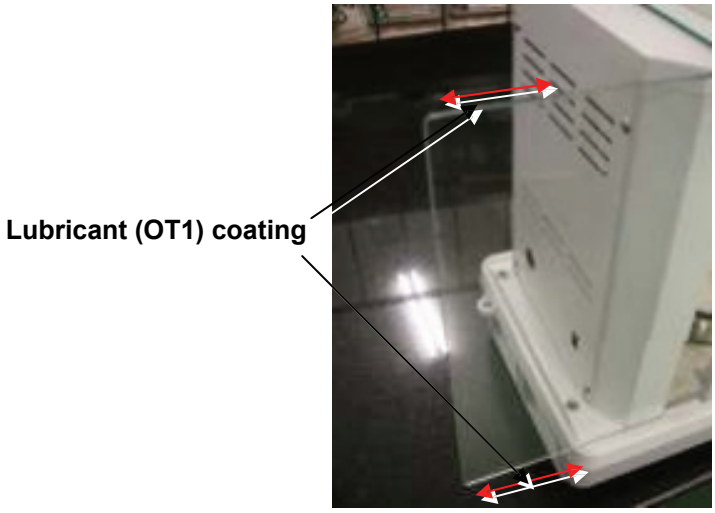


Fig. 2-15

2.3.3. Replacing the Roof Glass ASSY (C5)

1) Extract the AC adaptor, and remove the inside knob (C10).
2) Remove the roof glass ASSY (C5).
3) Insert the new roof glass ASSY (C5), and mount the knob (C10).

2.3.4. Replacing the Display Board ASSY (B2)

1) Use the procedures in "2.2 Inspecting the Balance Interior" to remove as far as the case ASSY (3).
2) Remove the connector inserted into the display board ASSY (B2).
   (ACJ series: 4 locations, ACS series: 2 locations)
3) Loosen the screw P3 M3 × 8 (4 screws) fixing the display board ASSY (B2) in place, and remove the display board ASSY (B2).
4) Use the screw P3 M3 × 8 (4 screws) to temporarily tighten the new display board ASSY (B2).
5) Adjust the mounting position for the display board ASSY (B2). Align the left and right directions to the edges of board mounting surfaces on the mount, display board (B8). For the front-to-back direction, align the display board ASSY (B2) to a pressed-forward position, and attach the screw P3 M3 × 8 (4 screws).
   *** Align the display board ASSY (B2) height position to left and right.**

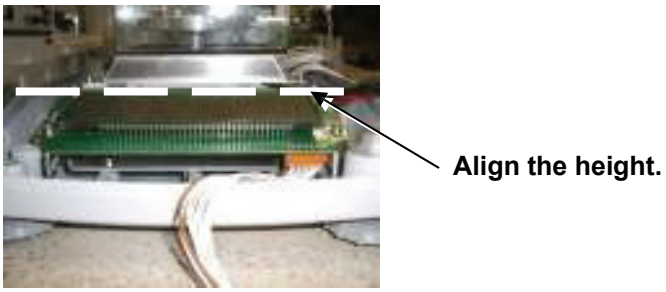


Fig. 2-16

6) Assemble the balance in the reverse procedure to the steps 1) and 2).

2.3.5. Replacing the Power Board ASSY (B4)

1) Use the procedures in "2.2 Inspecting the Balance Interior" to remove as far as the case ASSY (3).
2) Remove the connector inserted into the power board ASSY (B4). (1 location)
3) Loosen the bolt P3 M3 × 8 (4 bolts) fixing the power board ASSY (B4) in place, and remove the power board ASSY (B4).
4) Use a bolt to temporarily fix the new power board ASSY (B4) in place.
5) Use the procedures in "2.2 Inspecting the Balance Interior" to assemble the case ASSY (3).
6) Use the I/F board mounting jig (J6) to adjust and fix the position of the power board ASSY (B4). With the centers of the two connectors, and of the jig ACJ for board mounting (J7) holes, in aligned positions, adjust the board position so that it comes to the farthest outside position.

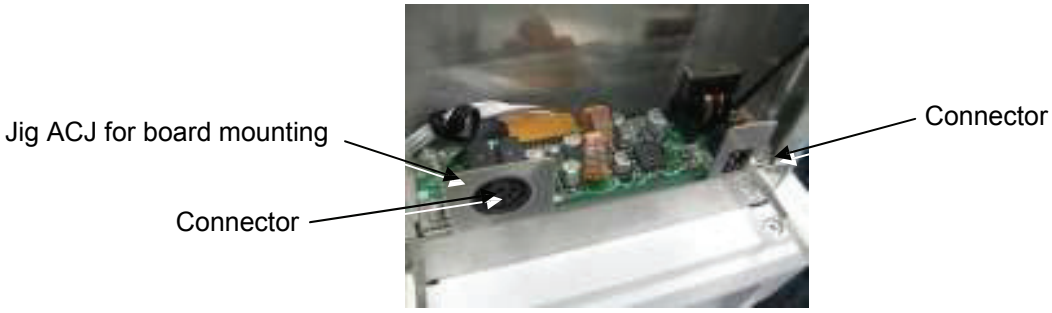


Fig. 2-17

7) Mount the rear cover (13).

2.3.6. Replacing the Analog Board ASSY (B3)

1) Use the procedures in "2.2 Inspecting the Balance Interior" to remove as far as the unit cover (B5).
2) Insert the lever fixing pin (J1) into the lever fixing hole on the top of the OPF.
3) Remove the connector on the upper side of the board inserted into the analog board ASSY (B3). (3 locations)

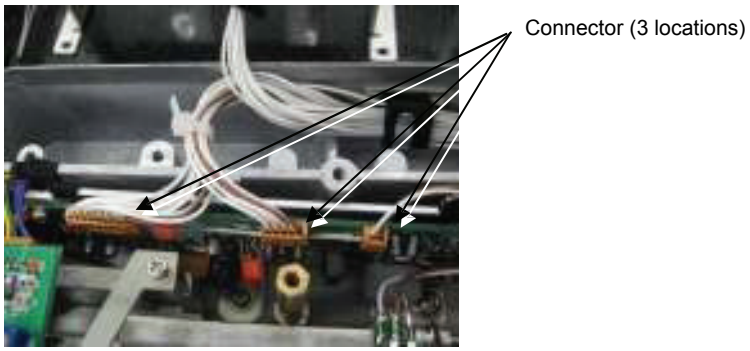


Fig. 2-18

4) Remove the connector inserted into the detector ASSY (U11). (1 location)
   *** When removing, use caution to ensure that it does not come into contact with the lever ASSY (U7) and scratch the elastic support.**

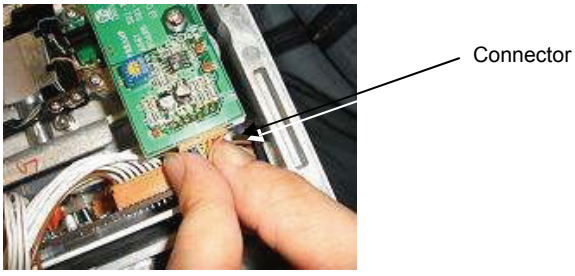


Fig. 2-19

5) Loosen the clamp, E-20-3C (B10) mounted to the base unit ASSY (2), and remove the wire.

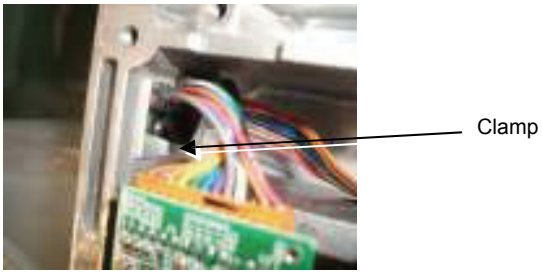


Fig. 2-20

6) Loosen the screw P4 M4 × 8 and flat washer M4 (2 locations) fixing the mount, analog board (B11) in place, and remove the mount, analog board (B11).
7) Loosen the screw P3 M3 × 8 (4 screws) fixing the analog board ASSY (B3) in place, and remove the analog board ASSY (B3).
8) Remove the connector (for the coil) inserted into the analog board ASSY (B3).
9) Use the above procedure in reverse to mount the new analog board ASSY (B3).

2.3.7. Replacing the Weight Loader ASSY (27)

1) Use the procedures in "2.2 Inspecting the Balance Interior" to remove as far as the unit cover (B5).
2) Loosen the screw P4 M4 × 8 (2 screws) and flat washer M5 (2 locations), remove the weight stopper (W3), and remove the weight.
   *** When removing the weight (W4), be careful to avoid damaging the unit ASSY (1). (Be careful to avoid letting the weight stopper (W3) rotating in tandem and coming into contact with the pan supporter axis.)**
   *** When performing re-assembly, be careful to avoid letting dust settle on the weight (W4).**
3) Loosen the screw P4 M4 × 8 (4 screws), and remove the weight loader ASSY (27).
4) Use the above procedure in reverse to mount the new weight loader ASSY (27).
   *** Mount the weight loader ASSY (27) on cell width of the unit ASSY (1) in the balance left and right directions.**
   *** Be careful to avoid letting the weight loader mechanism come into contact with the lever.**
   *** When mounting, press the weight loader ASSY (27) forward for the mounting position.**

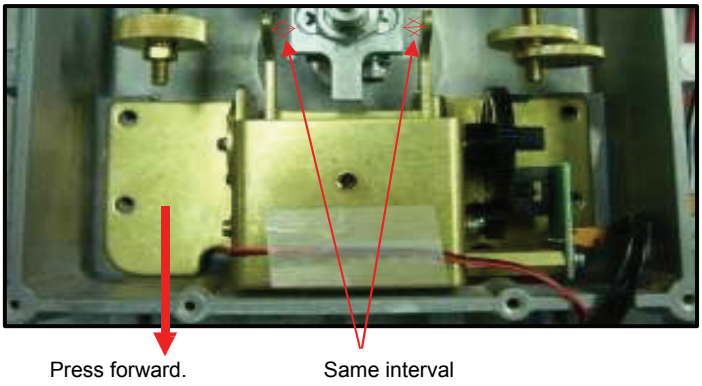


Fig. 2-21

2.3.8. Replacing the Unit ASSY (1)

1) Use the procedures in "2.2 Inspecting the Balance Interior" to remove as far as the unit cover (B5).
2) Loosen the screw P4 M4 × 8 (2 screws) and flat washer M5 (2 locations), remove the weight stopper (W3), and remove the weight.
3) Insert the lever fixing pin (J1) into the lever fixing hole on the top of the OPF.
   *** Lift up on the lever ASSY (U7) to insert the pin. Proceed carefully to avoid scratching the elastic support.**
4) Remove the connector inserted into the detector ASSY (U11). (1 location)
   *** When removing, use caution to ensure that it does not come into contact with the lever ASSY (U7) and scratch the elastic support.**
5) Stand the back of the base ASSY (B1) on the floor, loosen the bolt P3 M5 × 12 (3 bolts) on the bottom of the base ASSY (B1), and remove the unit ASSY (1).

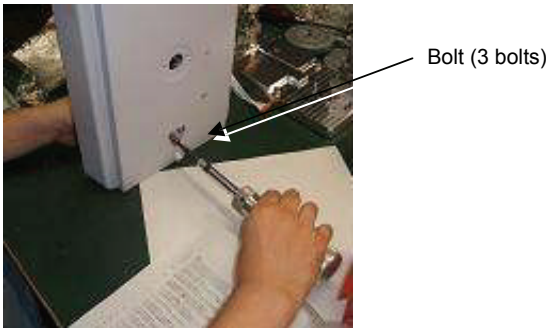


Fig. 2-22

6) After setting the new unit ASSY (1), use the bolt P3 M5 × 12 (3 bolts) on the bottom of the base ASSY (B1) to temporarily fix the unit ASSY (1), then use the unit ASSY positioning pin (J2) and plate (J8) to adjust the position, and tighten. (35 kgf—cm)
   *** When lifting up on the new unit ASSY (1), do not hold it by the parallel guide and movable pillar part.**
   *** When setting the unit ASSY positioning jig (J2), be careful to avoid damaging the unit ASSY (1).**

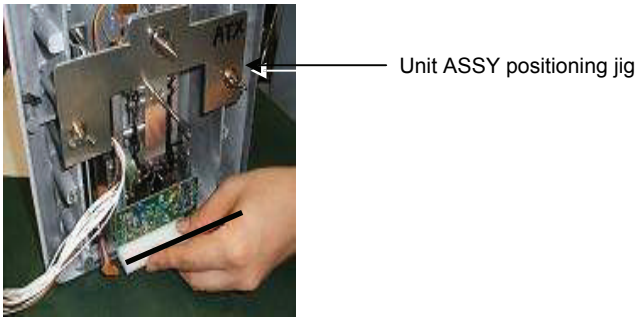


Fig. 2-23

7) See 2.3.7 to mount the weight loader ASSY (27).
   *** Mount the weight loader ASSY (27) on cell width of the unit ASSY (1) in the balance left and right directions.**
   *** Be careful to avoid letting the weight loader mechanism come into contact with the lever.**
8) Check repeatability and cornerload error, and then perform linearity, calibration of internal weight (ACJ series only), and sensitivity adjustment. (See "4.4 Adjusting the Cornerload Error," "5.5 Linearity Adjustment," "5.6 Internal Weight Calibration (PCAL)," and "5.7 Sensitivity Calibration.")
9) Use the above procedures 1) to 4) in reverse to restore the original state.

2.3.9. Replacing the Detector ASSY (U11)

1) Insert the lever fixing pin (J1) into the lever fixing hole on the top of the OPF.
   *** Lift up on the lever ASSY (U7) to insert the pin. Proceed carefully to avoid scratching the elastic support.**
2) See 2.3.8 to remove the unit ASSY (1).
3) Remove the solder on the temperature sensor cable connected to the detector ASSY (U11).
   *** MT: Yellow line, MG: blue line**

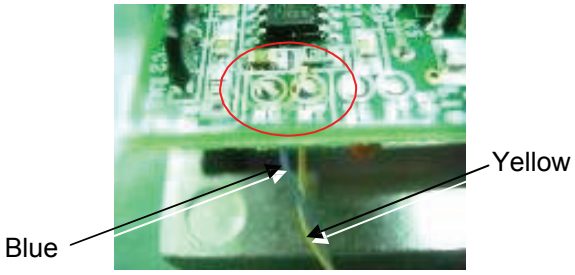


Fig. 2-24

4) Remove the screw P3 M3 × 8 (2 screws), and remove the detector ASSY (U11).

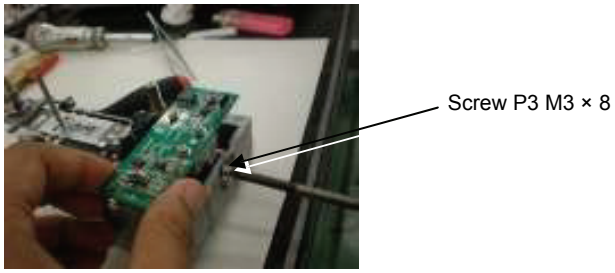


Fig. 2-25

5) Use the above procedures 3) to 4) in reverse to mount the detector ASSY (U11).
6) Perform "4.1 Adjusting the Detector ASSY (U11) Height."
7) Use the above procedures 1) to 2) in reverse to restore the original state.

2.3.10. Replacing the Force Coil ASSY (L1)

1) See 2.3.8 to remove the unit ASSY (1).
2) Insert the lever fixing pin (J1) into the lever fixing hole on the top surface.
   *** Lift up on the lever ASSY (U7) to insert the pin. Proceed carefully to avoid scratching the elastic support.**
3) See 2.3.9 to remove the detector ASSY (U11).
4) Remove the solder on the lever ASSY (U7) side of the two Pt-Ni bands (U17).
   *** Do not break or scratch the Pt-Ni band (U17).**
5) Remove the pan head screw M3 × 6 (2 screws) and flat washer M3 (2 locations), and remove the stopper plate (U14).
6) Remove the pan head screw M2.5 × 5 (4 screws), and slide the magnet lid (U16) horizontally to remove.

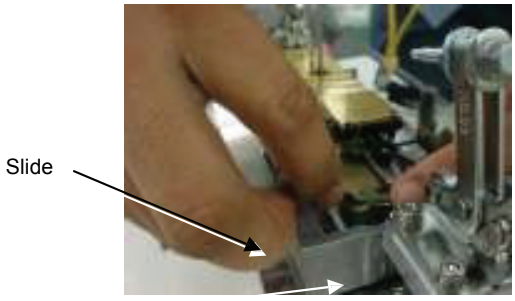


Fig. 2-26

7) Remove the socket head bolt M3 × 40 (2 bolts) fixing the lever ASSY (U7) in place, spring washer M3 (2 locations), flat washer M3 (4 locations), and nut M3 (2 locations), and remove the lever ASSY (U7) from the top surface.
8) Remove the solder on the twist cable (L7) for the force coil ASSY (L1) terminal plate.
9) Remove the pan head screw M2.5 × 6 fixing the force coil ASSY (L1), washer PB M2.6, and washer CC-2605-08 in place, and remove the force coil ASSY (L1).
10) Use the pan head screw M2.5 × 6, washer PB M2.6, and washer CC-2605-08 to lightly tighten the new force coil ASSY (L1) to the lever ASSY (U7), and solder the twist cable (L7) to the force coil ASSY (L1) terminal plate.
*** When viewed from the lever ASSY (U7) mounting side, left: blue line, right: yellow line**

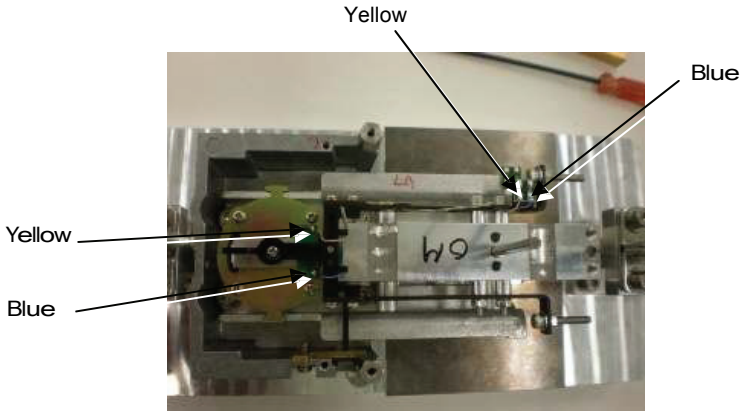


Fig. 2-27

11) Insert the lever ASSY (U7) from the top of the unit, and temporarily fix in place with the socket head bolt M3 × 40 (2 bolts), spring washer M3 (2 locations), flat washer M3 (4 locations), and nut M3 (2 locations).
*** Always insert the tightening parts in the facing shown in Fig. 2-29.**

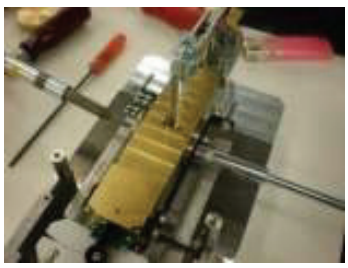


Fig. 2-28

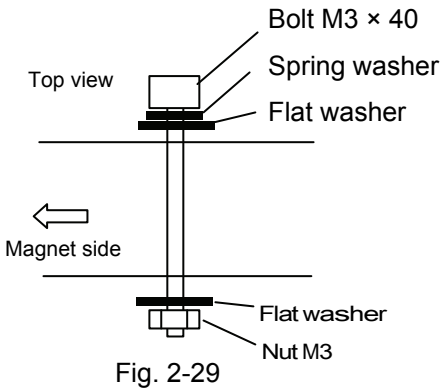


Fig. 2-29

12) With the force coil ASSY (L1) height adjusted by the magnet spacer (J9), tighten the lever ASSY (U7). (35 kgf—cm)

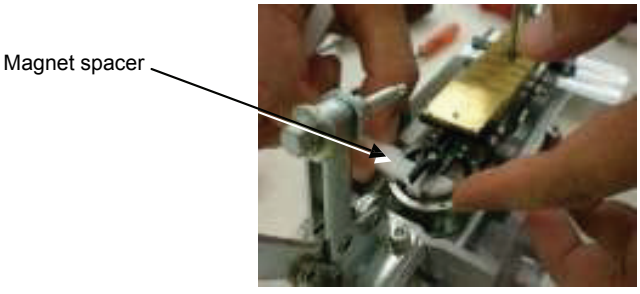


Fig. 2-30

13) Examine the unit from the top, align the center of the magnet ASSY (U9) and of the force coil ASSY (L1), and then tighten the force coil ASSY (L1).

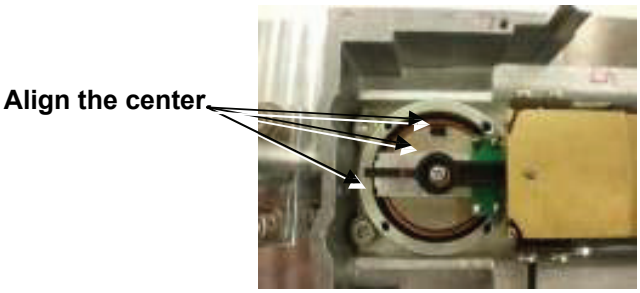


Fig. 2-31

14) Slide the four magnet lids (U16) horizontally to mount, and use the pan head screw M2.5 × 5 (4 screws) to tighten.
15) Insert the gap setting shim (J3) into the space between the upper edge of the lever ASSY (U7) and the stopper lever (U15) to obtain positioning, and use the screw P3 M3 × 8 (2 screws) to tighten the stopper lever (U15).

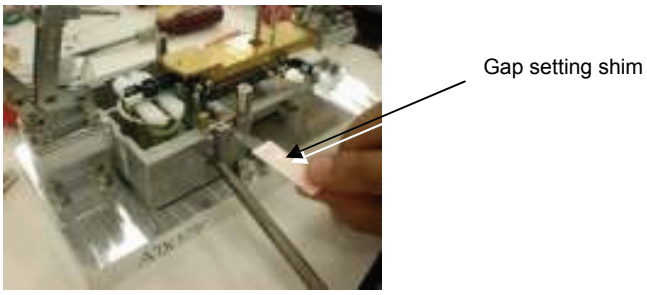


Fig. 2-32

16) Solder the two Pt-Ni bands (U17) to the lever ASSY (U7) side.
*** When soldering, apply the solder tilted and upward facing to ensure that the Pt-Ni band (U17) does not come into contact with the lever ASSY (U7).**
17) See 2.3.9 to remove the detector ASSY (U11).
18) Extract the lever fixing pin (J1) from the unit ASSY (1), shake the unit ASSY (1) lightly to move the lever ASSY (U7) up and down, and if it contacts the stopper lever (U15) with a clear sound, the unit ASSY (1) assembly is complete.
*** If it does not make a clear sound, the lever ASSY (U7) pin and stopper plate (U14), or the force coil ASSY (L1) and magnet ASSY (U9), may be in contact. Check each part to see if any are out of position, and readjust the position.**
19) Use the procedures in 2.3.8 in reverse to mount the unit ASSY (1) to the base ASSY (B1).
*** Always insert the lever fixing pin (J1) before mounting the unit ASSY (1) to the base ASSY (B1).**
20) With the stopper plate (U14) in a position aligned to the center of the force coil ASSY (L1) pin, use the pan head screw M3 × 6 (2 screws) and flat washer M3 (2 locations) to tighten.

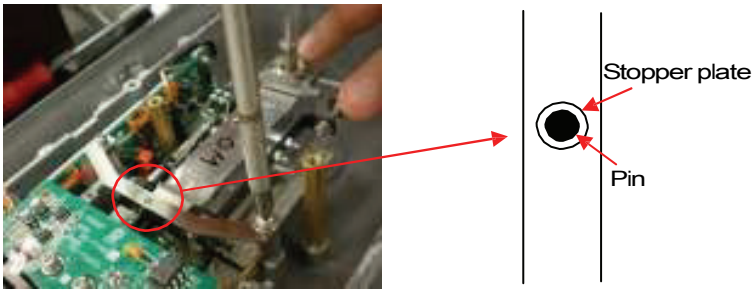


Fig. 2-33

21) Perform "4.2 Adjusting the Tilt Error," "4.3 Adjusting the Balance," and "4.4 Adjusting the Cornerload Error."

22) Use the procedures in "2.2 Inspecting the Balance Interior" in reverse to restore the original state.

2.3.11. Replacing the Stopper Plate (U14)

1) Use the procedures in "2.2 Inspecting the Balance Interior" to remove as far as the unit cover (B5).
2) Loosen the pan head screw M3 × 6 (2 screws) and flat washer M3 (2 locations), and remove the stopper plate (U14).
3) With the stopper plate (U14) in a position aligned to the center of the force coil ASSY (L1) pin, use the pan head screw M3 × 6 (2 screws) and flat washer M3 (2 locations) to tighten.
4) Use the procedures in "2.2 Inspecting the Balance Interior" in reverse to restore the original state.

2.3.12. Replacing the Stopper Lever (U15)

1) See 2.3.8 to remove the unit ASSY (1).
2) Use the cable ASSY jig (J10) connector to connect the detector ASSY (U11) and the analog board ASSY (B3).
   *** Leave the cable ASSY C (U19) (soldered cable with 2 pins) removed from the analog board ASSY (B3).**
3) Connect the tester (+) terminal to the detector ASSY (U11) CP1 pin, and the (-) terminal to the CPG pin.
4) Extract the lever fixing pin (J1) from the unit ASSY (1) lever fixing hole.
   *** Lift up on the lever ASSY (U7) to extract the pin. Proceed carefully to avoid scratching the elastic support.**
5) Connect the AC adaptor to the balance, and energize it.
6) With the screw P3 M3 × 8 (2 screws) connecting the stopper lever (U15) slightly loosened, press lightly on the lever ASSY (U7) up and down until it contacts the top of the stopper lever (U15), and then tighten the stopper lever (U15) in a position where the absolute value is the same (where the tester display reverses (+) (-)).
   *** Press lightly on the balance weight (U21), and adjust so that the direction the tester display points (direction where the shutter rises) becomes (-).**
   *** Detector ASSY (U11) output adjustment standard: Within 0.3 [V] between + side and – side**

   Allowable range of output voltage +1.5 to +2V, -1.5 to -2V

7) Extract the lever fixing pin (J1) from the unit ASSY (1), shake the unit ASSY (1) lightly to move the lever ASSY (U7) up and down, and if it contacts the stopper lever (U15) with a clear sound, the unit ASSY (1) assembly is complete.
   *** If it does not make a clear sound, the lever ASSY (U7) pin and stopper plate (U14), or the force coil ASSY (L1) and magnet ASSY (U9), may be in contact. Check each part to see if any are out of position, and readjust the position.**
8) Insert the lever fixing pin (J1) into the lever fixing hole on the top of unit ASSY (1).
   *** Lift up on the lever ASSY (U7) to insert the pin. Proceed carefully to avoid scratching the elastic support.**
9) See 2.3.8 to mount the unit ASSY (1).
10) Remove the AC adaptor, and remove the tester terminals from the detector ASSY (U11).
11) Remove the cable ASSY jig (J10).
12) Use the above procedures 2) to 3) in reverse to restore the original state.
13) See 2.3.8 to restore the original state.

3. Checking the Electronic Board

The ACJ/ACS Series boards and their signal allocations are summarized below. Numbers in parenthesis ((1), (2), (3), and so on) show pin numbers, and a checkmark (✓) indicates a point that needs checking, if possible.

3.1. Display Board ASSY (B2)

ASSY P/N	321-72185-01
Circuits Mounted	CPU1 Metric data average process Correction (temperature, linearity, sensitivity) LCD display control Key switch control Weight loader motor control EEPROM DATA memory CPU2 PID calculation Metric data calculation PWM gate array (16bit) PID calculation PWM Temperature correction PWM EEPROM Connector (J6) for flash memory writing Main clock 20 MHz (CPU1), 64 MHz (CPU2) Motor driver for weight loader I/F DATA communication circuit

3.2. Analog Board ASSY (B3)

ASSY P/N	321-71080
Board P/N	321-71082
Circuits Mounted	Displacement center signal amplification, A/D circuit (11 bits) PID control (feedback) system circuit (displacement PWM + temperature PWM + LPF + V/I conversion) Magnet temperature correction circuit (temperature PWM + LPF + temperature correction standard power comparison)

3.3. Preamp Board ASSY (B1)

ASSY P/N		321-71085 (Detector ASSY 321-71279)	
Board P/N		321-71077	
Circuits Mounted		Displacement sensor signal amplification Standard power mounting	
Check Voltage	✓	CP 1	Displacement sensor signal output Allowable range of output voltage : +1.5v to +2V, -1.5v to -2V
	✓	CP 2	Standard power voltage (about +5
		V) CP 3	Signal GND (0 V)
		J1 (1)	= CP1
		J1 (2)	= CP2
	✓	J1 (3)	Power (about +12
		V) J1 (4)	Power GND (0 V)
		J1 (5)	Power GND (0 V)
	✓	J1 (6)	Power (about -12 V)
	✓	J1 (7)	Temperature sensor signal output (about 2 to 3.2 V) (in environment of 5 to 35 °C)

3.4. Power Board ASSY (B4)

ASSY P/N		321-71075	
Board P/N		321-71077	
Circuits Mounted		Generates ±12 V, digital +5 V from AC adaptor input voltage (DC12 V/1 A) I/F communication circuit	
Check Voltage		J3 (1)	TXD signal
		J3 (2)	DSR signal
		J3 (3)	DTR signal
		J3 (4)	RXD signal
	✓	J3 (5)	Main power (AC adaptor, with external battery) check voltage (about +3.7 V)
	✓	J3 (6)	Power (about +12 V)
		J3 (7)	Power GND (0 V)
		J3 (8)	Power GND (0 V)
	✓	J3 (9)	Power (about -12 V)
	✓	J3 (10)	Power (about +5 V)
	✓	J3 (11)	Main power (about 11.5 V with AC adaptor)

4. Hardware Adjustment

When replacing the following components, balance performance may be altered. After replacement, check the performance and make adjustments if necessary.

Adjustments required		Service / Reference	Unit ASSY replacement	Force coil ASSY replacement	Detector ASSY replacement	Analog board ASSY replacement	Display board ASSY replacement	Weight loader ASSY replacement	ROM Version Up	Cornerload error adjustment	Tools required
		Reference	2.3.8	2.3.10	2.3.9	2.3.6	2.3.4	2.3.7	7	4.4	
1	Detector ASSY height adjustmen	4.1			✓						Tester (DC +/-5 V) check wire set
2	Tilt error adjustme	4.2		✓	✓						
3	SPAN temperature coefficient writing	6.2	✓ *2)				✓ *1)				
4	Linearity adjustme	5.5	✓	✓	✓	✓				✓	Weight
5	Error check off	5.3.1	✓	✓	✓	✓		✓		✓	
6	Internal weight calibration	5.6	✓	✓	✓	✓		✓		✓	Weight
7	Error check on	5.3.2	✓	✓	✓	✓		✓		✓	
8	Calibration (E-CAL,i-CAL)	5.7.1	✓	✓	✓	✓		✓		✓	Weight
9	Error log reset *3)	6.2	✓	✓	✓	✓		✓	✓	✓	
10	EEPROM data backup	6.3	✓	✓	✓	✓		✓	✓	✓	

*1) When the display board ASSY (B2) has been replaced, mount the EEPROM that was included with the original display board ASSY (B2).
*2) Input the included EEPROM data into the balance. Address No. 004 – 05A temperature coefficient
*3) See "6.2 Data Edit (EDIT) Operations," and enter **"0"** for the **two characters on the right side of Address No. 28E, through 292.** (Error Check)
*4) ACJ series only

4.1. Adjusting the Detector ASSY (U11) Height

1) See 2.3.8 to remove the unit ASSY (1).
2) Use the cable ASSY jig (J10) connector to connect the detector ASSY (U11) and analog board ASSY (B3).
   *** Leave the cable ASSY C (U19) (soldered cable with 2 pins) removed from the analog board ASSY (B3).**
3) Connect the tester (+) terminal to the detector ASSY (U11) CP1 pin, and the (-) terminal to the CPG pin.
4) Extract the lever fixing pin (J1) from the unit ASSY (1) lever fixing hole.
   *** Lift up on the lever ASSY (U7) to extract the pin. Proceed carefully to avoid scratching the elastic support.**
5) Connect the AC adaptor to the balance, and energize it.
6) With the screw P3 M3 × 8 (2 screws) fixing the detector ASSY (U11) slightly loosened, press lightly on the lever ASSY (U7) up until it contacts the top of the stopper lever (U15), and then tighten the detector ASSY (U11) in a position where the absolute value is the same (where the tester display reverses (+) (-)).
   *** Press lightly on the balance weight (U21), and adjust so that the direction the tester display points (direction where the shutter rises) becomes (-).**
   *** Detector ASSY (U11) output adjustment standard: Within 0.3 [V] between + side and – side Allowable range of output voltage + 1,5 to + 2V, –1,5 to –2V**
7) Insert the lever fixing pin (J1) into the lever fixing hole on the top of unit ASSY (1).
   *** Lift up on the lever ASSY (U7) to insert the pin. Proceed carefully to avoid scratching the elastic support.**
8) Remove the AC adaptor, and remove the tester terminals from the detector ASSY (U11).
9) Remove the cable ASSY jig (J10).
10) Use the above procedure 2) to 3) in reverse to restore the original state.
11) See 2.3.8 to restore the original state.

4.2. Adjusting the Tilt Error

1) Use the procedures in "2.3.7 Replacing the Weight Loader ASSY (27)" to remove as far as the weight (W4).
2) Extract the lever fixing pin (J1) from the unit ASSY (1) lever fixing hole, and set the pan supporter ASSY (4) and pan (6) in the unit ASSY (1) pan supporter axis.
3) Connect the switch board ASSY (C4).
4) Use the lever adjuster ASSY (2 units) to bring the air bubble in the level gauge to the center of the red-lined range and adjust the balance flatness, then connect the AC adaptor and energize.
   *** Be careful to avoid shorting the switch board ASSY (C4).**
5) Insert a sheet of 1 mm thickness into the central fixing foot in the back of the balance, and check the display with the balance in the grounded state.

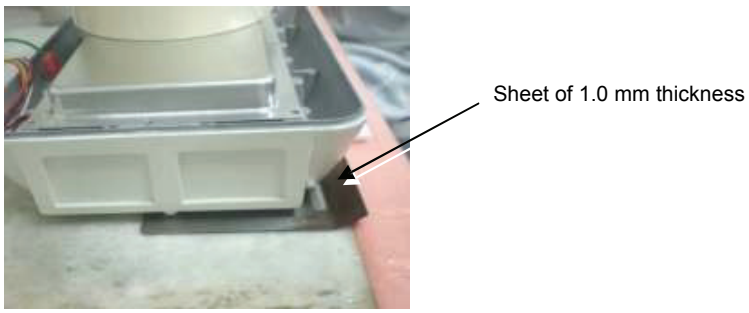


Fig. 4-1

6) If the adjustment standard deviates by ±5 mg, insert the lever fixing pin (J1) into the lever fixing hole on the top of the unit ASSY (1) OPF, and loosen the nut M3 fixing the eccentric balance weight (U20) for the lever ASSY (U7) in place.
7) If the display is (+), rotate the direction of eccentricity of the balance weight (U20) rightward and down, and if the display is (-), rotate the direction of eccentricity of the balance weight (U20) leftward and up.

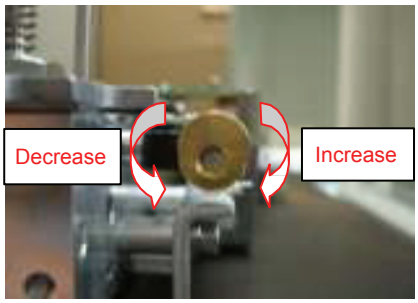


Fig. 4-2

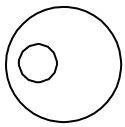


Fig. 4-3 Fixed direction of eccentric sphere

8) Repeat the above procedures 5) to 7) to perform adjustment, and when adjustment is complete, use the nut M3 to lock the balance weight (U20). (Fig. 4-2 and 4-3)
   *** When adjusting the lever ASSY (U7) screw and nut, always perform the operation with the AC adaptor connection cut off and the lever fixing pin (J1) inserted into the OPF.**

4.3. Adjusting the Balance

1) Use the procedures in "2.3.7 Replacing the Weight Loader ASSY (27)" to remove as far as the weight (W4).
2) Extract the lever fixing pin (J1) from the unit ASSY (1) lever fixing hole, and set the pan supporter ASSY (4) and pan (6) in the unit ASSY (1) pan supporter axis.
3) Connect the switch board ASSY (C4).
4) Use the lever adjuster ASSY (2 units) to bring the air bubble in the level gauge to the center of the red-lined range and adjust the balance flatness, then connect the AC adaptor and energize.
   *** Be careful to avoid shorting the switch board ASSY (C4).**
5) Enter the Service Menu, and bring up the "wAd" display. (See "1.1 Entering the Service Menu.")
6) If the wAd display is off from 6,000,000 to 7,000,000, insert the lever fixing pin (J1) into the lever fixing hole on the top of the unit ASSY (1) OPF, and loosen the nut M3 fixing the balance weight (U21) for the lever ASSY (U7) in place.
7) If increasing the wAd display, move the balance weight (U21) to the right, and if decreasing the display, move the balance weight (U21) to the left.

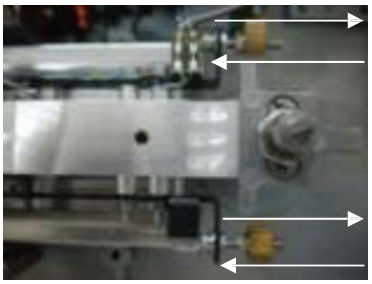


Fig. 4-4

8) Repeat the above procedures 5) to 7) to perform adjustment, and when adjustment is complete, use the nut M3 to lock the balance weight (U21). (Fig. 4-4)
   *** When adjusting the lever ASSY (U7) screw and nut, always perform the operation with the AC adaptor connection cut off and the lever fixing pin (J1) inserted into the OPF.**

4.4. Adjusting the Cornerload Error

1) Use the procedures in "2.3.7 Replacing the Weight Loader ASSY (27)" to remove as far as the weight (W4).
2) Extract the lever fixing pin (J1) from the unit ASSY (1) lever fixing hole, and set the adjustment pan in the unit ASSY (1) pan supporter axis.
3) Connect the switch board ASSY (C4).
4) Use the lever adjuster ASSY (2 units) to bring the air bubble in the level gauge to the center of the red-lined range and adjust the balance flatness, then connect the AC adaptor and energize.
5) Place the adjustment weight (200 g) at adjustment position R on the adjustment pan, and press the TARE key to display "0 g."

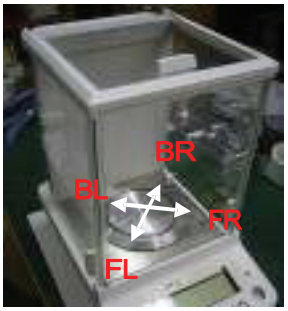


Fig. 4-5

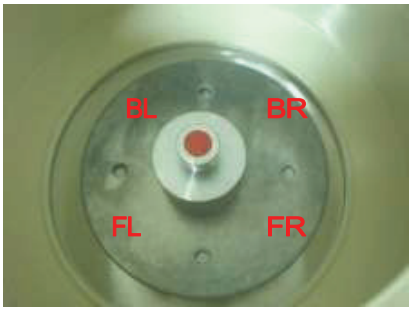


Fig. 4-6

6) Place the weight successively in adjustment positions L and R, and record the respective display values.
7) Place the adjustment weight (200 g) at adjustment position B on the adjustment pan, and press the TARE key to display "0 g."
8) Place the weight successively in adjustment positions F and B, and record the respective display values.
9) Use the handle for cornerload adjustment (J4) to shave the parallel guide induced strain area corresponding to the position showing the display value (+).
   *** To prevent deformation of the edge surface, do not shave off 3 mm on both sides of the cell width (X X area in the Fig. 4-8).**

Fig. 4-8

10) Repeat steps 5 to 9, record the display values, and perform the above adjustment until reaching the adjustment standard.

5. Software Adjustment

5.1. EEPROM Initialization

There are two methods for initializing the EEPROM, as shown below.

(1) Initializing EEPROM When Turning On the Power

1) Press down and hold the [ON/OFF] and [PRINT] keys, and switch on the power.
2) "EE INIT" is displayed.
3) Press and hold down the [TARE] key to display "PART."
   Press either the [MENU/↓] or [UNIT/↑] key to display "ALL."
4) – In the "PART" display, press and hold down the [TARE] key (until the display is changed).: Initializes part of EEPROM data.
   Write to EEPROM the temperature correction coefficient, linearity correction coefficient, and model setting information (weight capacity, minimum display) that is backed up on Flash memory.
   – In the "ALL" display, press and hold down the [TARE] key (until the display is changed).: Initializes all EEPROM data, and write to EEPROM.
   Note: Keep pressing the [TARE] key until the "PART" or "ALL" display changes to "CHE 3" display.
5) After initialization, move to the service mode.

(2) Initializing EEPROM from Service Menu

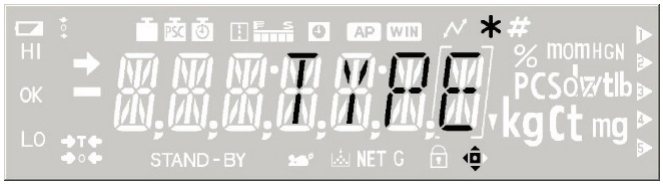
1) In the service menu, select [NVRAM] → [INIT (All Initialize)].
2) The execution confirmation display [OK?] appears.
3) Press the [TARE] key to execute.
4) The initializing progress indicator appears.

5) When initialization is completed, return to the AD value display in the service menu.

5.2 Model Selection

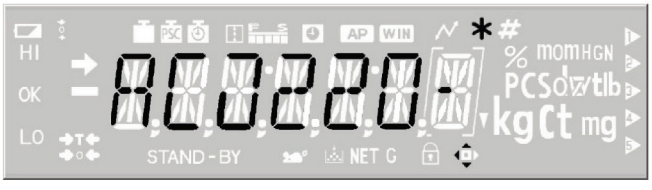
Select the KERN standard model name. The operation procedure is as shown below.

1) In the service menu, press either the [MENU/↓] or [UNIT/↑] key, and then select [Model Selection] (TYPE).
2) Press the [TARE] key.
   [Menu display example for model selection]



[Caution]
If "TYPE" does not appear on the menu display, the setting information lock must be released. See "5.3.1 Releasing the Setting Information Lock."

3) Press either the [MENU/↓] or [UNIT/↑] key to read out the model name stored in EEPROM, and display it on the LCD.
   [Display example for model name ACJ 220–4M]



4) Press the [TARE] key to determine the model.

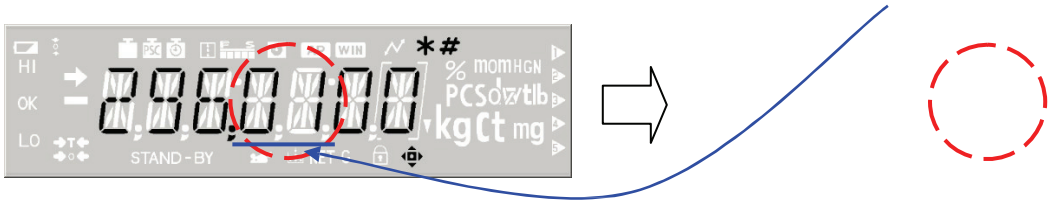
– Model name display is a maximum of seven characters. (Due to limitation to the panel display, numbers are displayed on the left and alphabetical characters on the right, separated by a "." dot.)
– If the OEM setting is set to ON, and the specified model name has not been input, a corresponding KERN standard model name will be displayed.

5.3 Releasing and Setting the Setting Information Lock

There will be cases where the setting information lock must be released due to calibration error, etc., to reselect the model and perform readjustment.
In such cases, follow the procedure below to release and set the setting information lock.

5.3.1. Releasing the Setting Information Lock

(1) In the service menu, select "NVRAM" → [EDIT] (Data edit). * See "6.2 Data Edit (EDIT) Operations."
(2) Input the address "296," and edit the lowest byte (right side: Address No.296) from "01" to "00."



(3) In the service menu, check that "TYPE" is displayed next to “LINEAR”.

5.3.2. Setting the Setting Information Lock

(1) In the service menu, select [LOCK].
(2) The "OK?" confirmation is displayed. Press the [TARE] key to lock the setting information.

[Caution] If the setting information is not locked, the calibration error check will not occur. Therefore, even if an unsuitable weight is used during calibration, or if an unsuitable calibration operation is performed, the sensitivity calibration coefficient is calculated without any conditions, resulting in problems in the measurement data display.

5.4. Inputting Weight Values for Linearity Adjustment

Before executing linearity adjustment, input the reference weight values to be used.
(1) Enter service mode and select [LINEAR] → [L.W.SET] in the service menu.
(2) Determine the reference weight required for linearity adjustment, depending on the model setting. (The mass of the weight and the number of measurements required)
(3) The reference weights required are displayed.
(4) Input the reference weight mass (including the certified value). See the table below, "Linearity Adjustment Reference Weights."
(5) Determine the reference weight value input. (5 points, excluding 0)
(6) Repeat steps (4) and (5) up to the number of reference weights required.
(7) When input for all weights is completed, return to the menu item display for linearity adjustment weight value input.

[Linearity Adjustment Reference Weights]
The model and reference weight value are as shown in the table below.

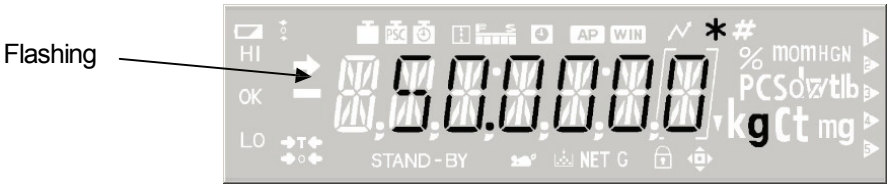
Model Name	ACJ/ACS 320	ACJ/ACS220	ACS80 ACJ/ACS120
Reference Weight	50g	50g	30g
	100g	100g	60g
	150g	150g	90g
	200g	200g	120g
	250g	250g	150g
	300g		
	350g		

Immediately after EEPROM initialization or model selection, values may differ from the table values above.

5.5. Linearity Adjustment

To satisfy linearity specifications, calculate the coefficient for correcting hardware linearity errors.
The operation procedure is as shown below.

(1) In the AD value display, press the [MENU] key several times to display "LINEAR," and then press the [TARE] key.
(2) Press either the [MENU] or [UNIT] key to display "L. ADJUST," and then press the [TARE] key.
(3) "START" is displayed. Press the [TARE] key.
(4) Use the LCD weight value display to position the weight, and after the stability mark light goes on, press the [TARE] key, and perform measurements of the adjustment data.
Example of weight value display:



(5) When measurement of all adjustment data is complete, calculate the correction coefficient, and save in NVRAM.
In addition, save the correction coefficient in Flash memory as a backup.
(6) Return to the AD value display.

5.6. Internal Weight Calibration (PCAL) (ACJ Only)

Execute the internal weight calibration.
The reference weight used in PCAL is as shown below. If the weight value stipulated in step 3) is not flashing, enter the weight value as shown in the table below.

Model Name	CAL Value
ACJ 220	**200g**
ACJ 120	**100g**
ACJ 320	**300g**

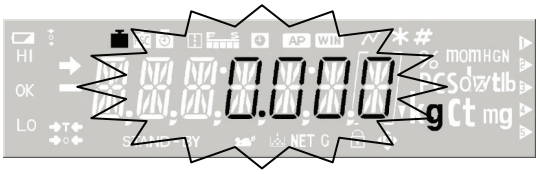
5.6.1 Operation Procedure and Process

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 board), connect the AC adapter and when “CHE2” is displayed, release the switch.
2) After a short time the display appears “OFF”. Press the [ON/OFF] Key once.
3) In weighing mode press and hold down the [CAL] key, with [UNIT] or [MENU] key call up the sensitivity calibration related menu to display “PCAL”, and press the [TARE] key.
4) The display appears P-0000. Input the PCAL password P-9999 by using the arrow keys and press the [TARE] key once.

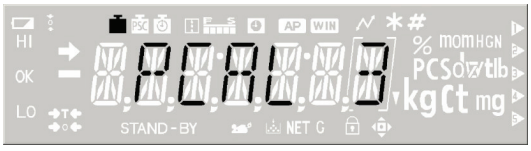
5) The calibration reference weight value begins flashing.

If the [MENU] key is pressed while the display is flashing, it proceeds to setting the reference weight value. Use the arrow keys to input the reference weight value and confirm with [TARE]. The reference weight value begins flashing. Load the displayed weight on the pan.

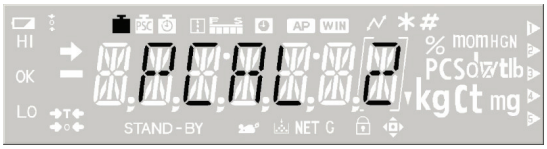
6) If the reference weight mass value is stable, automatically measure the mass.
7) Zero begins flashing.



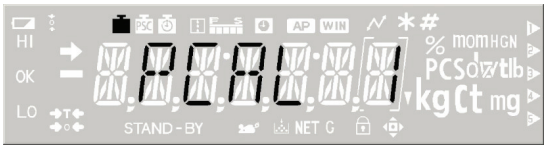
8) Take the reference weight off from the pan.
9) If the zero point mass value is stable, automatically measure the mass.
10) Drive the weight loader system, and place the internal weight in UniBloc.



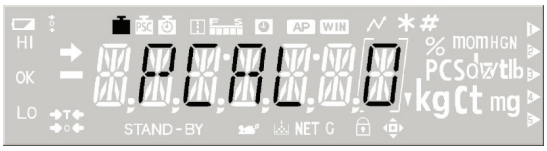
11) Stop the weight loader system, and when the mass value is stable, automatically measure the mass.



12) Drive the weight loader system, and unload the internal weight from UniBloc.



13) Stop the weight loader system, and when the zero point mass is stable, measure the mass (Z int).

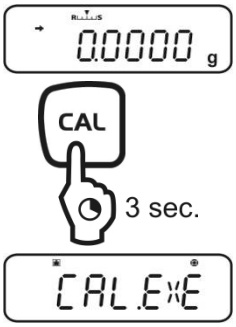


14) Attach an instrumental error to the internal weight, and re-store in NVRAM.
15) Automatic sensitivity calibration (ICAL) starts up next.
16) Calibration is completed when the display returns to mass display.

5.7. Sensitivity Calibration

5.7.1. Menu settings „I.CAL“ / „E.CAL“

⇨ To invoke the adjustment function in weighing mode, press **CAL** for 3 sec.



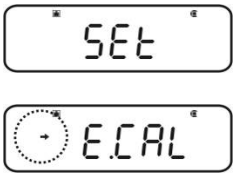
⇨ Acknowledge using **PRINT**, the current setting is displayed.

⇨ Select the desired adjustment using the navigation keys (🡻 🡹)

I.CAL: Adjustment with internal weight

E.CAL: Adjustment with external weight

⇨ Confirm with **TARE**



⇨ Press **ON/OFF** repeatedly or 3 sec., the balance will return into weighing mode

The saved adjustment (I.CAL or E.CAL) can now directly be invoked via the **CAL** button.

5.7.2. Adjustment with external weight (KERN ACS)

- If during the adjustment process within 60 s no operation is carried out, „**ERR C**“ will be displayed. Press **ON/OFF** a restart.

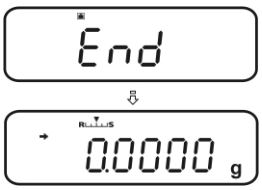
⇨ In weighing mode press **CAL**. The weight value of the recommended adjustment weight appears flashing. The indicator will be shown.

If the value shall be changed, press **MENU**, the active digit flashes. Carry out the desired setting using navigation buttons

⇨ With flashing adjustment weight display, place the adjustment weight carefully on the center of the weighing plate within 60 s. Close wind screen doors completely.

⇨ Wait until the zero display flashes.

⇨ Take away the adjustment weight and close the wind screen doors. After successful adjustment the balance automatically returns to weighing mode.
In case of an adjustment error (e.g. objects on the weighing plate) the display will show an error message, repeat adjustment.



Display	Error Name	Description
CAL E1	Instability error	Measurement value during zero point or weight mass measurement is unstable. Stabilization mark failed to light up even after 15 seconds had elapsed since weight was placed or removed.
CAL E2	Zero point error	Drift in zero point from last sensitivity calibration is large. Object exceeding 20 % of weight capacity is placed on the pan, or a change in the zero point
CAL E4	Span error	Difference between the set reference weight value and measured weight span value exceeds 2 % of the weight mass.

Pressing the [ON/OFF] key returns to the AD value display.
[Reference Weight Values]

Model Name	Reference Weight Value
ACJ/ACS 320	**300g**
ACJ/ACS 220	**200g**
ACJ/ACS 120	**100g**
ACS 80	**50g**

5.7.3. Adjustment with internal weight (KERN ACJ)

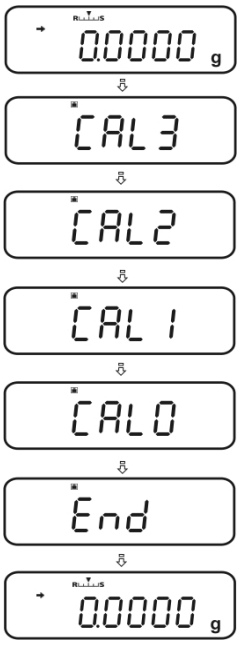
With the internal adjustment weight, the weighing accuracy can be checked and re-adjusted at any time.

- **Condition**: Menu setting „**I.CAL**“.

  Adjustment may be interrupted with **ON/OFF**, „ABORT“ is displayed.

⇨ Press the **CAL**-button and adjustment will take place automatically.

The indicator will be shown.



⇨ After successful adjustment the balance automatically returns to weighing mode.
In case of an adjustment error (e.g. objects on the weighing plate) the display will show an error message, repeat adjustment.

While detailed error codes are not displayed in user mode, they are displayed in service mode, as shown in the table below. To return from the error display, press the [ON/OFF] key.

Manufacturing Mode Error Name	Display	Description
Unstable Error (CAL E1)		Measurement value during zero Point and weight mass measurement is unstable.
Zero Change Error (CAL E2)		Drift in zero point from last sensitivity calibration is large. Object exceeding 20 % of weight capacity is placed on the pan, or a change in the zero point equivalent to excess of 20 % of weight capacity
Weight Error (CAL E3)		Difference between reference weight value and measured weight span value during PCAL exceeds 2 % of the reference weight value.
Span Change Error (CAL E4)		Difference between the set reference weight value and the measured weight span value exceeds 2 % of the weight mass.

i. Operation and execution of sensitivity calibration, and the operating procedure for the sensitivity calibration menu is the same as in the user mode, and does not appear as a service mode menu item.

5.8. Weight Loader Mechanism Operation Check

The initial position returning of the ACJ internal weight loader mechanism and the weight loader action are checked.
ACJ also has a function that enables adjustment and testing using an external weight loader system, which is also displayed as a menu item.

5.8.1. Operation Procedure and Process

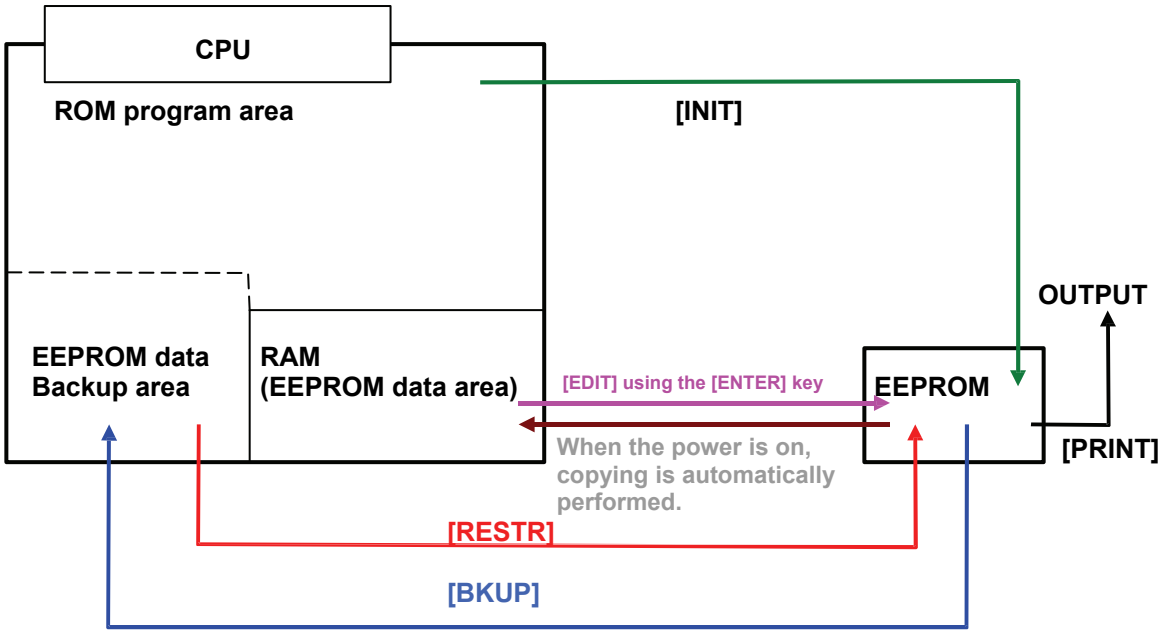
(1) Enter the Service Mode.
(2) Press the [MENU] key several times to display "LD.W," and then press the [TARE] key.
(3) Press either the [MENU] or [UNIT] key, either select "HOME" to return to the initial position, or the weight loader "LD.ULD." Confirm with [TARE].
(4) To select “LDW” again, press the [MENU] key twice.
    i. Returning to initial position
    Returns the weight to the position where the weight was unloaded from UniBloc (operation origin position), no matter in what position it was stopped.
    ii. Weight loader
    If weight is not placed in UniBloc: Place weight in UniBloc.
    If weight was placed in UniBloc: Unload weight from the UniBloc. (Return to original position.)
(5) If the specified stop position is detected, weight loader system operations are stopped and the procedure ends.

5.8.2. Errors

If the operation is not completed within the specified time, a timeout error occurs, and an error log is registered.
When returning from the error display, press the [ON/OFF] key.

Code	Error Name	Description
S-ERR0	Weight loader error	Weight loader mechanism did not complete action within the specified time.

6. EEPROM



	Address No.	Ref.
Temperature coefficient data	004 ~ 05A	
Fixed model (see 5.3.1.)	296	"296.xx**" ON : xx=01 OFF:xx=00
Error log	28F ~ 293	"28E.**xx" ~ "292.xxxx" xx : Error log
Password	3C5 ~ 3C7	9999: "3C4.**0F", "3C6.27**"

6.1. PRINT Operations

(1) In the service menu, select [NVRAM] and confirm with [TARE]. The display appears "PRINT". Confirm with [TARE].

(2) The model name, S/N, software version No., and the address inside EEPROM are displayed as the header, and then data is printed.

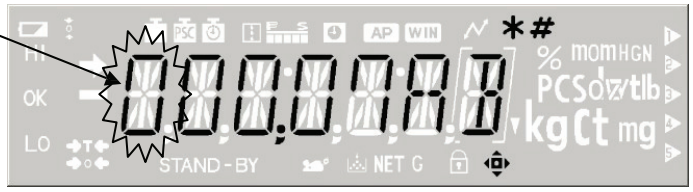
[Print example]
TYPE : ACJ 220
S/N : 0000000000
V NO : 1.00,00,00 0000 : 07AB
0002 : ACAB
0004 : 0041
0006 : 0E47
•
•

(3) When printing of all data is completed, return to the AD value display in the service menu.

6.2. Data Edit (EDIT) Operations

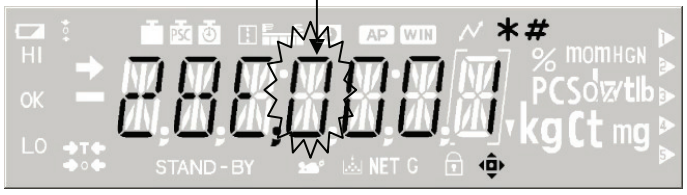
(1) In the service menu, select [NVRAM] and then [EDIT (Data edit)].
(2) Data with address in EEPROM are displayed as shown below.
The flashing value can be changed.

Flashing



(3) Input the address of the data to be edited. The address data is displayed (in the right four digits).
(4) Press the [TARE] key to confirm the address, and editing of that address data is enabled.

Flashing



(5) Edit the data.
(6) Press the [TARE] key to confirm the data, and the data is saved to the corresponding address.
(7) To continue editing, repeat the procedure from step (1).
When completed, press the [ON/OFF] key. Return to the AD value display in the service menu.

6.3. Backup (BKUP) Operations

(1) In the service menu, select [NVRAM] and then [BKUP (Backup)].
(2) The execution confirmation display "OK?" appears.
(3) Press the [TARE] key. Data in EEPROM is backed up and saved to the microcomputer Flash memory.
(4) The backup progress indicator appears.

(5) When backup is completed, return to the AD value display in the service menu.

6.4. Download (RESTR) Operations

(1) In the service menu, select [NVRAM] and then [RESTR (Download)].
(2) The execution confirmation display "OK?" appears.
(3) Press the [TARE] key. Data backed up in the microcomputer FLASH memory is transferred to EEPROM.
(4) The download progress indicator appears.

(5) When download is completed, return to the AD value display in the service menu.

6.5. All Initialization (INIT) Operations

(1) In the service menu, select [NVRAM] and then [INIT (All Initialize)].
(2) The execution confirmation display "OK?" appears.
(3) Press the [TARE] key to execute.
(4) The initialization progress indicator appears.

(5) When initialization is completed, return to the AD value display in the service menu.

7. Performance Inspection

Before starting the performance inspection, turn on the power and leave the balance in the mass display state for at least an hour. Also be sure that the location is not subject to wind, vibrations, or sudden temperature changes.

7.1. Reproducibility

Place the weight specified in Table 1 on the center of the pan, and then remove it. Repeat this procedure six times to find the amount of variation at the zero point and the weighing capacity, Rx and Ry.

$$R_x = X_{\max} - X_{\min} \qquad : X_1, X_2 \quad \cdots X_5$$
$$R_y = Y_{\max} - Y_{\min} \qquad : Y_1, Y_2 \quad \cdots Y_5$$

("max" shows the maximum value, and "min" shows the minimum value.)

7.2. Cornerload Error

1) Prepare the weight specified in Table 1 for each model.
2) As shown in the figure at below right, place the weight in the center 1 of the pan, and then in succession place in positions 2, 3, 4, and 5 shifted from the center, and then lastly return to the center 1 to register the display values.
3) If the differences (cornerload error) between the display values at the positions 2, 3, 4, and 5, and the display value at the center position 1 are all within the criteria, conditions are normal.
   Example: (Error at position 3) = (Display value at position 3) - (Average of two display values at position 1)
4) If the errors are minor, follow "4.4 Adjusting the Cornerload Error."

*** This adjustment is only effective for minor errors (within ±30 counts).**
If the error is larger, replace the unit ASSY (1).

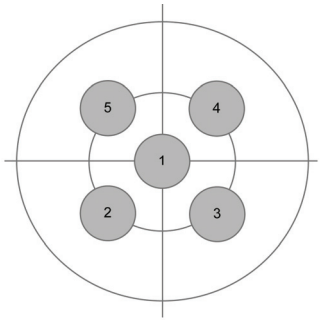


Fig. 20

7.3. Linearity

1) In the sensitivity calibration menu, set "E.CAL," and use the external weight to perform "E CAL" one time.
2) Place weights in the order shown in Table 1, and record the display value when it stabilizes.
3) Calculate the error at each load.
   (Error) = (Display value at each load) - (Average of zero point display values) – (Weight certified value)
4) If the errors are minor, follow "5.5 Linearity Adjustment."

*** This adjustment is only effective for minor errors (within ±10 counts).**
If the error is larger, replace the unit ASSY (1).

7.4. Tilt Error

1) Press the [TARE] key to change to the "0g" display. (A)
2) Position a sheet with thickness of 1 mm at the base of the rear fixing feet, and register the display value after the display stabilizes. (B)
   (Error) = (B) - (A)
3) If the errors are large, follow "4.2 Adjusting the Tilt Error."

Table 1 Inspection Criteria

Model		ACJ320 ACS320	ACJ220 ACS220	ACJ120 ACS120	ACS80
Weighing capacity (g)		320	220	120	82
Minimum display (mg)		0.1	0.1	0.1	0.1
Reproducibility (Rx, Ry)	Standard (mg)	2	2	2	2
	Weight (g)	300	200	100	80
Cornerload error	Standard (mg)	±1	±1	±0.5	±0.5
	Weight (g)	100	100	50	50
Weight error	Standard (mg)	0g ≤ Weight ≤ 50g : +/-0.5mg 50g < Weight ≤ 200g : +/-1mg 200g < Weight : +/-1.5mg			
	Weight (g)	0 300 0 50 100 200 0 300 0	0 200 0 50 100 150 0 200 0	0 120 0 20 50 100 0 120 0	0 80 0 20 40 60 0 80 0

When replacing parts, balance performance may be altered. After replacement, check the performance and make adjustments if necessary by referring to the table below.

Replaced Part	Items required for adjustment and inspection			
	Sensitivity temperature characteristics	Linearity	Internal weight calibration (ACJ)	Tilt error
Display board ASSY	Yes (*1)	Yes (*1)	Yes (*1)	N
Analog board ASSY	N	Y	Y	N
Power board ASSY	N	N	N	N
Weight loader ASSY	N	N	Y	N
Unit ASSY	Yes (*2)	Y	Y	N
Detector ASSY	N	Y	Y	N
Force coil ASSY	N	Y	Y	Y

*1: When the display board ASSY has been replaced, mount the EEPROM that was included with the original display board ASSY.
*2: If the unit ASSY has been replaced, mount the included EEPROM to the display board ASSY.

8. Problems and Solutions

8.1. General Problem Solutions

Problem	Cause	Solution
Nothing appears on the display.	1) Power voltage not compatible	Check the power supply, and connect correctly.
	2) Problem with supply voltage or AC adaptor	Replace the AC adaptor.
	3) Power board ASSY (B4) fault	Replace the power board ASSY (B4).
	4) Display board ASSY (B2) fault	Replace the display board ASSY (B2).
Numerals or symbols not displayed	1) Display board ASSY (B2) fault	Replace the display board ASSY (B2).
Key operation does not work.	1) Switch board ASSY (C4) fault	Replace the switch board ASSY (C4).
	2) Display board ASSY (B2) fault	Replace the display board ASSY (B2).
	3) Fixing fault in case ASSY (3)	Refix the case ASSY (3) in place.
"OL" or "-OL" is displayed.	1) Contact with stopper plate (U14) and stabilizer pin	Realign the stopper plate (U14).
	2) Pt-Ni band (U17) fault	Check the Pt-Ni band (U17), and connect correctly.
	3) Contact with force coil ASSY (L1) and magnet ASSY (U9)	Reset or replace the force coil ASSY (L1).
	4) Force coil ASSY (L1) fault	Replace the force coil ASSY (L1).
	5) Damage to OPF (U1)	Replace the unit ASSY (1).
	6) Detector ASSY (U11) fault	Replace the detector ASSY (U11).
	7) Analog board ASSY (B3) fault	Replace the analog board ASSY (B3).
Large zero or span drift	1) Not enough time allowed for warmup	Perform unit warmup.
	2) Unit under direct sunlight, or subject to breeze from air conditioner	Change the balance installation site.
Span is incorrect.	1) Not horizontally adjusted	Use the level adjuster ASSY (B6) to adjust the level.
	2) Balance has been relocated.	Calibrate the span (sensitivity) at the current installation site.
	3) Damage to OPF (U1)	Replace the unit ASSY (1).
Large cornerload error (30 d or larger)	1) Damage to OPF (U1)	Replace the unit ASSY (1), and readjust.
Poor measurement reproducibility Large fluctuation in display values Difficulty in getting stability mark to light up	1) Affected by breezes or vibration	Relocate the balance. Change to high-stability settings.
	2) Cable between detector ASSY (U11) and analog board ASSY	Rearrange the cable.
	3) Contact with stopper plate (U14) and stabilizer pin	Realign the stopper plate (U14).
	4) Contact with force coil ASSY (L1) and magnet ASSY (U9)	Reset or replace the force coil ASSY (L1).
	5) Dust adheres to inside of force coil ASSY (L1) or magnet ASSY (U9)	Remove dust.
	6) Temperature sensor fault	Re-solder the temperature sensor to the detector ASSY (U11).
	7) Damage to OPF (U1)	Replace the unit ASSY (1).
	8) Analog board ASSY (B3) fault	Replace the analog board ASSY (B3).
	9) Detector ASSY (U11) fault	Replace the detector ASSY (U11).

Problem	Cause	Solution
Large linearity error	1) Linearity adjustment fault	Readjust linearity. If over 10 d, replace the unit.
	2) Damage to OPF (U1)	Replace the unit ASSY (1).
	3) Load cell breakdown	Replace the load cell ASSY.
	- Breakdown of temperature sensor used to measure and correct UniBloc sensor temperature characteristics.	Check the sensor solder. Replace the analog board ASSY.
	- Abnormal data for various correction coefficients for mass display, balance information, and menu setting conditions, etc.	Download the data again.
	- Weight loader ASSY (27) fault (snapping, sensor fault, short of motor coil)	Check connector connection and wire connection. Replace the weight loader ASSY (27). Replace the display board ASSY (B2).
When the power is switched on, display stops at "Software Version."	Communication fault between the display board ASSY and analog board ASSY.	Replace the connection cable. Replace the analog board. Replace the display board.

8.2. Error Display

8.2.1. User Mode Errors

Display	Error Name	Description
ERR H	Hardware error	Breakdown of temperature sensor used to measure and correct UniBloc sensor temperature characteristics.
		Abnormal data for various correction coefficients for mass display, balance information, and menu setting conditions, etc.
		ACJ weight loader ASSY fault
ERR C	Sensitivity calibration error	Calibration weight not placed on the pan. Something else is placed on the pan. The calibration weight is wrong.
ERR N	Numerical input error	Too small a number has been input for reference number settings.
		The password entered is not recognized, when using a function that requires password entry.
ERR W	Operations error	Formulation, or other mode operation error
COM ERR	External input error	Unidentifiable command code received
OL		Weight capacity exceeded
- OL		Measurement pan was removed.
Battery Mark	Power voltage drop	Lights up when voltage supplied to the microcomputer is at or below the specified voltage.
WAIT	Wait for operation approval	
ABORT	Abort	

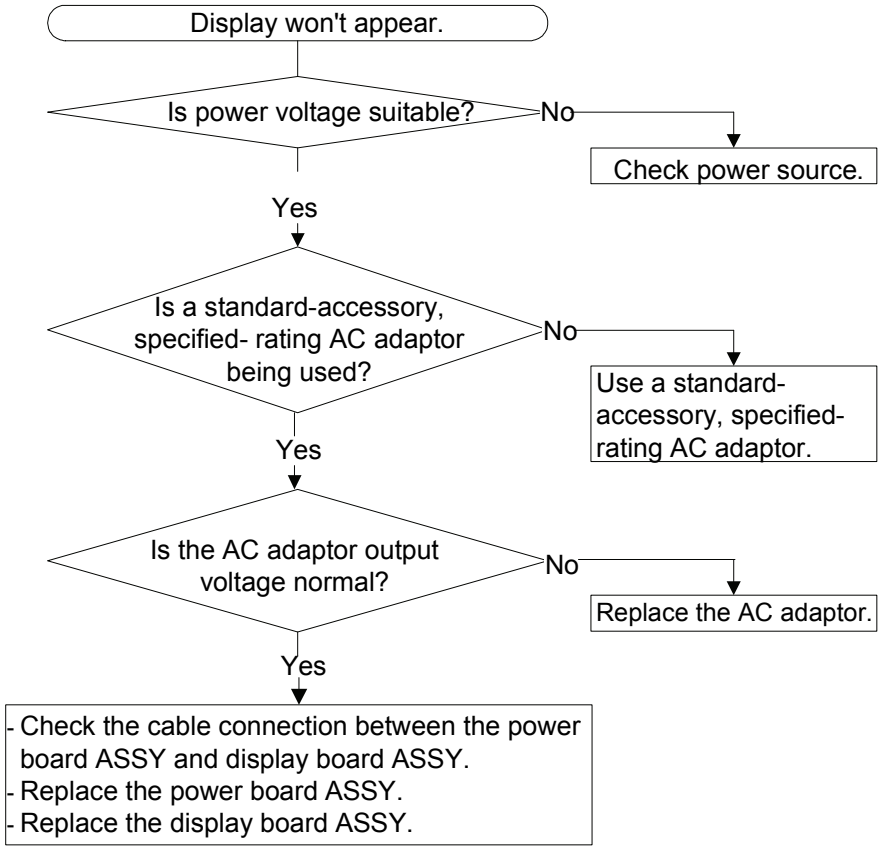
8.2.2. Service Mode Errors

When entering service mode, detailed error codes are displayed for the errors generated in user mode, as shown in the table below. In this state, press the [→] key to display a history of the most recent errors, up to a maximum of five errors.
When more than five errors are displayed, press the [→] key to return to the display of the most recent errors.
If entering service mode when no errors have been generated, "NO ERR" is displayed, as shown in the table below.

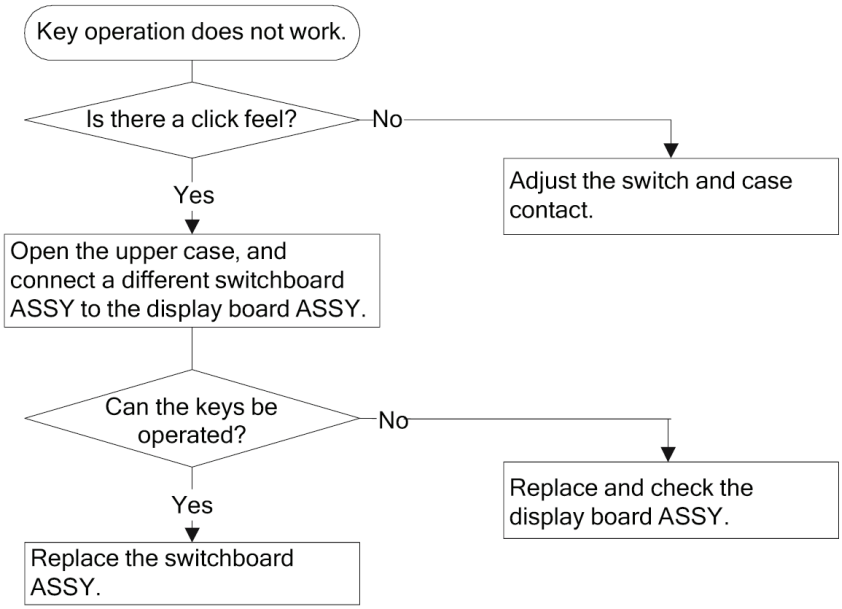
User Mode Error	Service Mode Error Name	Display	Cause
No Errors	-		No errors occurred during user mode.
System error (Hardware error)	Weight loader system error (Err0)		Weight loader system for the ACJ Series did not function correctly due to malfunction, etc.
	Temperature sensor error (Err1)		Abnormal temperature data due to temperature sensor malfunction
	EEPROM data error (Err5)		Abnormal mass calculation due to EEPROM data abnormality
Sensitivity calibration error	Stabilization error (CAL E1)		Measurement value at zero point or during weight measurement is unstable.
	Zero point error (CAL E2)		Drift in zero point from last sensitivity calibration is large. During first sensitivity calibration after energizing, the zero point change exceeds 20 % of the weight capacity, or a later zero point change exceeds 2 % of the weight capacity.
	Reference weight error (CAL E3)		Difference between reference weight value input during PCAL and measured weight span value exceeds 2 % of reference weight value.
	Span error (CAL E4)		Difference between the set reference weight value and measured weight span value exceeds 2 % of the reference weight mass.

9. Troubleshooting

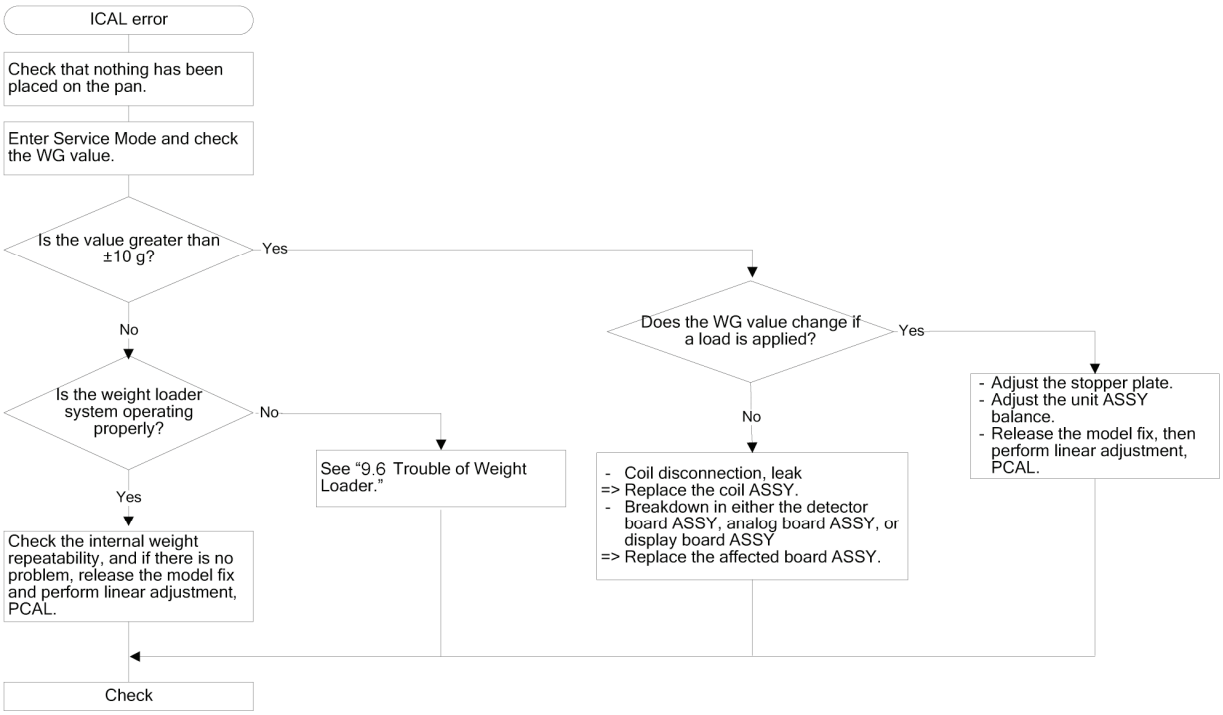
9.1. Display Won't Appear

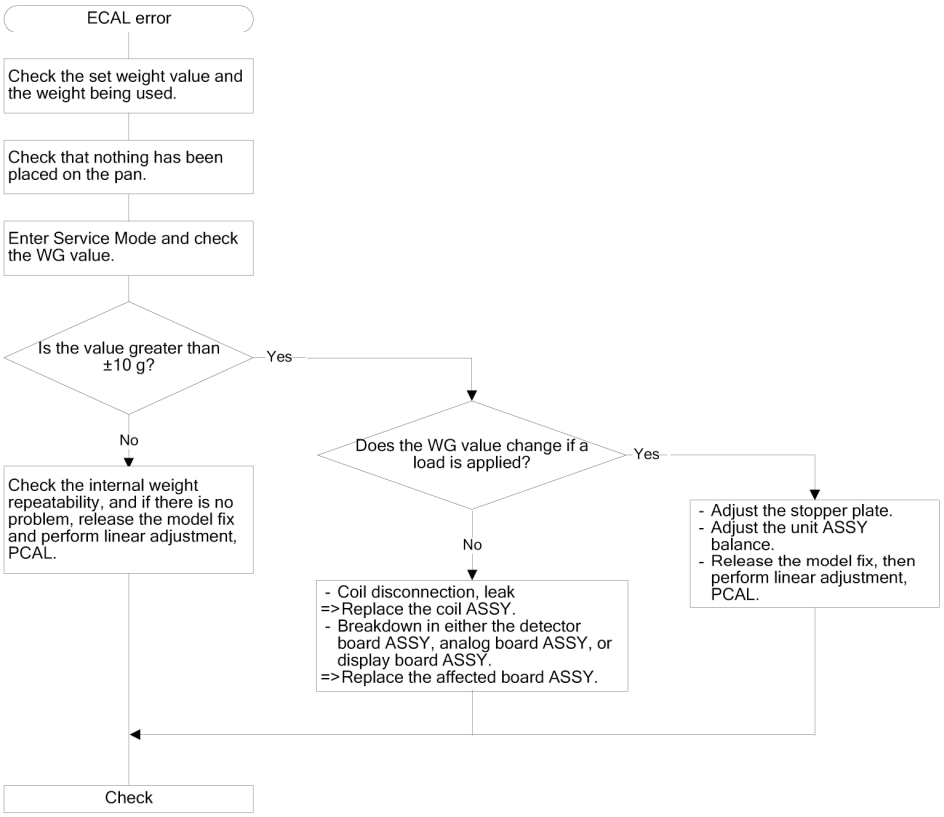


9.2. Key Operation Does Not Work



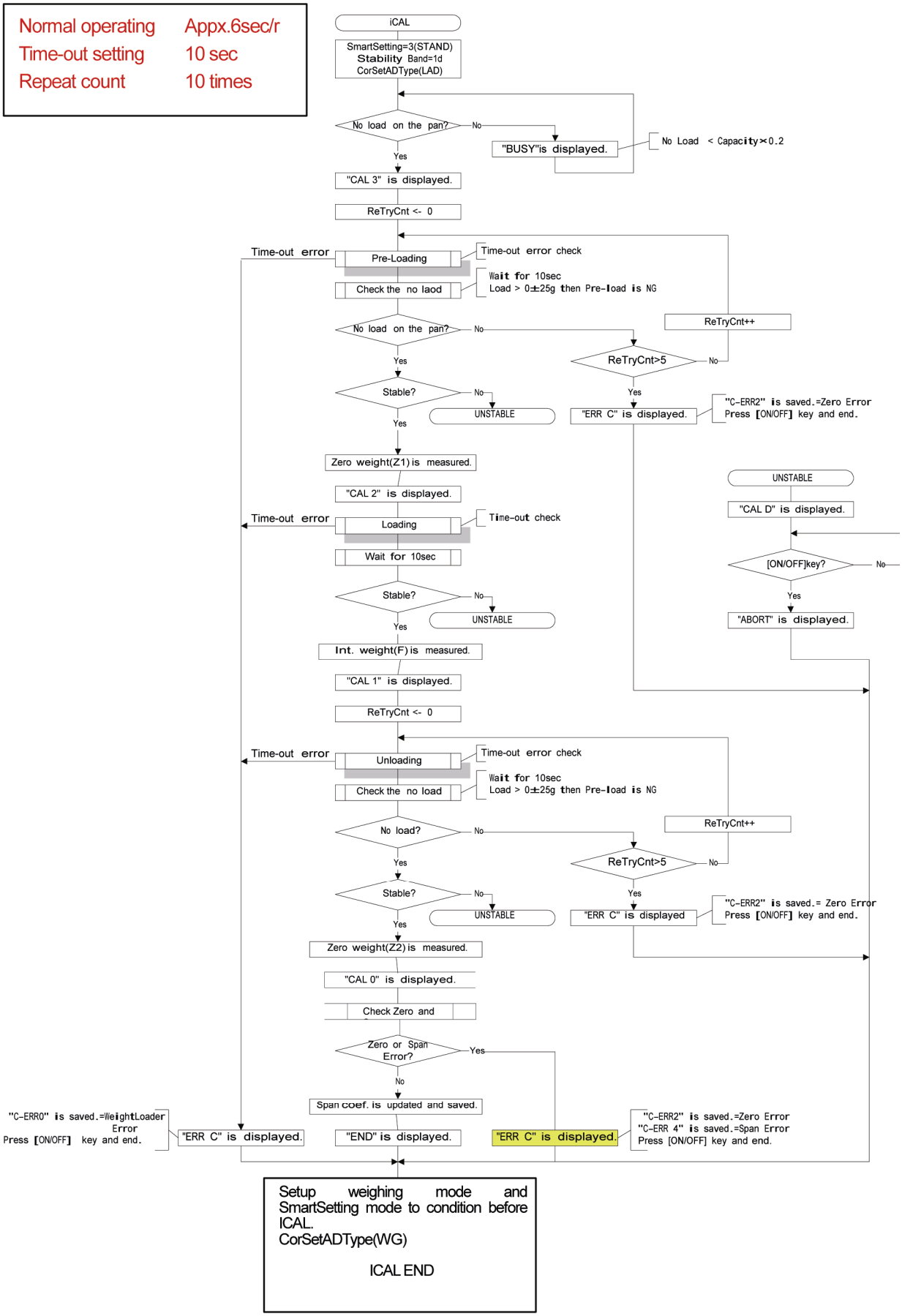
9.3. “ERR C” is Displayed



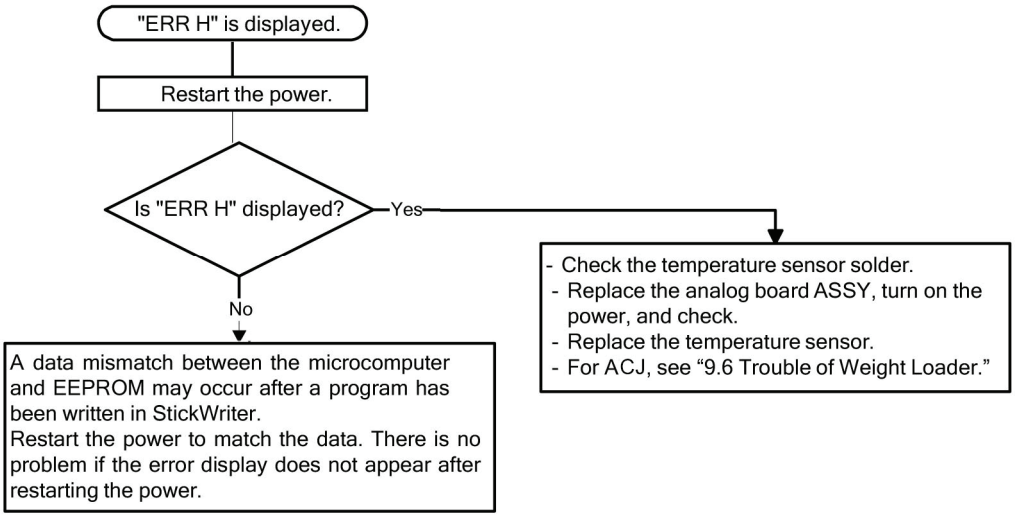


Flow Chart of CAL error

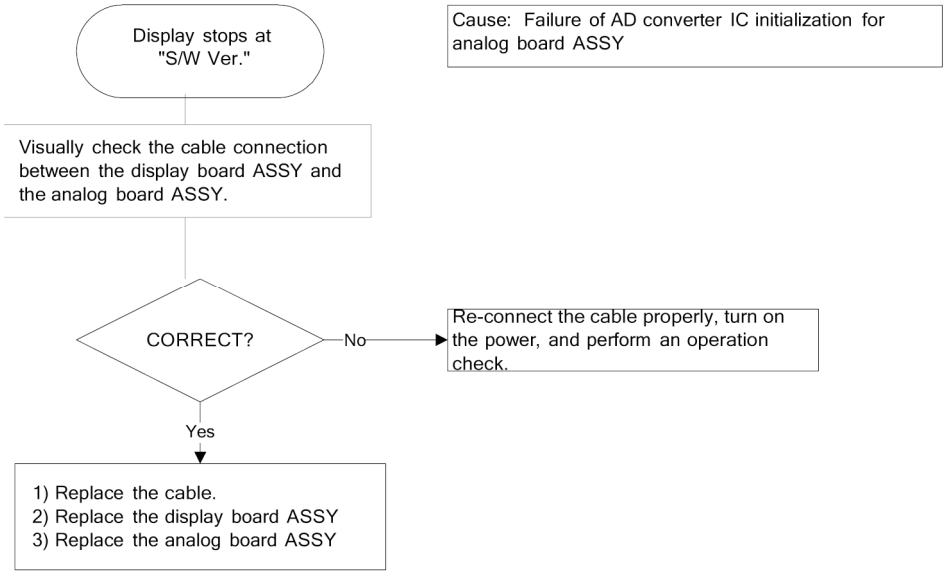
Normal operating	Appx.6sec/r
Time-out setting	10 sec
Repeat count	10 times



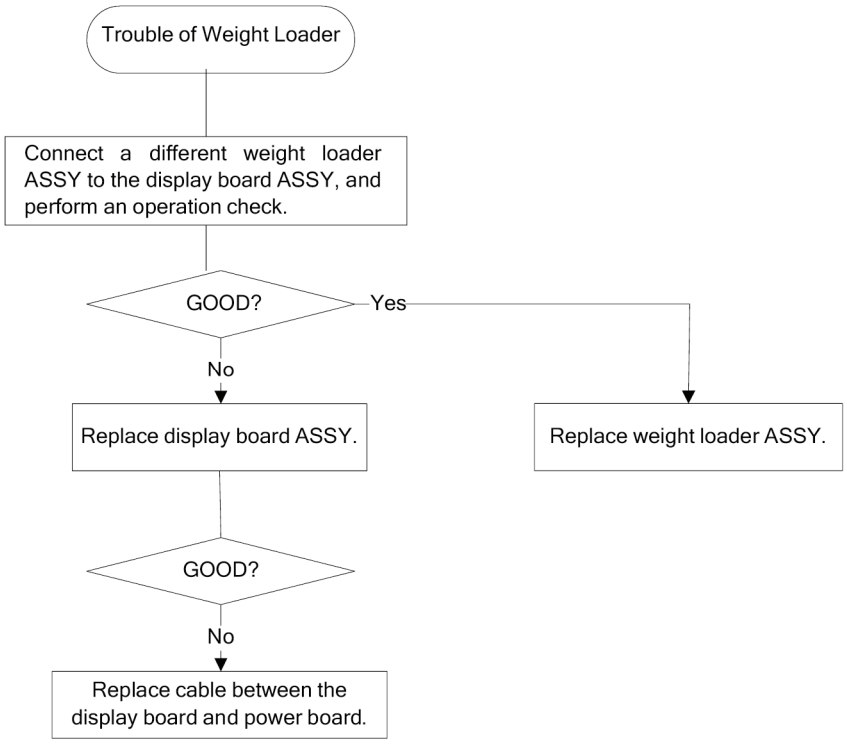
9.4. “ERR H” Is Displayed



9.5. When Power Is Switched On, Display Stops at “Software Version”



9.6. Trouble of Weight Loader



10. Standard Accessories and Maintenance Parts List

10.1. Maintenance parts

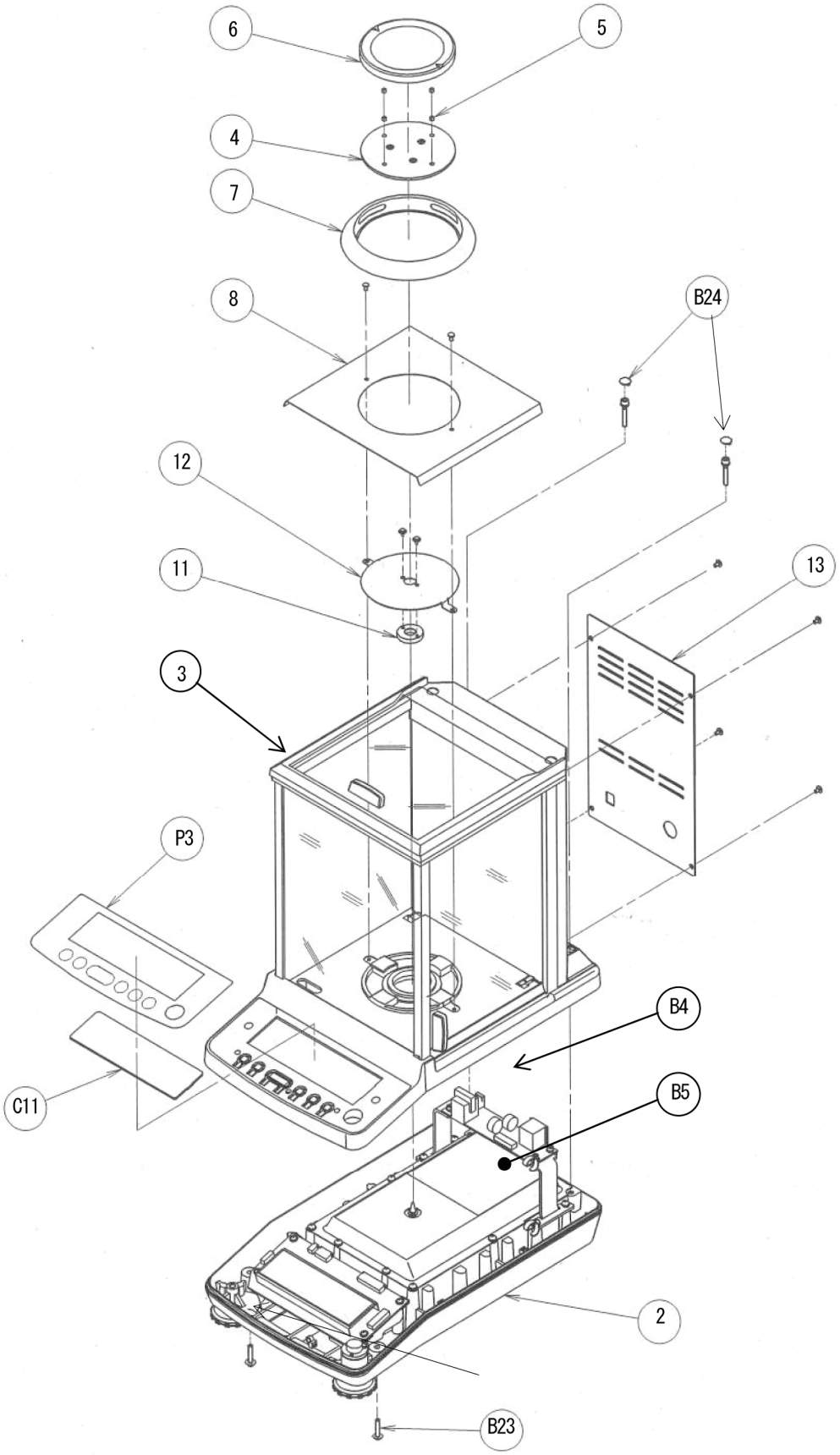
No.	Parts Name	P/N	Remarks
1	UNIT ASSY,ACJ120	321-71317	For ACJ120-4M
1	UNIT ASSY,ACJ220	321-71317-01	For ACJ220-4M
1	UNIT ASSY,ACJ320	321-71317-02	For ACJ320-4M
1	UNIT ASSY,ACS	321-71317-03	For ACS320-4,ACS220-4,ACS120-4,ACS80-4
4	PAN SUPPORTER ASSY	321-71284	
5	CUSHION RUBBER SET	321-62984-02	4-unit set, common with ABT series
6	PAN	321-71052	
7	WIND SHIELD RING	321-71053-01	
8	COVER PLATE	321-71055	
9	AC ADAPTER HOLDER	072-60330-02	
10	PROTECT COVER	321-71025	
11	BLOW KEEP OFF RING	321-71563	For ACJ/ACS
12	WIND SHIELD PLATE	321-71054	
13	REAR COVER	321-71035	
27	WEIGHT LOADER ASSY	321-62850-01	Common with ABT series
B1	BASE ASSY	321-71013-01	For ACJ/ACS
B2	DISPLAY BOARD ASSY	321-72185-01	
B3	ANALOG BOARD ASSY	321-71080	
B4	POWER BOARD ASSY	321-71075	
B5	UNIT COVER	321-71061	
B6	LEVEL ADJUSTER ASSY	321-71069	
B7	LEVEL INDICATOR	321-53128-03	
B8	MOUNT, DISPLAY BOARD	321-71059	
B9	CABLE ASSY A	321-71107-01	Connection line between POWER BOARD ASSY and ISPLAY BOARD ASSY
B10	CLAMP, E-20-3C	037-60186	
B11	MOUNT, ANALOG BOARD	321-71275	
B23	BOLT, SST HEX SEMS P4X25	022-27750-09	CASE and BASE connection screws
B24	COVER, SCREW	321-71038	
C1	CASE	321-71030	
C3	CASE ROOF	321-71032	
C4	SW, BOARD ASSY	321-71095	
C5	ROOF GLASS ASSY	321-71041-11	For ACJ/ACS, With knob
C6	SIDE GLASS ASSY (RIGHT)	321-71043-11	For ACJ/ACS, Glass door on facing right side, with knob
C7	SIDE GLASS ASSY (LEFT)	321-71043-12	For ACJ/ACS, Glass door on facing left side, with knob
C8	FRONT GLASS ASSY	321-62931-01	FOAMING SHEET, CUSHION TAPE (SIDE GLASS and cushion) with
C10	KNOB	321-62787-01	
C11	WINDOW DISPLAY	321-71037	
C12	FRONT PILLAR	321-62902	
C13	CUSHION	321-71286-01	Attached to front pillar
C14	CHAMBER POLE ASSY	321-71278	
C15	REINFORCE PLATE	321-71285-01	
C16	REINFORCE PLATE	321-71285-02	
P3	SHEET PANEL,ACJ/ACS	321-71614	For ACJ/ACS

No.	Parts Name	P/N	Remarks
P4	MODEL NANE LABEL,ACJ120	321-71616-03	For ACJ120-4M
P4	MODEL NANE LABEL,ACJ220	321-71616-04	For ACJ220-4M
P4	MODEL NANE LABEL,ACJ320	321-71616-05	For ACJ320-4M
P4	MODEL NANE LABEL,ACS80	321-71616-07	For ACS80-4
P4	MODEL NANE LABEL,ACS120	321-71616-08	For ACS120-4
P4	MODEL NANE LABEL,ACS220	321-71616-09	For ACS220-4
P4	MODEL NANE LABEL,ACS320	321-71616-10	For ACS320-4
L1	FORCE COIL ASSY	321-71280	
L7	TWIST CABLE	015-16501-46	
U7	LEVER ASSY	321-71028	
U9	MAGNET ASSY	321-55222-03	Common with ABT series
U11	DETECTOR ASSY	321-71085	
U14	STOPPER PLATE	321-71276	
U15	STOPPER, LEVER	321-70244	
U16	LID, MAGNET	321-54743-21	
U17	Pt-Ni BAND	014-54301	
U17	Pt-Ni BAND,1MT	321-70188-01	Total length 1 M, ACJ/ACS series usage volume 30 mm × 2 units
U18	TEMP. SENSOR ASSY	321-54735-02	Common with ABT series
U19	CABLE ASSY, C	321-71109-01	For coil
U20	BALANCE WEIGHT (ECCENTRIC)	321-71019-02	φ10, t = 4
U20	BALANCE WEIGHT (ECCENTRIC)	321-71019-04	φ10, t = 6
U20	BALANCE WEIGHT (ECCENTRIC)	321-71019-06	φ12, t = 6
U21	BALANCE WEIGHT	321-71018-02	φ10, t = 4
U21	BALANCE WEIGHT	321-71018-04	φ10, t = 6
U21	BALANCE WEIGHT	321-71018-06	φ12, t = 6
U22	CABLE ASSY, A (P7)	321-71107-03	Connection line between DETECTOR ASSY and ANALOG BOARD ASSY
U23	CABLE ASSY, A (P9)	321-71107-02	Connection line between SWITCH BOARD ASSY and DISPLAY BOARD
U24	CABLE ASSY, B (P14)	321-71108	Connection line between DISPLAY ASSY and ANALOG BOARD ASSY
U25	CORE,ESD-SR-160 BLACK	075-08031-65	For ACJ/ACS
W1	BOARD ASSY SENSOR	321-60239-01	WEIGHT LOADER ASSY sensor board
W2	MOTOR ASSY	321-62941-01	
W3	WEIGHT STOPPER	321-62862	
W4	WEIGHT	321-62863	For ACJ220-4M,ACJ320-4M
W4	WEIGHT	321-62939	For ACJ120-4M
OT 1	LUBRICANT, TRI-FLOW	017-27019-01	For weight loader sliding surface and side glass sliding surface lubrication, 94 ml aerosol
OT 2	GREASE, GP-837DE 2KG	017-30842-01	LEVEL ADJUSTER (caster) grease
OT3	PACKING BOX,ACJ/ACS	321-71926	PACKING BOX FOR ACJ/ACS

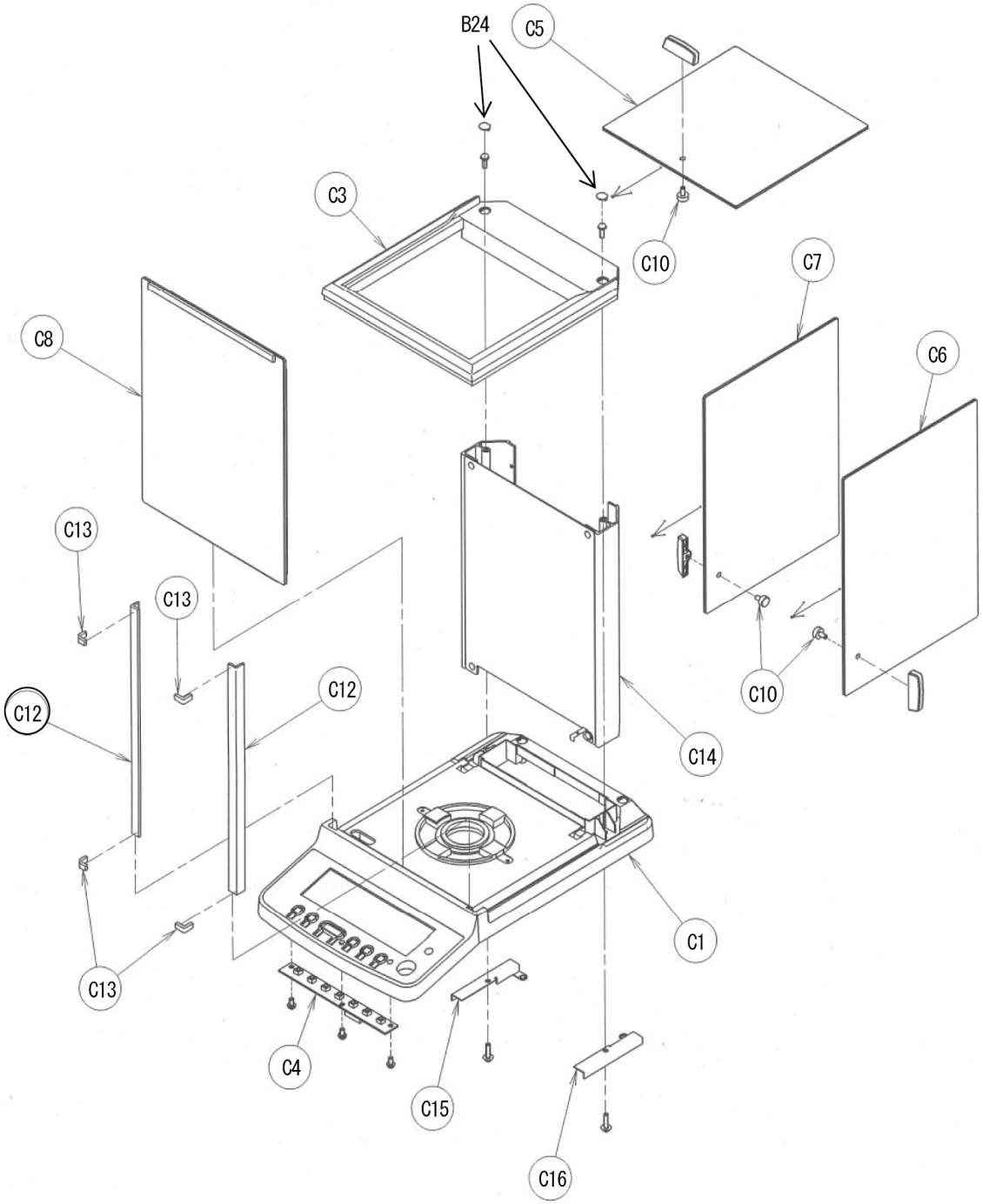
10.2. Dedicated Jigs

No.	Parts Name	P/N	Remarks
J1	LEVER FIXING PIN	321-62674	Common with ABT
J2	UNIT ASSY POSITIONING JIG	774-41101-01	
J3	GAP SETTING SHIM (t = 0.1)	774-41357	Common with Unibloc products
J4	HANDLE FOR CORNERLOAD ADJUSTMENT	321-69205	Common with Unibloc products
J5	GRIND STONE	321-69206	Common with Unibloc products
J6	I/F BOARD MOOUNTING JIG	775-35175	
J7	JIG ACJ, BOARD MOUNTING	775-35175	
J9	MAGNET SPACER	321-71245	
J10	JIG, CABLE ASSY	774-41782	
	Flash programmer SW-K0LX2	774-49154	
	Flash programmer cable	774-41751	

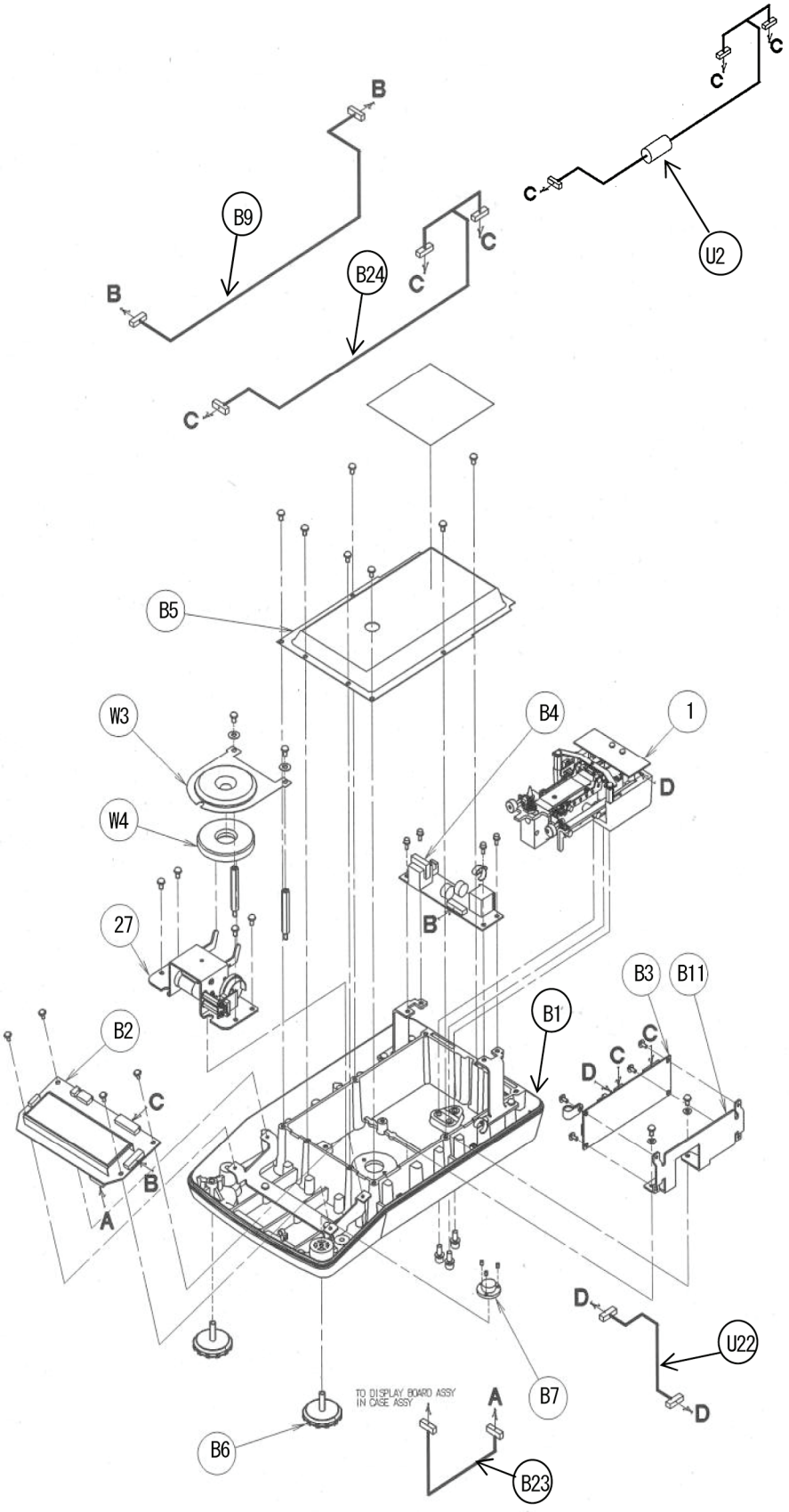
10.3. Exploded View



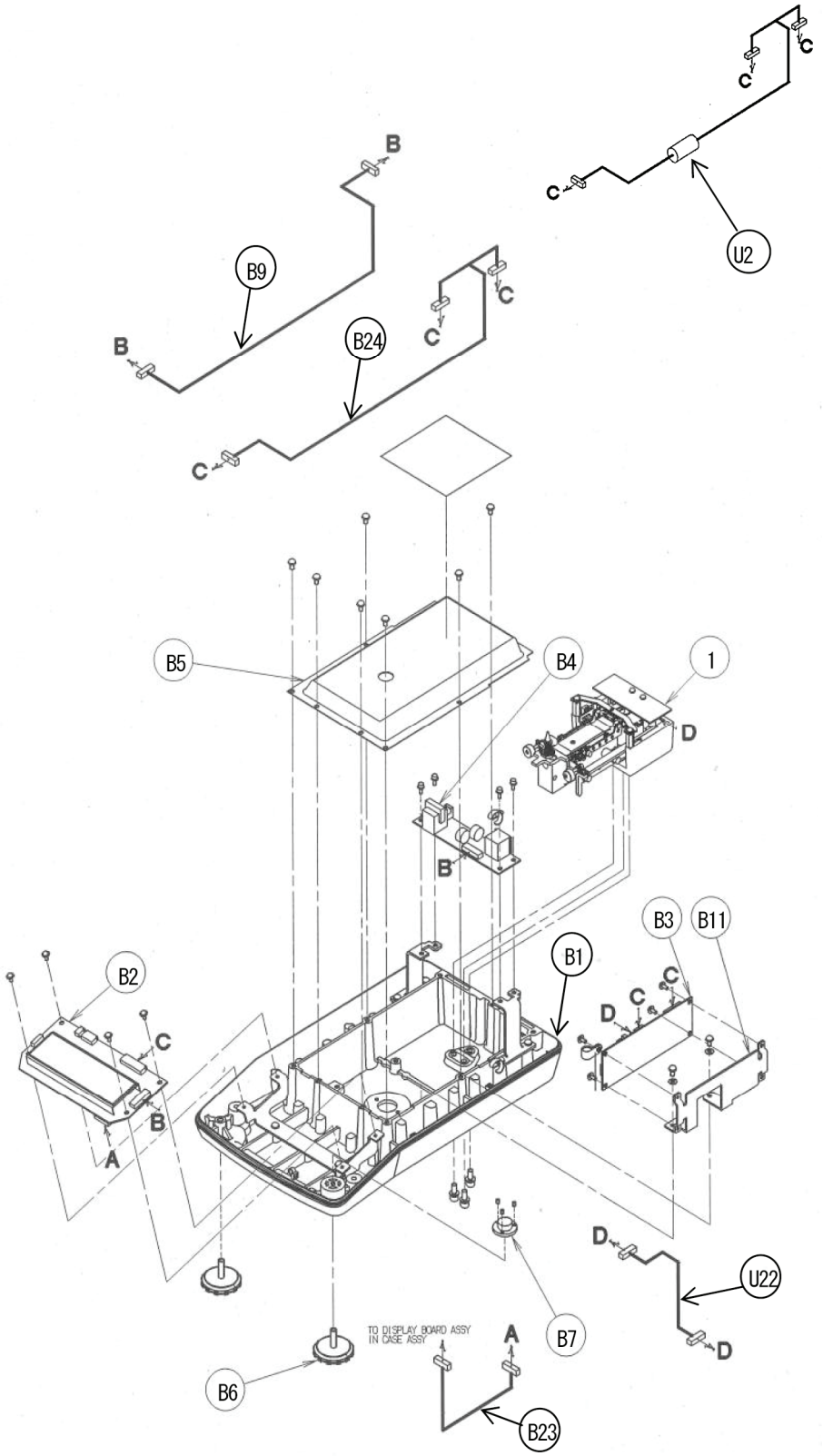
Case ASSY



ACJ Base Unit ASSY



ACS Base Unit ASSY



Unit ASSY