



KERN & Sohn GmbH

Ziegelei 1
D-72336 Balingen
E-Mail: info@kern-sohn.com

Tel: +49-[0]7433- 9933-0
Fax: +49-[0]7433-9933-149
Internet: www.kern-sohn.com

Service manual Precision balance

KERN PEJ/PES

Version 1.1
4/2009
GB



PEJ/PES-SH-e-0911



KERN PEJ/PES

Version 1.1 4/2009

Service manual Precision balance

Contents

1.	Basic information.....	3
2.	Total View.....	4
3.	Electronic Construction.....	5
3.1	Block Diagram.....	5
3.2	Whole Wiring.....	6
4.	Troubleshooting.....	7
4.1	Troubleshooting Procedure.....	7
4.2	Troubleshooting Table.....	8
4.3	Troubleshooting Table 2.....	9
4.4	Primary Checks.....	10
4.5	Checks for Electric/Electronic Parts.....	11
4.5.1	Check of VIBA-2A board.....	13
5.	Adjustment and Setting.....	14
5.1	Span Calibration (Adjustment with internal weight – PEJ).....	14
5.2	Span Calibration (Adjustment with external weight – PES).....	15
5.3	Corner Error Adjustment.....	16
5.4	Linearity Adjustment.....	17
5.4.1	Table Increasing Calibration Weight for Linearity Adjustment.....	18
5.5	Calibration of Built-In Weight (Ref Cal) – only PEJ.....	19
6.	Parts Replacement.....	20
6.1	How to Remove the Case.....	20
6.2	How to Cover the Case.....	20
6.3	How to Replace Mechanical Unit.....	21
6.4	How to Remove Mechanical Unit.....	21
6.5	How to Install Mechanical Unit.....	22
6.6	Sequence of Tuning-Fork Sensor Replacement.....	23
6.7	How to Remove Tuning-Fork Assy.....	23
6.8	How to Install Tuning-Fork Assy.....	24
6.9	Adjustment of Overload Stopper.....	25
6.10	Sequence of Circuit Board Replacement.....	26
7.	Installation of Options.....	27
7.1	Installation of Battery Option.....	27
7.2	Installation of Relay Contact Option.....	28
8.	Parts List.....	30
8.1	Explosion Diagram.....	30
8.2	Bill of Material.....	31
8.3	View of Components PES 31000-1M.....	32

1. 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.

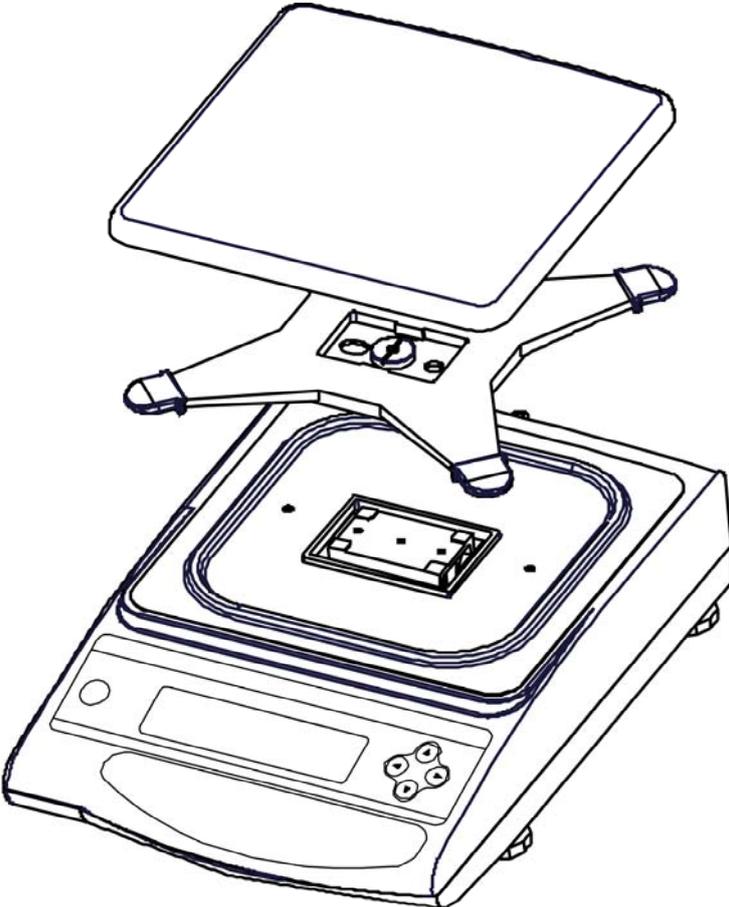
Es dürfen nur Originalersatzteile verwendet werden.

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!

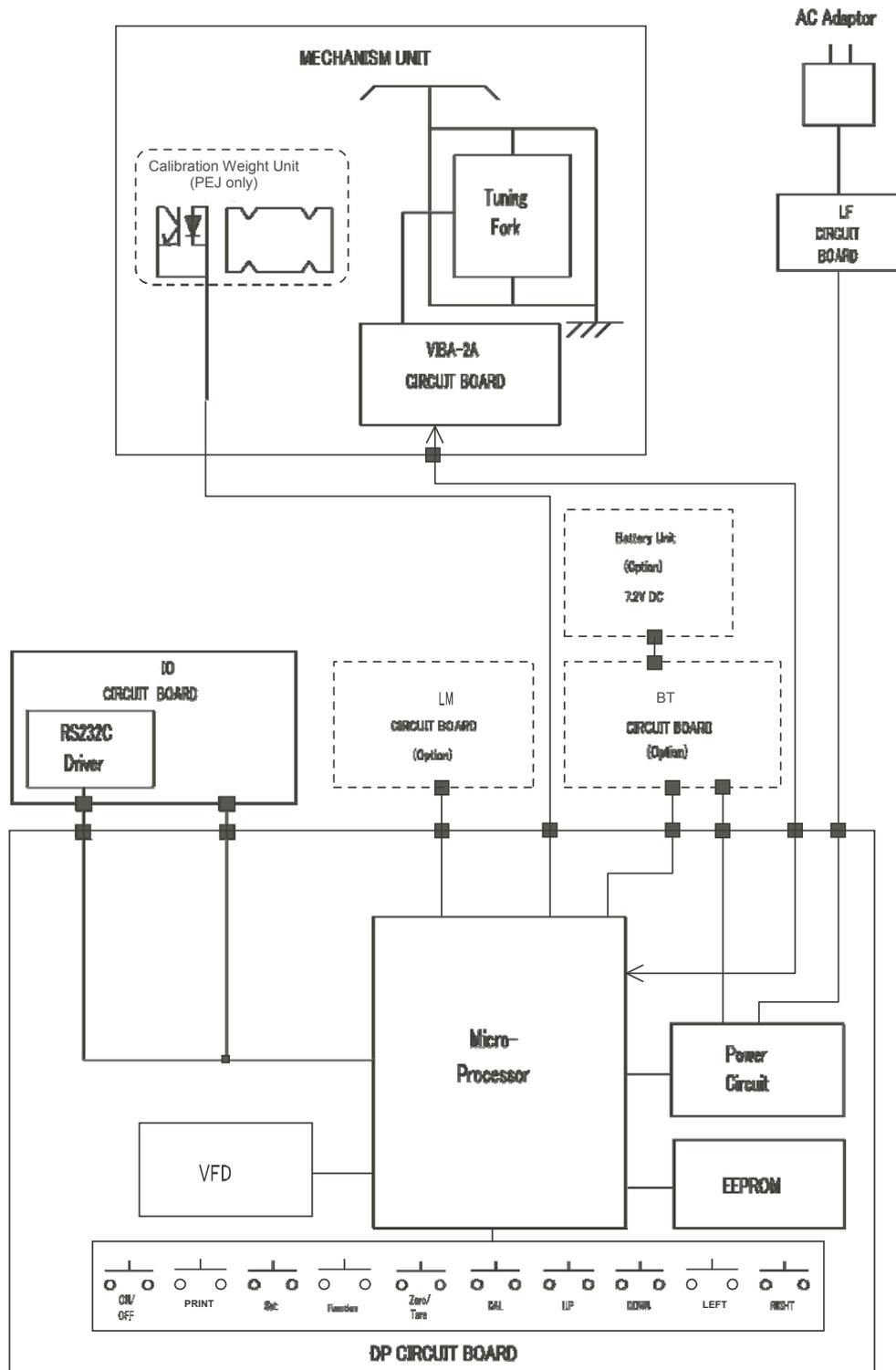
Nach erfolgreicher Reparatur muss eine Nacheichung erfolgen, um die Waage wieder im gesetzlich geregelten Bereich verwenden zu können.

2. Total View

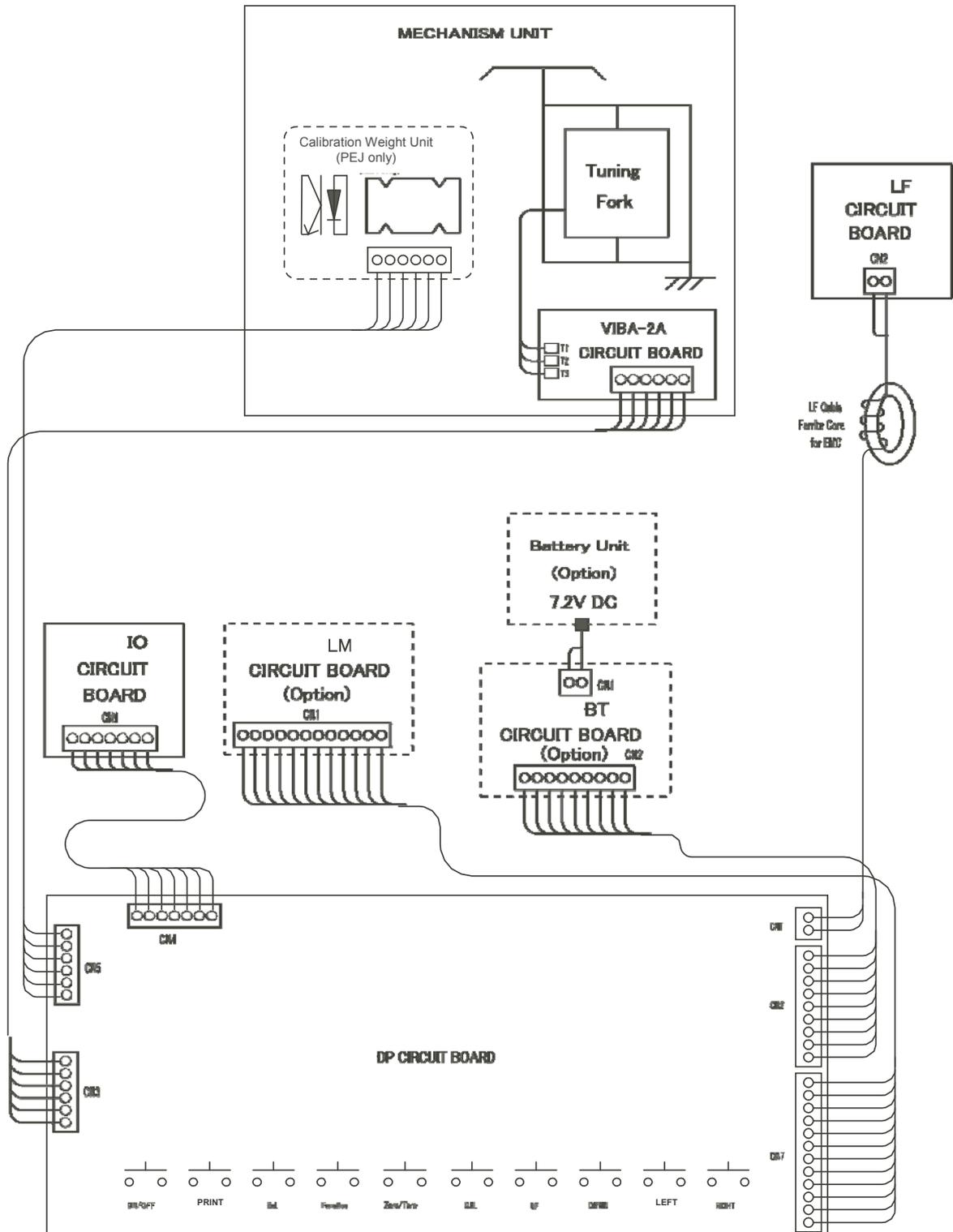


3. Electronic Construction

3.1 Block Diagram

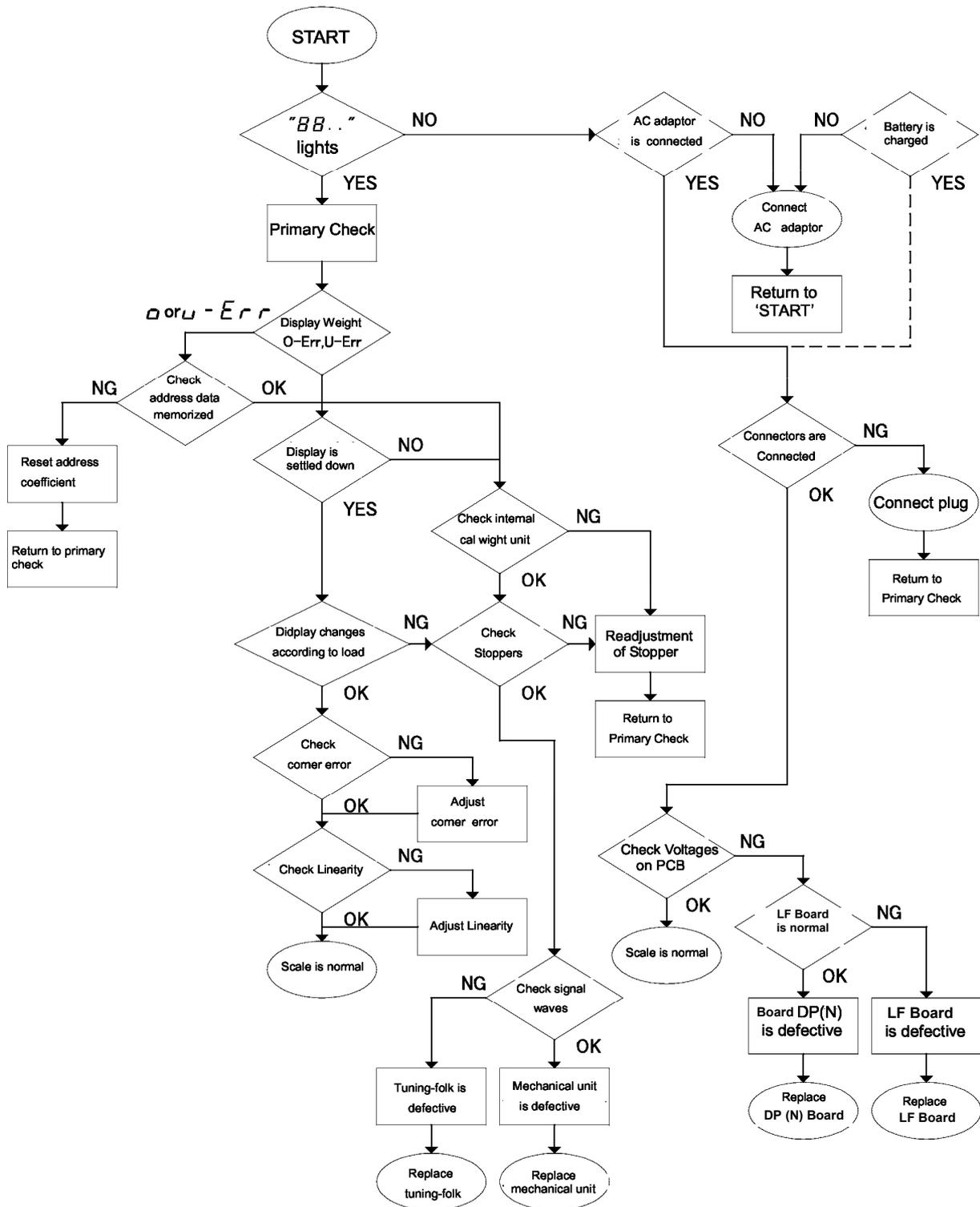


3.2 Whole Wiring



4. Troubleshooting

4.1 Troubleshooting Procedure



4.2 Troubleshooting Table

SYMPTOMS	CAUSES & REMEDY
No display lights on	<ol style="list-style-type: none"> 1. DP board is defective. 2. AC adaptor is defective. 3. Wrong connection of connection cords inside. 4. Built-in battery is discharged.
'u-Err' or 'o-Err' appears self test of segment.	<ol style="list-style-type: none"> 1. Wrong weighing pan is applied. 2. Tuning-fork sensor or mechanism unit is defective. 3. DP board is defective. 4. Setting of address date has mistake. 5. Coefficient memories (address data) have changed by noise or static electricity. Adjust linearity.
<p>Display does not get settled down.</p> <p>Display does not repeat correctly.</p> <p>Zero points drifts.</p>	<ol style="list-style-type: none"> 1. Some parts such as stopper touch others. 2. Internal calibration weight touches other parts. 3. Weighing pan touches other parts. 4. Foreign substances are in the scale. 5. Tuning-fork sensor or mechanism unit is defective. 6. Affected by wind or disturbing oscillation. Check environment or working base. Check also setting of stabilization time.
'o-Err' appears with a net load less than specified capacity.	<ol style="list-style-type: none"> 1. Gross weight applied to the scale pan (net weight + tare value) exceeds the scale capacity. 2. Setting of address data has mistake. 3. Coefficient memories (address data) have changed by noises or static electricity. Adjust linearity. 4. Wrong external calibration weight is used in span calibration. 5. Internal calibration weight touches other parts.
Span is out of specified range.	<ol style="list-style-type: none"> 1. Tuning-fork sensor or mechanism unit is defective. 2. DP board is defective. 3. Setting of address data has mistake. 4. Coefficient memories (address data) have changed by noises or static electricity. Adjust linearity.
Linearity is out of specified range.	<ol style="list-style-type: none"> 1. Tuning-fork or mechanism unit is defective. 2. Setting of address data has mistake. 3. Coefficient memories (address data) have changed by noises or static electricity. Adjust linearity. 4. Wrong external calibration weight is used in span calibration.

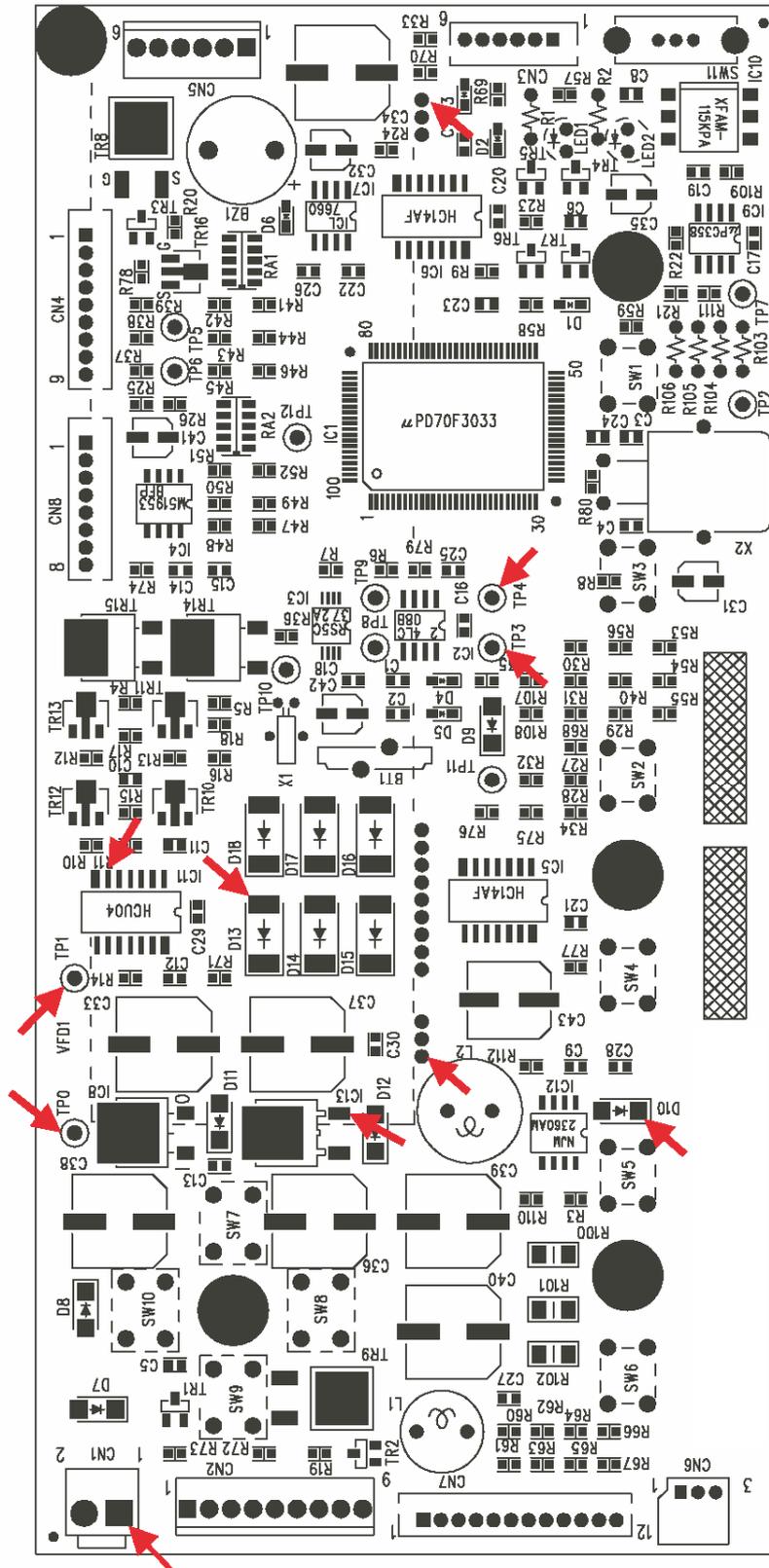
4.3 Troubleshooting Table 2

SYMPTOMS	CAUSES & REMEDY
- Corner error is too much.	<ol style="list-style-type: none"> 1. Mechanical unit is defective, such as roberval plate (spring) has been bent or twisted. 2. Pan base touches other parts.
- Display suddenly disappeared	<ol style="list-style-type: none"> 1. DP board is defective. 2. AC adaptor is defective.
- "1-Err" appears.	1. Wrong external calibration weight is used in span calibration. (External weight is less than 50% of capacity).
- "2-Err" appears.	<ol style="list-style-type: none"> 1. Span error exceeds 1% of capacity in span calibration (check the external weight). 2. Tuning-fork sensor or mechanical unit is defective.
- "3-Err" appears.	Something is loaded on the pan in automatic span calibration (remove the things from the pan).
- "4-Err" appears.	<ol style="list-style-type: none"> 1. Span error exceeds 1% of capacity in automatic span calibration. 2. Tuning-fork sensor or mechanical unit is defective.
- "5-Err" appears.	Interval time is not properly set.
- "7-Err" appears.	Automatic span calibration stops due to battery consumption.
「r-Err」 appears.	The weight error exceeds +/- 100.00mg. Re-set the weight error within +/- 100.00mg.
- "b-Err" appears.	Coefficient memories (address data) have changed. Reset the data.
- "c-Err" appears.	Internal clock function is defective. Check internal clock and replace DP board, if necessary.
- "d-Err" appears.	Coefficient memories (address data) have changed. Check the address data and reset it, if necessary.
- "L-Err" appears.	The weight of sample is too light (counting mode and % mode).
- "E-Err" appears.	Counting function is not properly operated.

4.4 Primary Checks

1. Is any wind around the site?
Is any oscillation? Is the working table stable?
2. Is anything under the pan base or the weighing pan?
3. Is the weighing pan the right one?
4. Is AC adaptor connected both with the scale and with the scale and with the outlet properly?
5. Is battery option charged sufficiently?

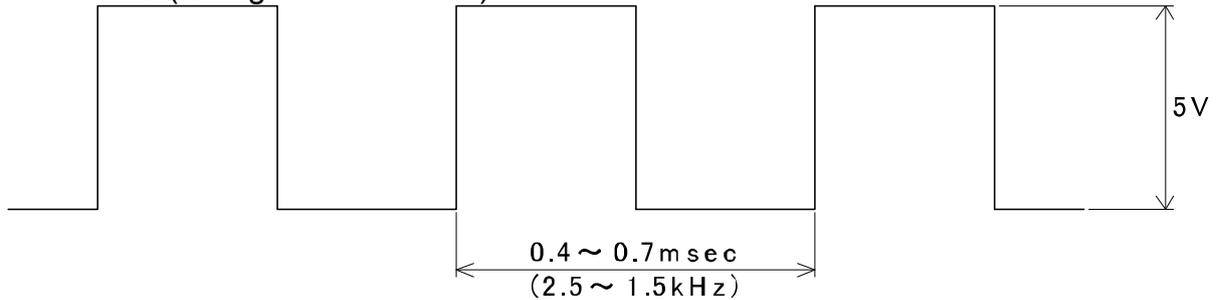
4.5 Checks for Electric/Electronic Parts



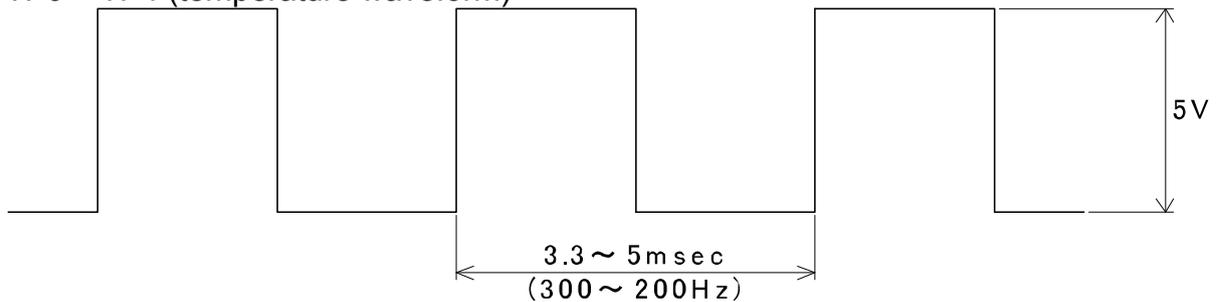
1. Check of input voltage
 TP0 – CN1-① +12V~+14V

2. Power voltage in the circuit
 TP0 – TP1 +4.75V~+5.25V
 TP0 – IC13-O +9.5V~+10.5V
 TP0 – D13 anode +3.7V~+4.3V
 TP0 – D10 cathode +23.5V~+24.5V

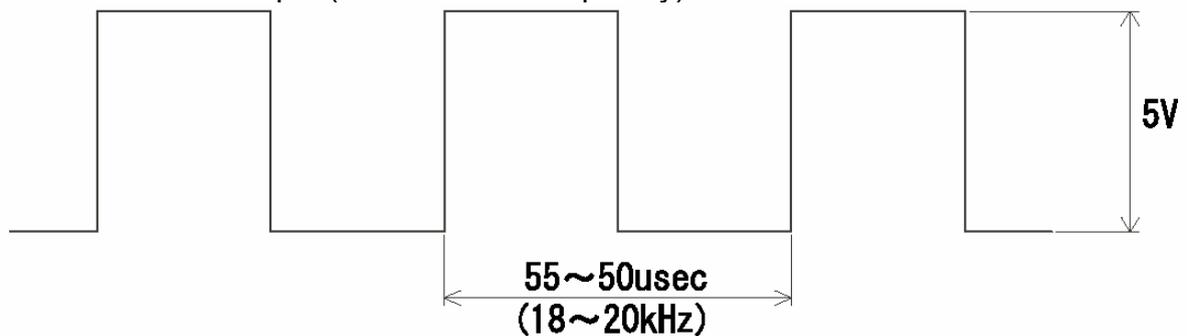
3. Check of signal wave
 TP0 – TP3 (tuning-fork waveform)



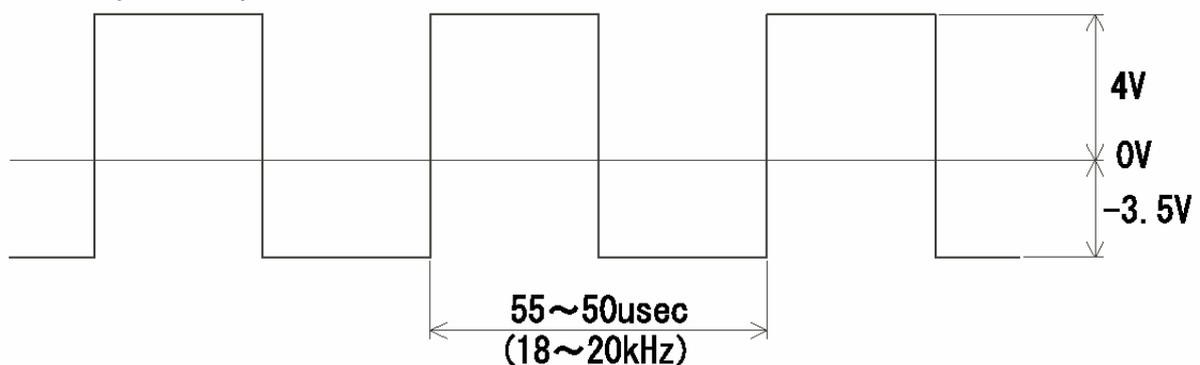
TP0 – TP4 (temperature waveform)



D13 anode – IC11-6pin (VFD filament frequency)



VFD1-1 pin – 56 pin



4.5.1 Check of VIBA-2A board

1. Preparation for checks

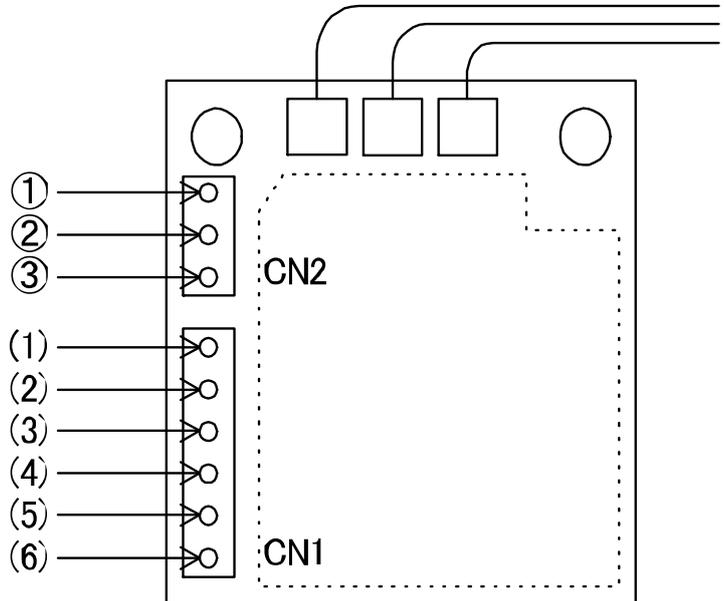
Prepare the oscilloscope. Turn off the scale and connect probe to **CN2**.

- CH - 1 → (1)
- GND → (2)
- CH - 2 → (3)

Voltage and Frequency range of oscilloscope.

- Voltage Range
 - CH - 1 → 0.1~0.5V/DIV.
 - CH - 2 → 1V/DIV.

- Frequency Range
 - 0.2m sec/DIV.



CN 1

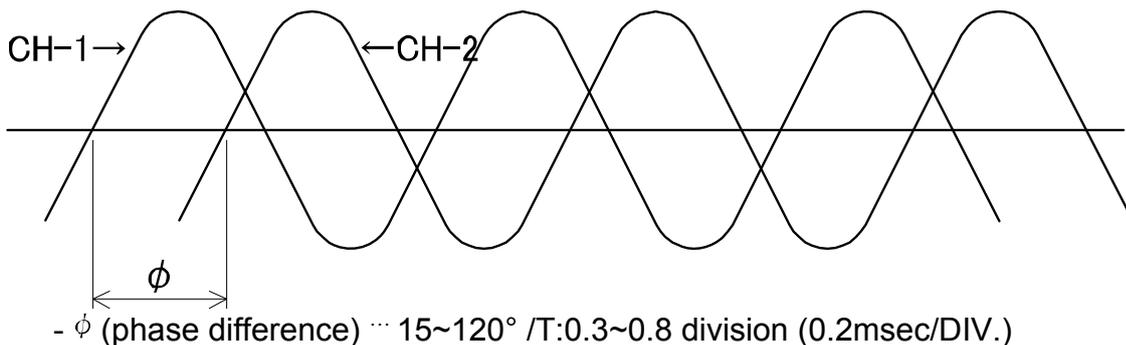
1. Power Source +4V - +6V
2. GND
3. Power Source -4V - -6V
4. Rectangular Wave Output (tuning-fork)
5. GND
6. Rectangular Wave Output (temperature)

2. How to Check

(1) Vibration starts in 3 seconds after turning on the switch of scale.

(2) Check the amplitude and phase difference of CH-1 and CH-2 as ½ of full capacity is loaded.

- E -amplitude (P-P) ... CH-1 → more than 150mV (average: 750mV)
- CH-2 → more than 700mV (average: 3.5V)



5. Adjustment and Setting

5.1 Span Calibration (Adjustment with internal weight – PEJ)

The installed adjusting weight allows checking and resetting the weighing accuracy at any time.

Procedure for adjustment (according to the operating instructions):

Observe stable environment conditions. A warming-up time of approx. 2 hours for stabilisation is necessary.

Setting: 7. CA. "1"

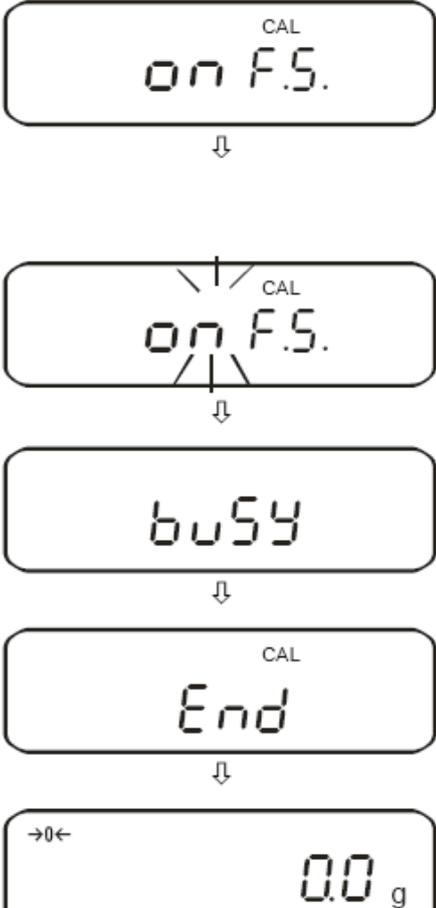
Operation	Display
Switch on the balance using the  -key	
Press  -key, [Auto CAL] is displayed. Automatic adjustment is started.	
↓	
Calibration will be carried out automatically.	 ↓ 
Calibration process has been concluded.	

5.2 Span Calibration (Adjustment with external weight – PES)

Procedure for adjustment (according to the operating instructions):

Observe stable environment conditions. A warming-up time of approx. 2 hours for stabilisation is necessary.

Setting: 7. CA. "3"

Operation	Display
<p>Switch on the balance using the  -key</p> <p>Press  -key.</p> <p>Zero point will be saved.</p>	 <p>The display shows 'CAL EXT' with 'CAL' in the top right corner. An arrow points down to the next display, which shows 'on 0' with 'CAL' in the top right corner and a vertical line with diagonal slashes through it.</p>
<p>Carefully place adjusting weight in the centre of the weighing plate</p> <p>Adjustment process is started.</p> <p>The process of adjustment is completed.</p> <p>Remove adjusting weight, balance will return into weighing mode automatically. In case of an adjustment error or incorrect adjusting weight the display will show [- Err]; repeat adjustment process.</p>	 <p>The display shows 'on F.S.' with 'CAL' in the top right corner. An arrow points down to the next display, which shows 'on F.S.' with 'CAL' in the top right corner and a vertical line with diagonal slashes through it. Another arrow points down to the next display, which shows 'busy'. A final arrow points down to the next display, which shows 'End' with 'CAL' in the top right corner. A final arrow points down to the last display, which shows '→0←' on the left and '0.0 g' on the right.</p>

5.3 Corner Error Adjustment

1. Remove the case, then after setting the pan base and the pan, turn the adjuster legs to bring the bubble of the level to the center of the circle.
2. Push nylon rivet from the inside and remove the rear shutter.
3. Load full scale weight and push T key. Check the corner error referring to the diagram below.



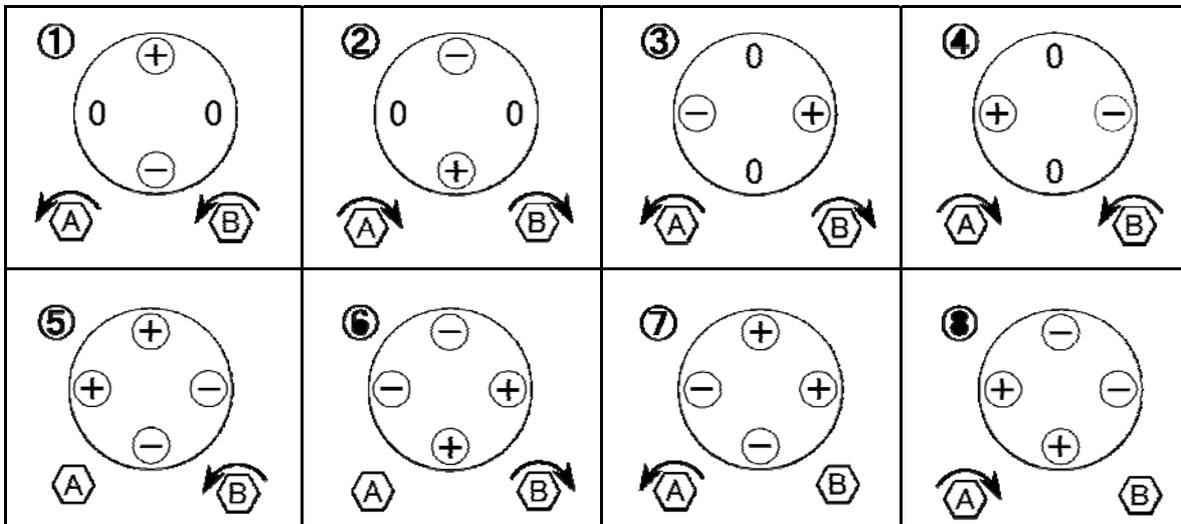
Adjusting Bolt (A) Adjusting Bolt (B)



Rear shutter Nylon rivet

- ⊕ : The error is positive to the center.
- ⊖ : The error is negative to the center.
- ↺ : Drive the bolt counter-clockwise.
- ↻ : Drive the bolt clockwise.

Corner Error Adjusting Diagram:

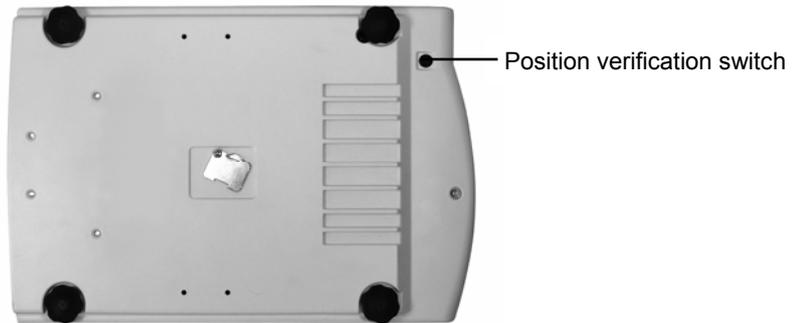


5.4 Linearity Adjustment

Set the verification switch to unlocked before doing the linearity adjustment (see drawing).

Prior to verification, the verification switch must be moved into the verification position.

- **Position forwards:** enabled (unlocked)
- **Position backwards:** verification position



While pressing both **F** + **TARE**, press **ON/OFF** to ON. Release both keys when **[H 1400 ×]** appears (maintenance mode).

[H 1400 ×]

After a while, display changes to weight value. Press **F** until **[CAL 2]** appears after displaying **[Func]**.

[CAL 2]

Press **TARE** first and press **F** together and release both.

[on 0]

[on 0] display starts blinking to indicate zero adjusting is performed automatically.

[on 1]

[on 2]

[on 3]

[4]

Put the weight referring to the table at the next page

Returns to weight value after reading **[End]**.

Press **ON/OFF** to turn off Power and press **ON/OFF** again. Then return to normal weighing mode.

5.4.1 Table Increasing Calibration Weight for Linearity Adjustment

Model Display	220 g	420 g	620 g	2200 g
0n 0	0 g	0 g	0 g	0 g
0n 1	50 g	100 g	150 g	500 g
0n 2	100 g	200 g	300 g	1000 g
0n 3	150 g	300 g	450 g	1500 g
0n 4	220 g	420 g	620 g	2200 g
Calibration Weight Required	50 g x 4 20 g x 1	100 g x 4 20 g x 1	100 g x 4 50 g x 4 20 g x 1	500 g x 4 200 g x 1

Model Display	4200 g	6200 g	8200 g	15000 g
0n 0	0 g	0 g	0 g	0 g
0n 1	100 g 0	1500 g	2000 g	3000 g
0n 2	2000 g	3000 g	4000 g	7000 g
0n 3	3000 g	4500 g	6000 g	11000 g
0n 4	4200 g	6200 g	8200 g	15000 g
Calibration Weight Required	1000 g x 4 200 g x 1	1000 g x 4 500 g x 4 200 g x 1	2000 g x 4 200 g x 1	2000 g x 7 1000 g x 1

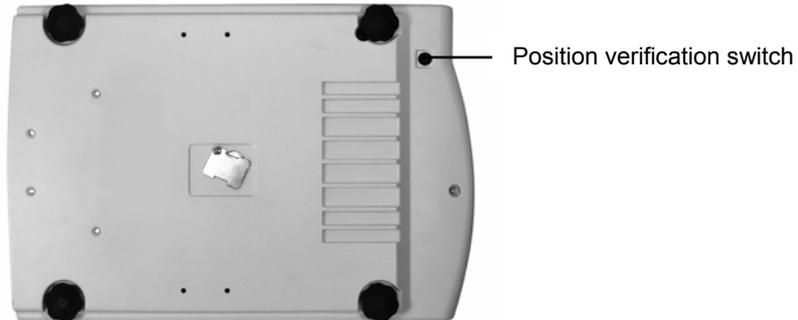
*Please use the weight for F1 or higher class to maintain the accuracy.

5.5 Calibration of Built-In Weight (Ref Cal) – only PEJ

Set the verification switch to unlocked before doing the calibration of built-in weight (see drawing).

Prior to verification, the verification switch must be moved into the verification position.

- **Position forwards:** enabled (unlocked)
- **Position backwards:** verification position



- | | | |
|---|---|------------------|
| 1 | While pressing both F + TARE , press ON/OFF to ON. Release both keys when [H]H00x appears. | [H]H00x |
| 2 | After a while, display changes to weight value. Press CAL , [rEF.CAL] is displayed. | [rEF.CAL] |
| 3 | Verify that no load is on the pan. Press TARE first and press F key together and release both. [on 0] display starts to blinking to indicate zero adjustment is performed automatically. | on 0 |
| 4 | When Zero adjustment is completed, display advances to [on F5] , indicating the span adjustment is ready to start. | on F5 |
| 5 | Load the reference weight. Display starts blinking to adjust the span automatically. | |
| 6 | The calibration is finished and display stops blinking, then automatically returns to weighing mode. | |

1. It is recommended to use a weight of full scale capacity for accurate calibration (**max. load**).
2. Error messages:
 - 0 - Error:** The reference weight is over than the full capacity.
 - 1 - Error:** The reference weight is less than ½ of the capacity.
 - 2 - Error:** The data error exceeds 1% of the capacity.
3. It is recommended to use reference calibration weight of better accuracy than the scale.

6. Parts Replacement

6.1 How to Remove the Case

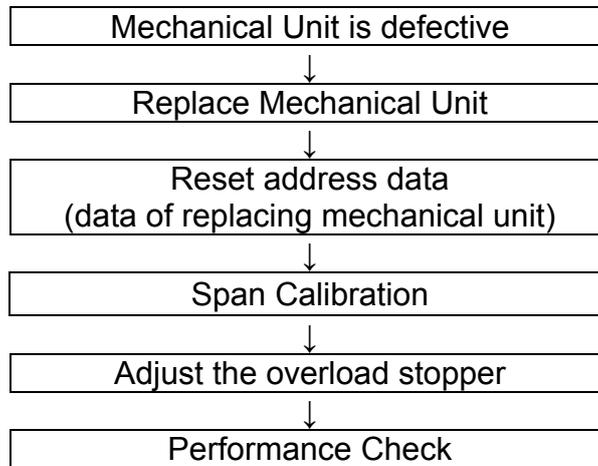
1. Remove pan and pan base.
2. Remove three screws fixing the case.



6.2 How to Cover the Case

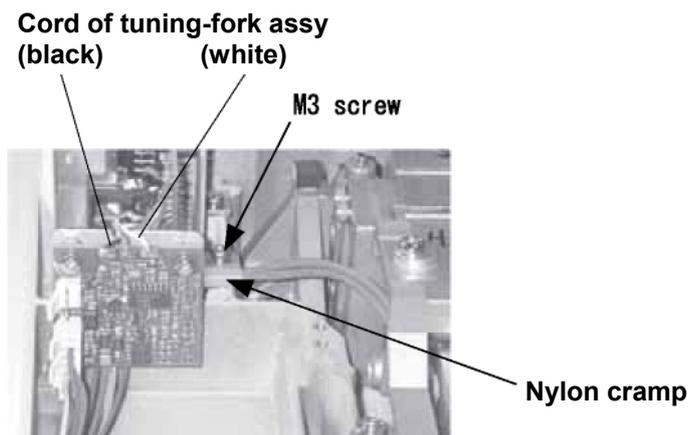
1. Cover the case
2. Fixing the case with screws
3. Put the pan base and the pan.

6.3 How to Replace Mechanical Unit

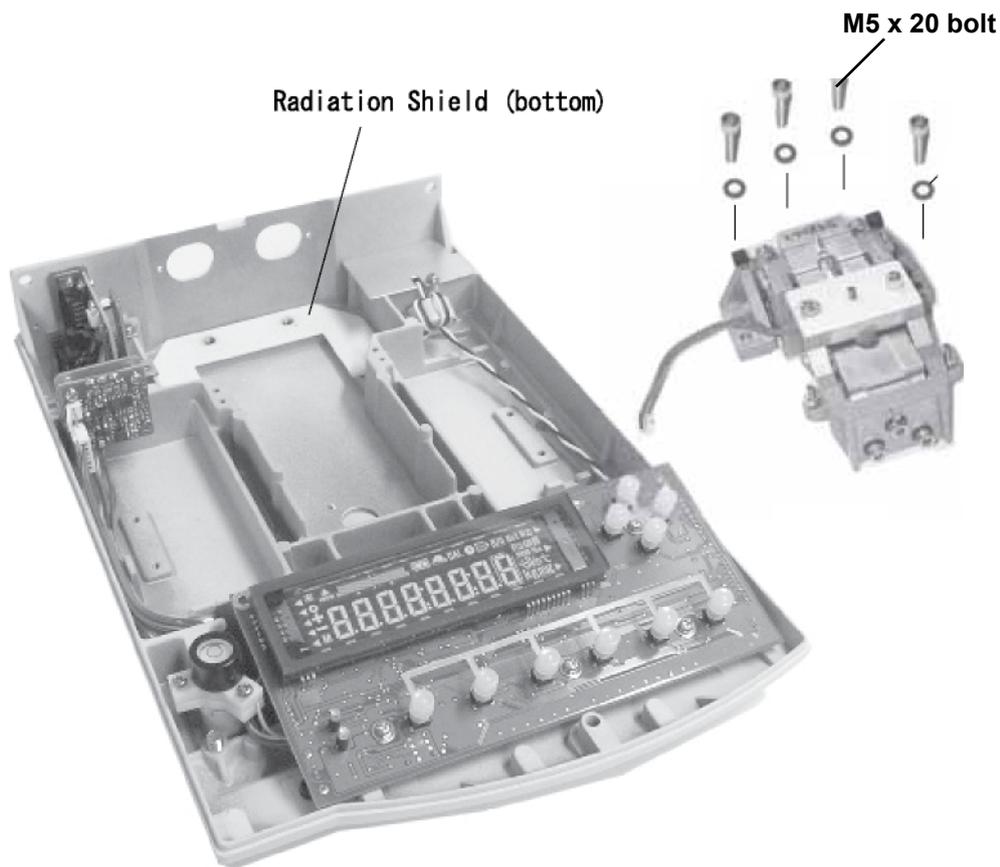


6.4 How to Remove Mechanical Unit

1. Remove the case.
2. Remove the cords (black and white) of tuning-fork assy from VIBA board assy (remove the solder).
3. Remove nylon cramp fixing cords of tuning-fork assy.

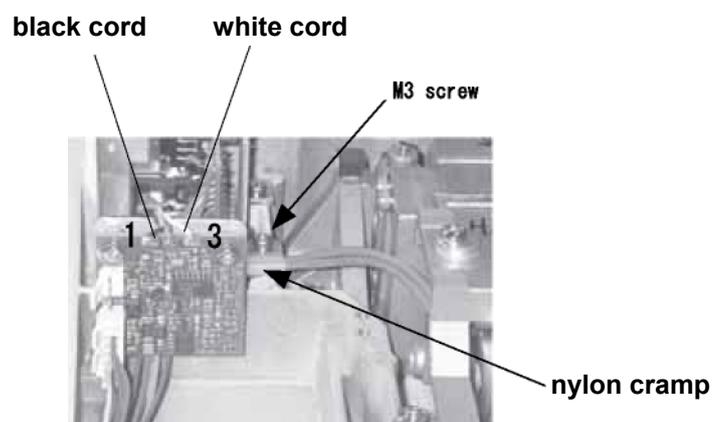


4. Remove four bolts fixing mechanical unit.
5. Remove the mechanical unit from the chassis.

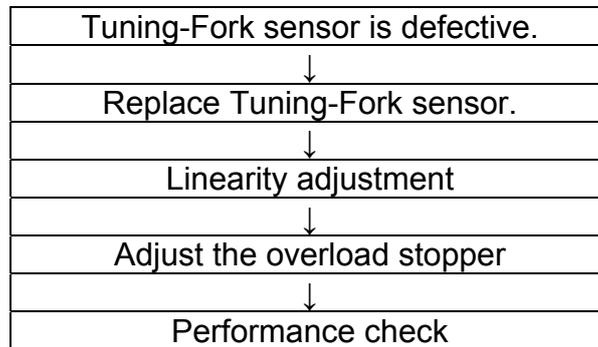


6.5 How to Install Mechanical Unit

1. Put the mechanical unit on the chassis (take care to put radiation shield between the chassis and the mechanical unit).
2. Solder the cords of tuning-fork sensor to VIBA board assy (black cord to “1” and white cord to “3”, referring to the picture below).
3. Fix the cords of tuning-fork sensor with nylon cramp (be sure these cords are not touch with other parts).
4. Cover the case.

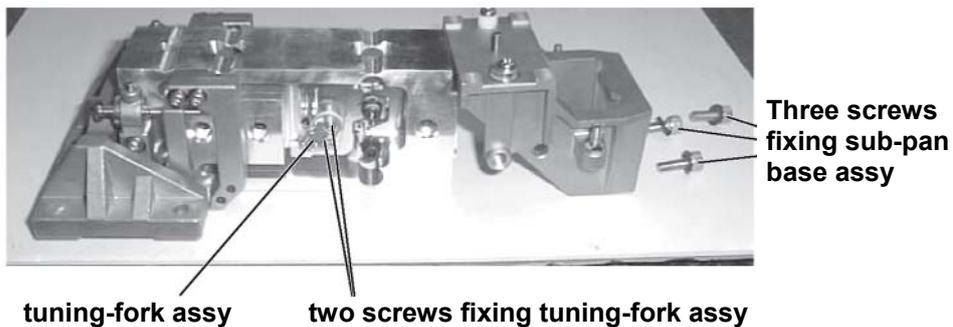


6.6 Sequence of Tuning-Fork Sensor Replacement



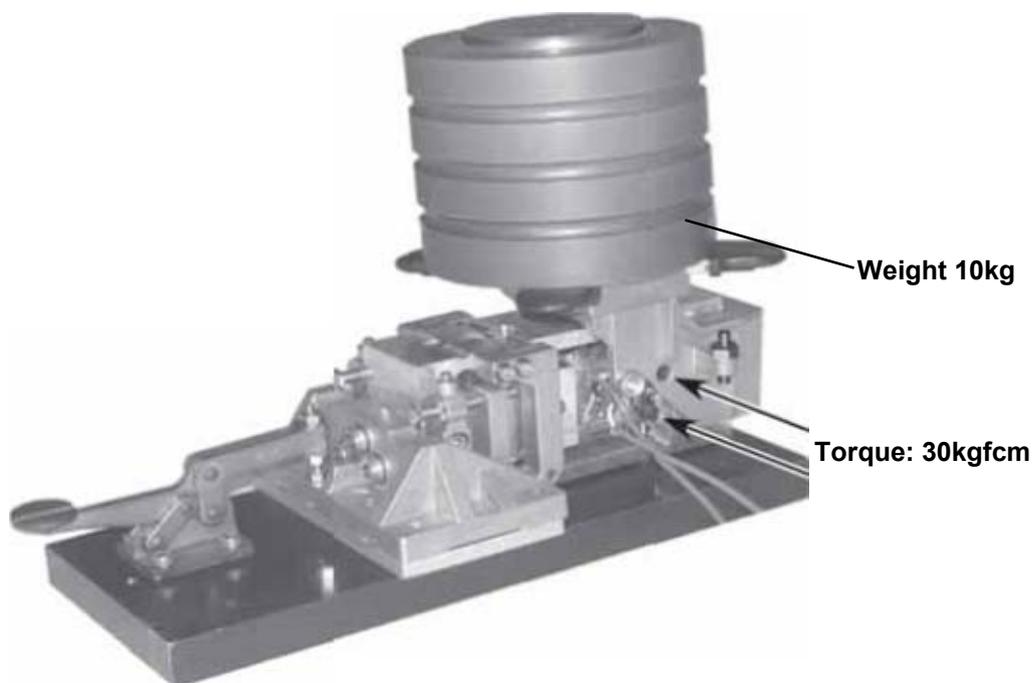
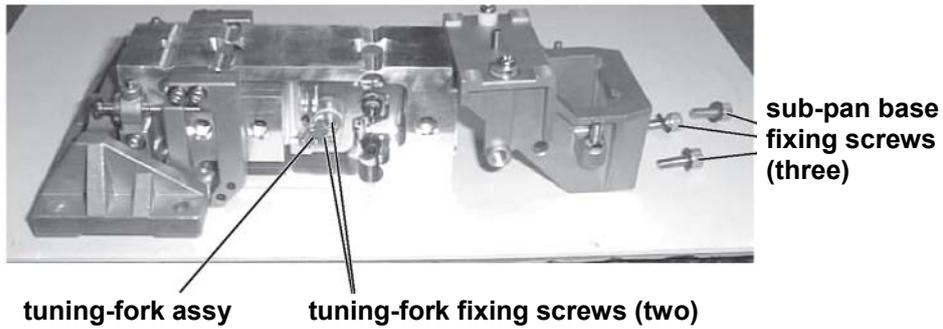
6.7 How to Remove Tuning-Fork Assy

1. Remove the mechanical unit from the chassis.
2. Remove the sub-pan base assy by loosening three screws on the mechanical unit.
3. Loosen two screws to remove tuning-fork assy.
4. Replace tuning-fork assy.



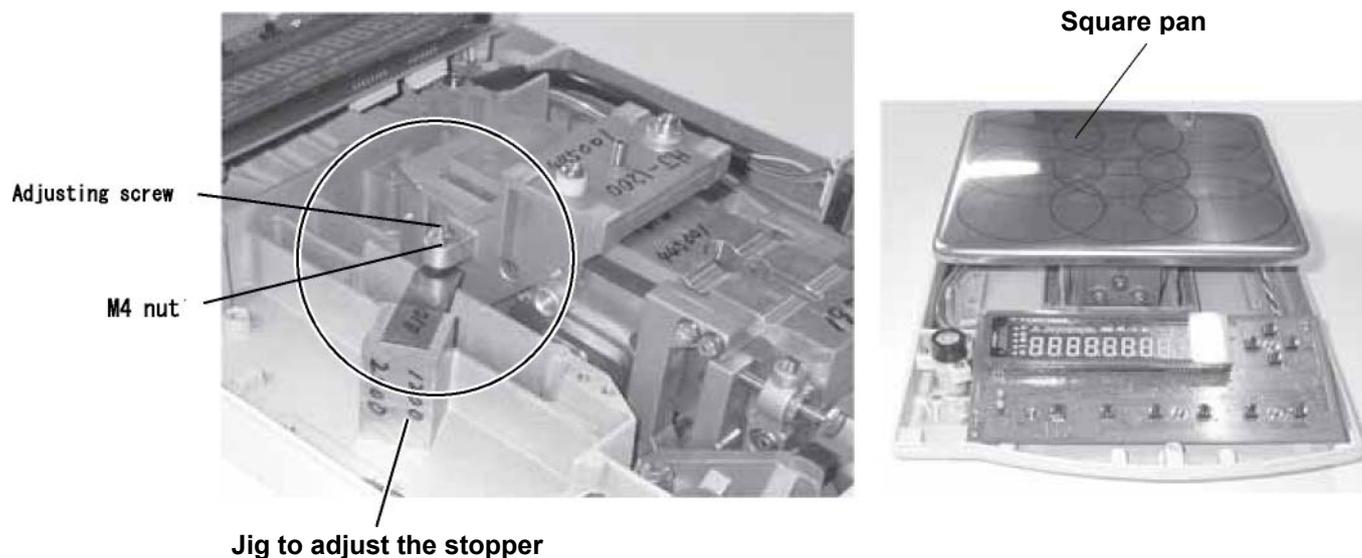
6.8 How to Install Tuning-Fork Assy

1. Temporarily fix tuning-fork assy to mono-metal block.
2. Fix sub-pan base assy to mono-metal block with screws (torque: 52.5kgfcm).
3. Tightly fix tuning-fork assy with screws while putting the weight (10kg) on the sub-pan base assy (torque: 30kgfcm).



6.9 Adjustment of Overload Stopper

1. Fix the pan base assy to the mechanical unit and put the square pan on it.
2. Connect AC adaptor and turn on the switch.
3. Change to maintenance mode.
4. Adjust the overload stopper.



[Adjusting procedure]

1. Remove the pan and the pan base.
2. Push TARE key to display [0.0.0.].
3. Put the clearance gauge between the adjusting screw and the chassis, then adjust the stopper.
4. After adjusting the stopper, check the overload-error value in referring to the table below.

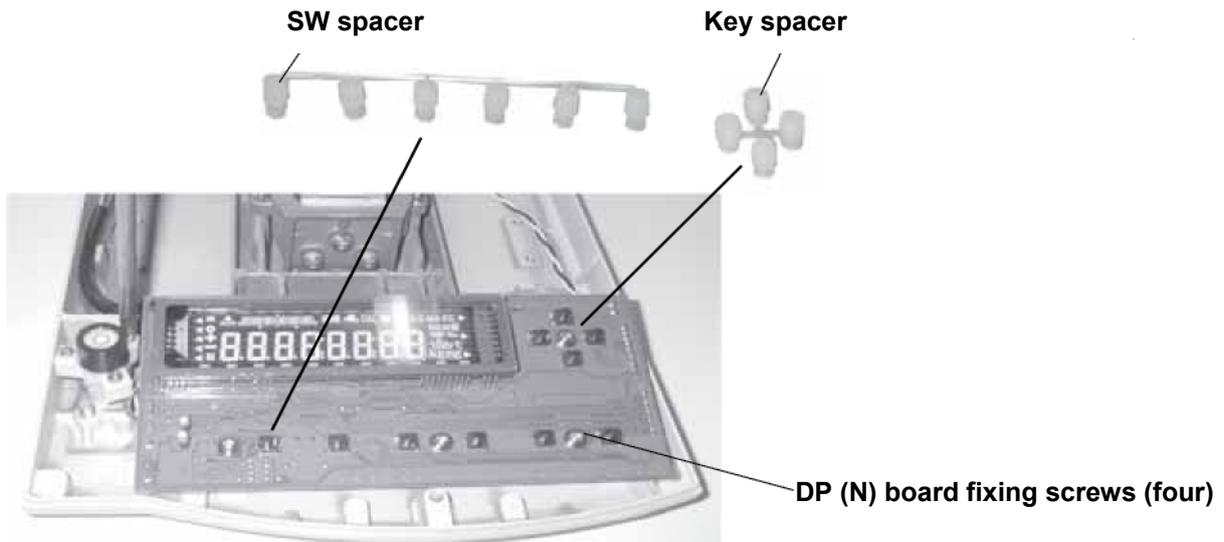
Capacity	Overload stopper adjustment
2200 g	6000 ~ 7000 g
4200 g	6000 ~ 7000 g
6200 g	9500 ~ 11500 g
8200 g	18500 ~ 20000 g
15000 g	24000 ~ 26000 g

Capacity	Clearance
2200 g	0.2
4200 g	0.2
6200 g	0.2
8200 g	0.35
15000 g	0.4

6.10 Sequence of Circuit Board Replacement

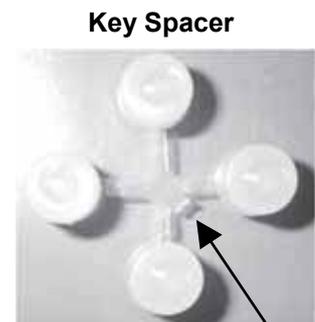
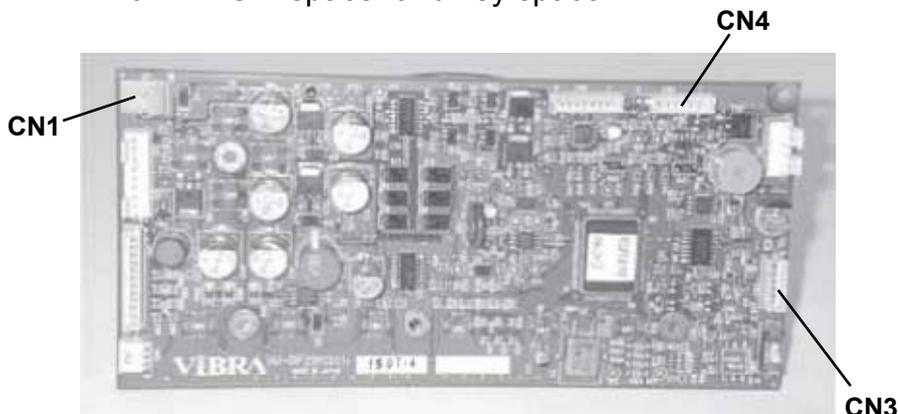
[How to Remove DP (N) Board]

1. Open the case. Remove SW spacer and key spacer from DP (N) board.
2. Loose four screws from DP (N) board.
3. Take off the connectors of CN1, CN3 and CN4 on DP (N) board.



[How to Install DP (N) Board]

1. Connect the connectors to DP (N) board.
CN1: LFM board assy cord
CN3: Tuning-fork assy cord
CN4: RS Board assy cord
2. Fix DP (N) board with screws.
3. Fix SW spacer and key spacer.



This projection should be on right lower side.

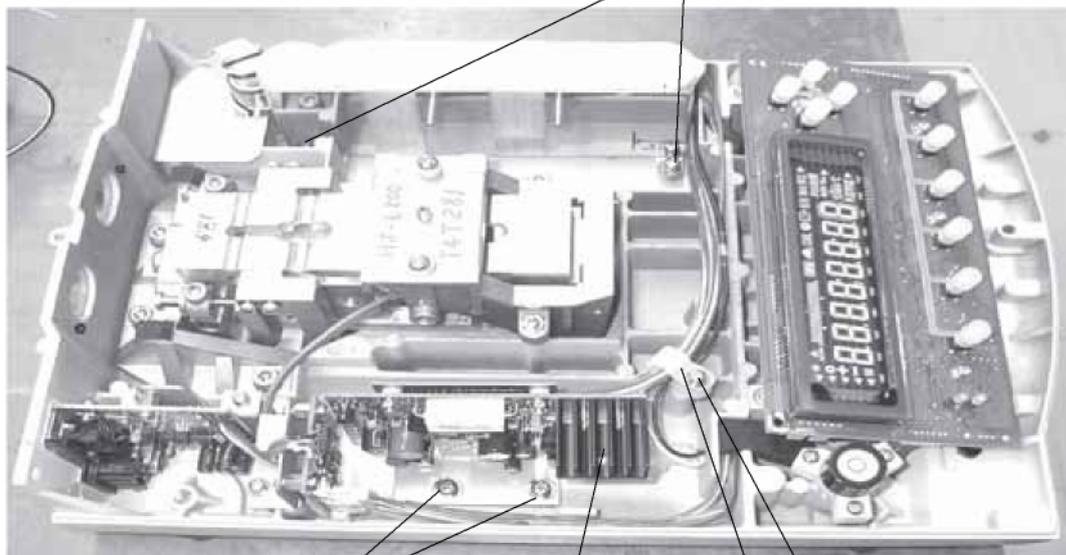
7. Installation of Options

7.1 Installation of Battery Option

1. Remove the case.
2. Fix battery assy to the chassis with two screws.
3. Fix cords of BT board assy with nylon clamp and two screws.
4. Connect the cord of BT board assy to CN2 of DP (N) board.
5. Put "BATTERY" label on the AC adaptor.



Battery Assy



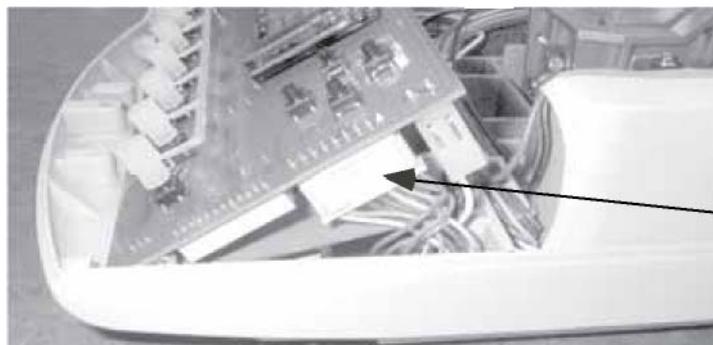
M4 screws

M3×6 screws

HJ-BT Board assy

M3×8 screws

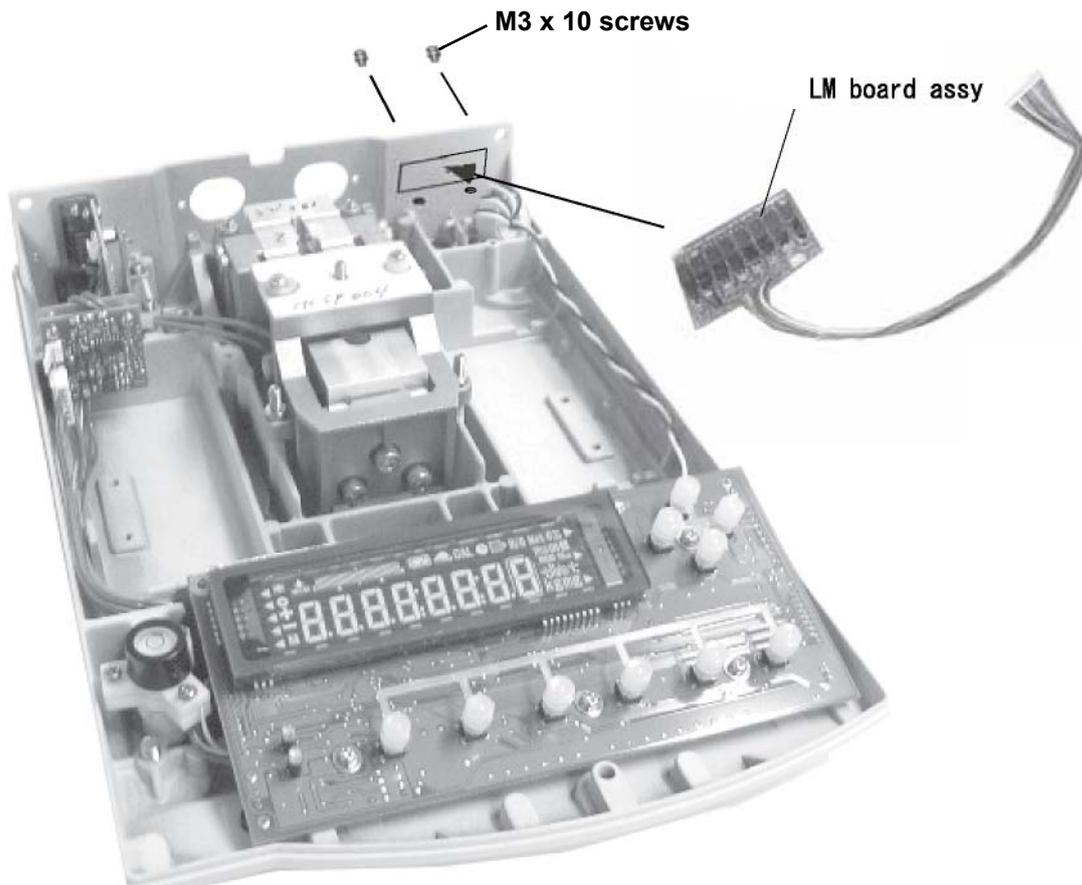
nylon clamp



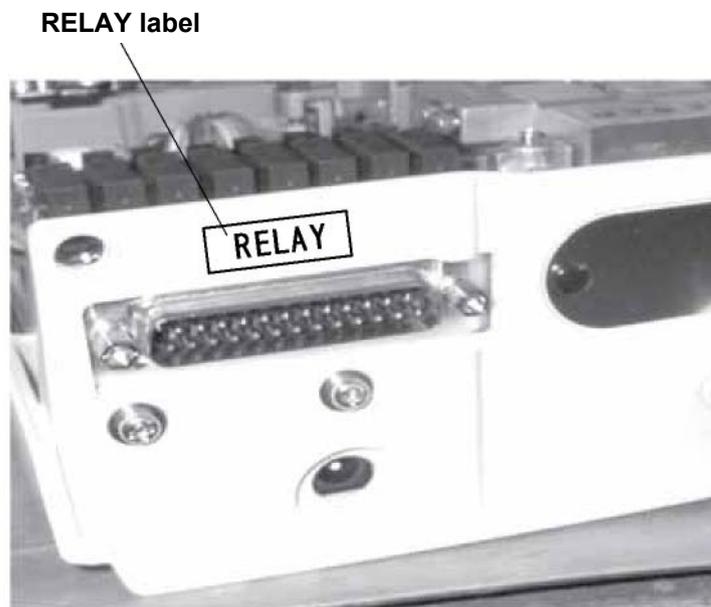
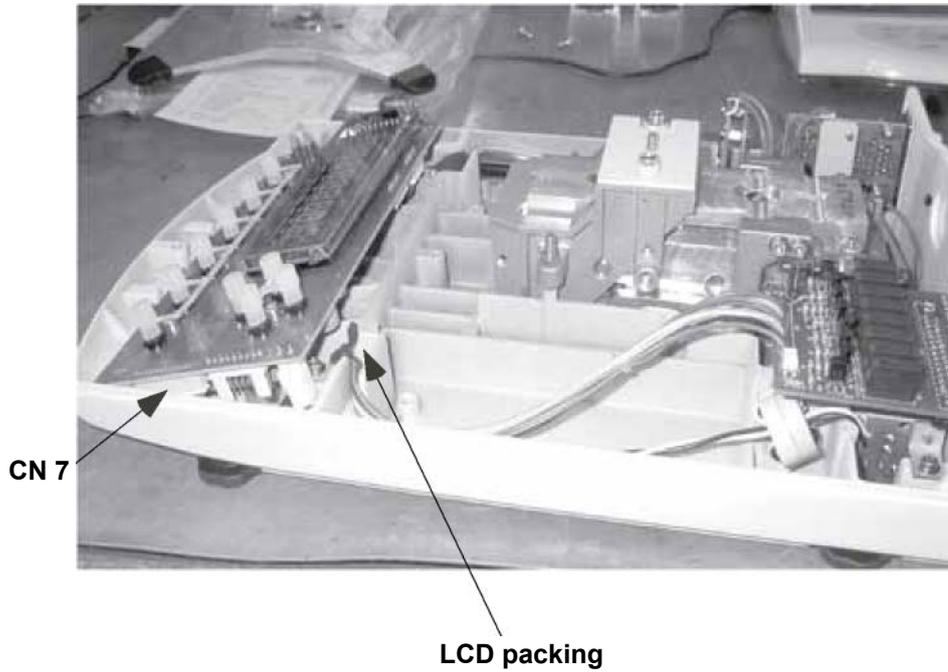
CN2 connector

7.2 Installation of Relay Contact Option

1. Remove the case.
2. Fix LM board assy to the chassis with two screws.

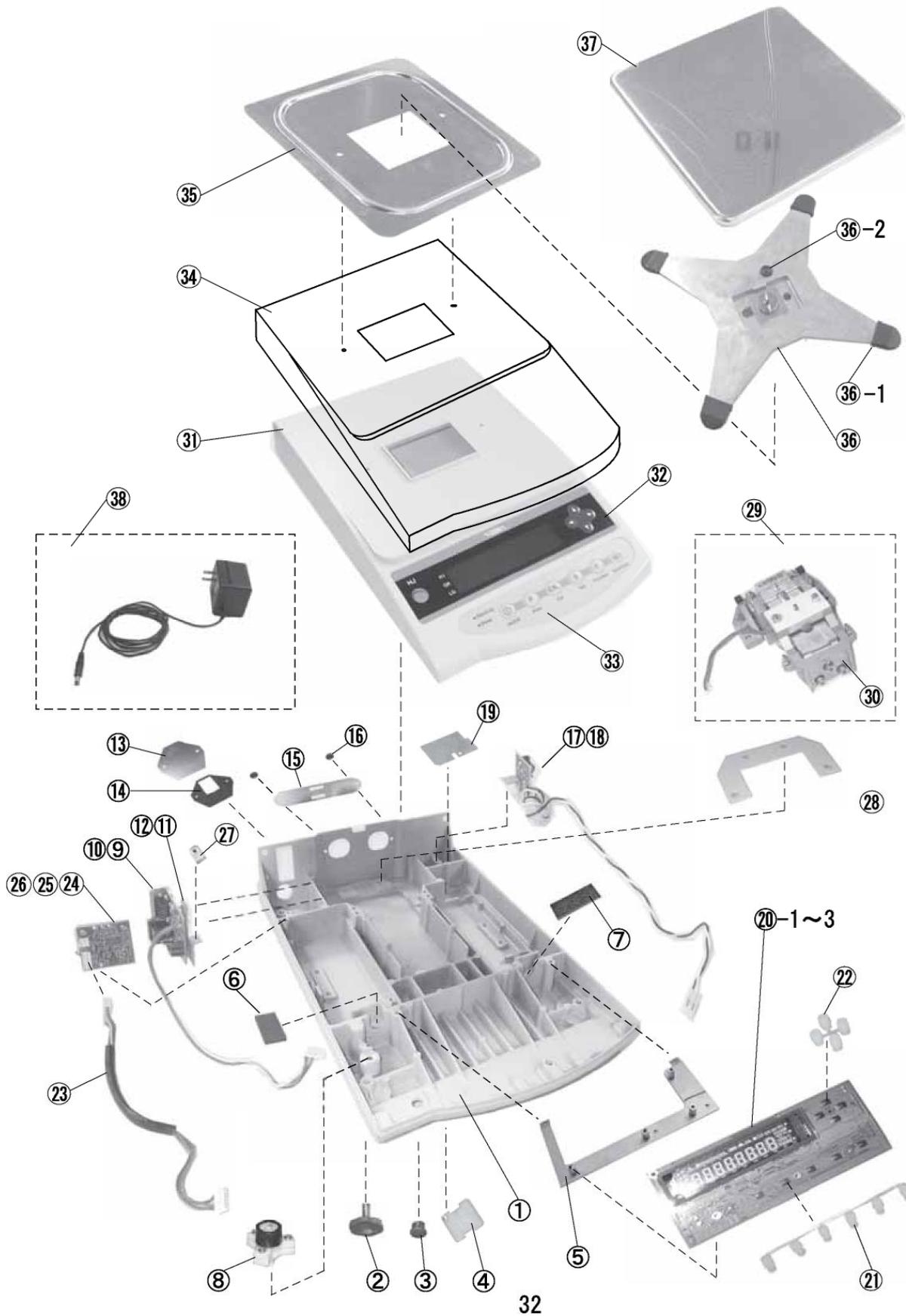


3. Fix cords of LM board assy with LCD packing and connect the cords to CN7 of display board.
4. Put RELAY label.



8. Parts List

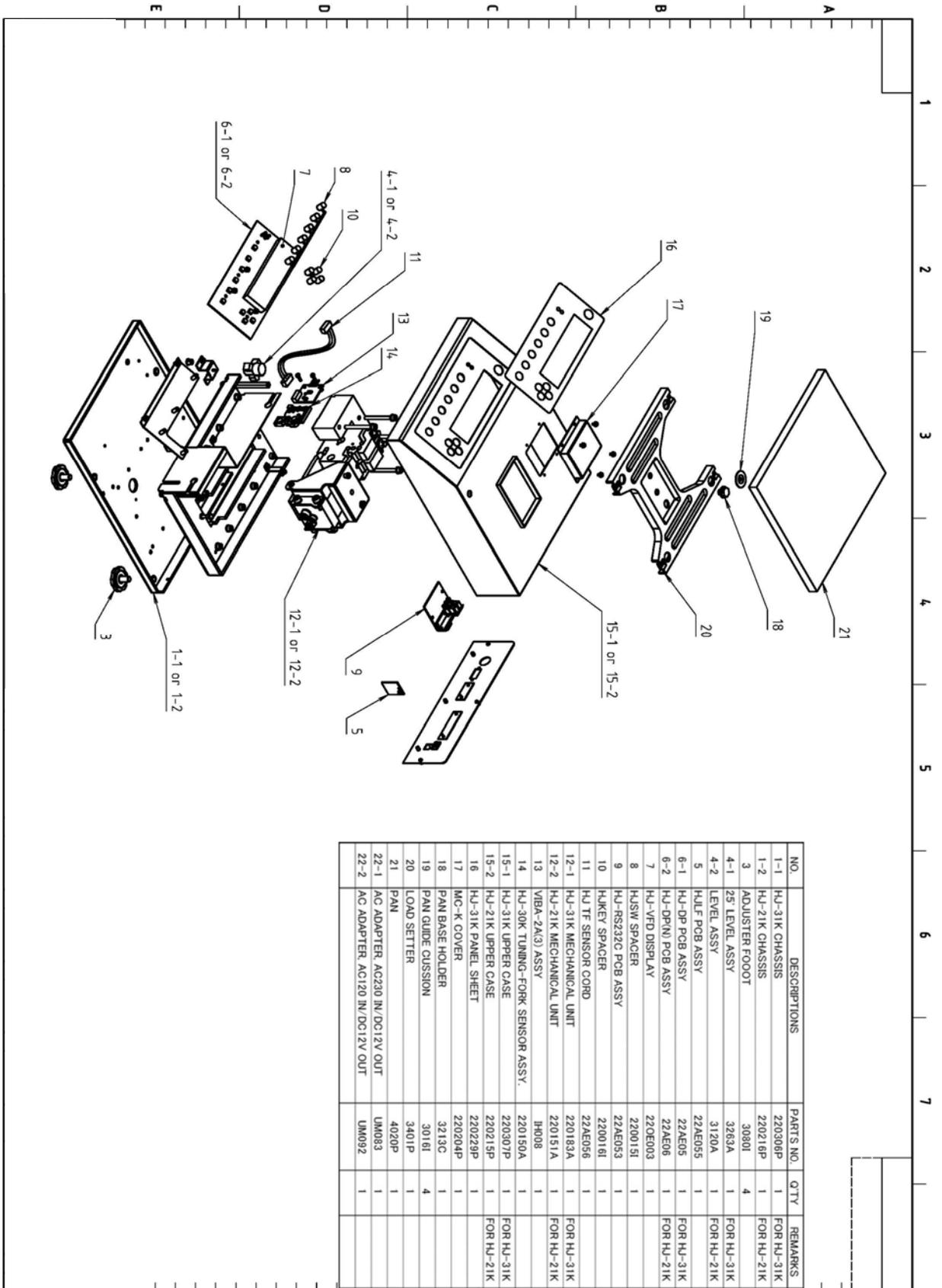
8.1 Explosion Diagram



8.2 Bill of Material

POS. NO.	DESCRIPTIONS	PARTS NO.	Q'TY	REMARKS
1	CHASSIS	220012I	1	
2	ADJUSTER	200034I	4	
3	HOLE PLUGDP-312	110002J	1	
4	SHUTTER	3190P	1	
5	DP PCB SUPPORT PLATE	220072P	1	
6	LCD SPACER	3650P	1	
7	LCD PACKING	7398P	1	
8	LEVEL ASSY	3120A	1	
9	RS232C PCB ASSY	22AE053	1	
10	RS BLIND	220062P	1	
11	RS BRACKET	220069P	1	
12	PCB SPACER FOR RS232	3166C	2	for RS232 PCB
13	RS SUTTER	220073P	1	
14	RS PACKING	220090P	1	
15	REAR SHUTTER	220066P	1	
16	NYLON RIVET NRP-355	22CN0L3	2	with rear shutter (220066P)
17	LF PCB ASSY	22AE055	1	
18	LF PCB SUPPORT PLATE	220071P	1	
19	LF COVER	220032P	1	
20	DP(N) PCB ASSY	22AE06	1	
20-1	VFD DISPLAY	22OE003	1	
20-2	TACT SWITCH	22SW001	1	
20-3	SLIDE SWITCH	11SW002	10	
21	SW SPACER	220015I	1	
22	KEY SPACER	220016I	1	
23	TF SENSOR CODE	22AE056	1	
24	VIBA-2A (3) Assy	IH008	1	
25	VIBA STAY	22AE70P	1	
26	PCB SPACER FOR VIBA-2A	3166C11	1	for VIBA-2A(3) PCB
27	NYLON CLAMP NK-2N	OM007	2	
28	HEAT SHUTTER PLATE	220068P	1	
29	MECHANICAL UNIT		1	
29-1	TUNING FORK SENSOR ASSY		1	
30	SUB PAN BASE ASSY	22006A	1	
31	UPPER CASE	220011I	1	
32	DISPLAY PANEL SHEET	220063P	1	
33	SWITCH PANEL SHEET	220064P	1	
34	DUST COVER	220014I	1	
35	PROTECTOR	220065P	1	
36	PAN BASE ASSY	220063A	1	
36-1	PAN GUIDE	3071I	4	
36-2	M-1064	22OM014	1	
37	SQUARE PAN	220067P	1	
38(A)	AC ADAPTER, AC230 IN/DC12V OUT	UM083	1	
38(B)	AC ADAPTER, AC120 IN/DC12V OUT	UM092	1	

8.3 View of Components PES 31000-1M



NO.	DESCRIPTIONS	PARTS NO.	QTY	REMARKS
1-1	HJ-31K CHASSIS	220306P	1	FOR HJ-31K
1-2	HJ-21K CHASSIS	220216P	1	FOR HJ-21K
3	ADJUSTER FOOT	30801	4	
4-1	25' LEVEL ASSY	3263A	1	FOR HJ-31K
4-2	LEVEL ASSY	3120A	1	FOR HJ-21K
5	HJLF PCB ASSY	22AE055	1	
6-1	HJ-DP PCB ASSY	22AE05	1	FOR HJ-31K
6-2	HJ-DF(N) PCB ASSY	22AE06	1	FOR HJ-21K
7	HJ-VFD DISPLAY	22OE003	1	
8	HJ-SW SPACER	2200151	1	
8	HJ-RS232C PCB ASSY	22AE053	1	
10	HJKEY SPACER	2200161	1	
11	HJ TF SENSOR CORD	22AE056	1	FOR HJ-31K
12-1	HJ-31K MECHANICAL UNIT	220183A	1	FOR HJ-31K
12-2	HJ-21K MECHANICAL UNIT	220151A	1	FOR HJ-21K
13	VIBA-2A(3) ASSY	h4008	1	
14	HJ-30K TUNING-FORK SENSOR ASSY.	220150A	1	
15-1	HJ-31K UPPER CASE	220307P	1	FOR HJ-31K
15-2	HJ-21K UPPER CASE	220215P	1	FOR HJ-21K
16	HJ-31K PANEL SHEET	220229P	1	
17	MC-K COVER	220204P	1	
18	PAN BASE HOLDER	3213C	1	
19	PAN GUIDE CUSHION	30161	4	
20	LOAD SETTER	3401P	1	
21	PAN	4020P	1	
22-1	AC ADAPTER, AC230 IN/DC12V OUT	UM063	1	
22-2	AC ADAPTER, AC120 IN/DC12V OUT	UM092	1	