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**Service Manual
Electronic Precision Balances**

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KERN 440-33 /-45/-47

1 PCB
Version 2.0



KERN 440-33 /-45 /-47

Version 2.0 / 1 PCB

Service Manual

Electronic Precision Balances

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1. Introduction

1.1 Features :

- Full Tare
- Memory function with indicator
- Stable indicator
- Negative value indication
- Two types of Digital Auto Calibration
- Solder pads to prevent end-user internal calibration
- Low battery indicator
- Auto off function (battery mode only)
- AC adaptable
- Display segment test function
- Overload protection

1.2 Digital Auto Calibration Procedure :

1. Turn balance on and allow the unit to acclimatize and stabilize for two minutes.
2. Press and hold the [CAL/MODE] key until the display shows a flashing weight reading. The flashing weight reading indicates the correct weight that must be placed on the tray.
3. With the display still flashing, press the off key. The display will now show [CAL 0]. Then gently place the correct calibration weight on the center on the tray.
4. The display will now show [Cal F] and then return to normal operating mode. The calibration is complete when the display correctly shows the weight that is placed on the tray and the display has stabilized.
5. Remove the calibration weight and press the [TARE] key to reset the zero point.

In case [CAL E] is displayed instead of [CAL F], this indicates a calibration procedure error. Turn the scale off and then on and repeat the procedure

1.3 Internal Calibration Procedure :

1. Remove the top housing of the scale.
2. Connect J1 by soldering the pads together.
3. With tray top installed, turn balance on. Display shall show zero with the unit indicator on.
4. Press [CAL/MODE] key once. Display shall show the internal count. The reading shall fall in the range from 9000 to 12000. In case out of this range, connect J10 left side or right side to reduce or increase the reading. Connecting or disconnecting pads on J7, J8, or J9 can fine tune the reading.
5. Press [OFF] key once. Display will show [CAL 0] and then the required calibration weight. Place the corresponding calibration weight on the center of the tray.
6. Display will now show [CAL L] and then the next calibration weight. Place the corresponding calibration weight on the tray. Repeat this step until display shows [CAL F].
7. Disconnect J1. Reset the zero point and check the accuracy at different weight.
8. Install the top housing of scale.

(refer to drawing : component layout)

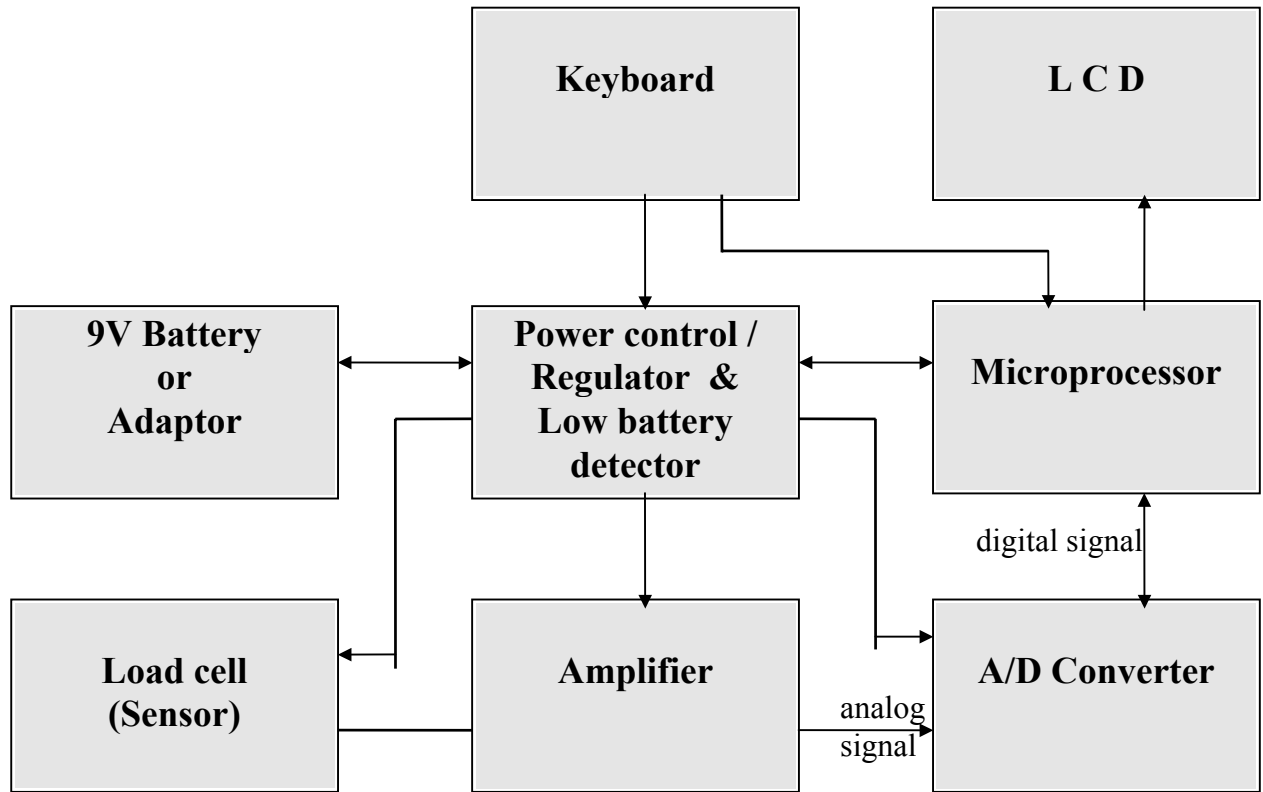
In case [CAL E] is display instead of [CAL F], this indicates a calibration procedure error, or wrong weight applied for calibration. Turn the scale off and then on and repeat the procedure.

1.4 Display Segment Test :

Whenever the scale is power on, all segments of the LCD will be turn on for 2 seconds. Check for any missing segment.

2. Functional Block Diagram / Description

2.1 Functional Block Diagram :



2.2 Function Description :

1. Load cell

This is the heart of the whole system. The load cell itself is arranged as a bridge. The resistance change of the bridge elements is proportional to the load applied on the load cell. Therefore, the output of the load cell is an analog signal, which is proportional to the load applied on the scale.

2. Amplifier

The analog signal from the load cell is very small, of the order of micro-volt. Hence, a linear and stable amplifier is applied to amplify the analog signal to an appropriate level.

3. A/D Converter

In order for the analog signal can be input to the microprocessor, this part converts the analog signal to its digital equivalent. The operation of the analog to digital converter is using a SIGMA DELTA technique and under the control of the microprocessor.

4. Microprocessor

The microprocessor control all the functions of the scale, such as auto zero, A/D conversion, timings, weight calculation and display, parts counting, overload indication, low battery indication, tare function, etc....

5. Display

This is the part where the weight is shown out on the LCD display in digital form. The whole display is driven by the microprocessor.

6. Power Regulator and Low Battery Detector

This part contains the ON/OFF power control. In order for the external power can be used by other parts of the scale, a regulator is used to regulate the supply. A low battery detector is employed to make sure that the power supply is strong enough for normal operation of the scale.

7. Keyboard

The keyboard provides on user interface. [ON/MEMORY], [CAL/MODE], [TARE] and [OFF] keys are employed to operate the scale.

3. Trouble Shooting :

Power on



Full Segments?

If no display, check battery /adaptor; connection between keyboard—main board, battery/adaptor—main board.

If missing segments, check fixing of LCD frame, zebra connector under LCD.



Display Zero?

If display [LO], check battery >7.5v, adaptor >9v.

If display [E] , check internal count.



Proper readout?

If unstable reading, check tray top, overload stopper, loadcell



Correct reading?

If not accurate, perform internal calibration.

If cannot reach full capacity, check tray top, overload stopper, loadcell, and internal zero point.

If always zero, check internal zero point. Internal calibration if necessary.



Normal operation.

4. To Replace PCBA

1. Disassemble top housing of scale.
2. Disconnect PL1, PL2 and JP2 from the PCBA. Disassemble the ground wire screw. Replace a new PCBA. Connect PL1 PL2 and JP2 again. Assemble the ground wire with screw.
3. Assemble the top housing.
4. Perform internal calibration as described in section 1.
5. Check accuracy of scale at different weight.

440-33		440-45		440-47	
weight(g)	tolorance	weight(g)	tolorance	weight(g)	tolorance
50.00	0.02g	200.0	0.2g	500.0	0.2g
100.00	0.02g	400.0	0.2g	1000.0	0.2g
150.00	0.02g	600.0	0.2g	1500.0	0.2g
200.00	0.02g	800.0	0.2g	2000.0	0.2g

6. Check other functions, such as TARE, MEMORY, and Auto-Off.

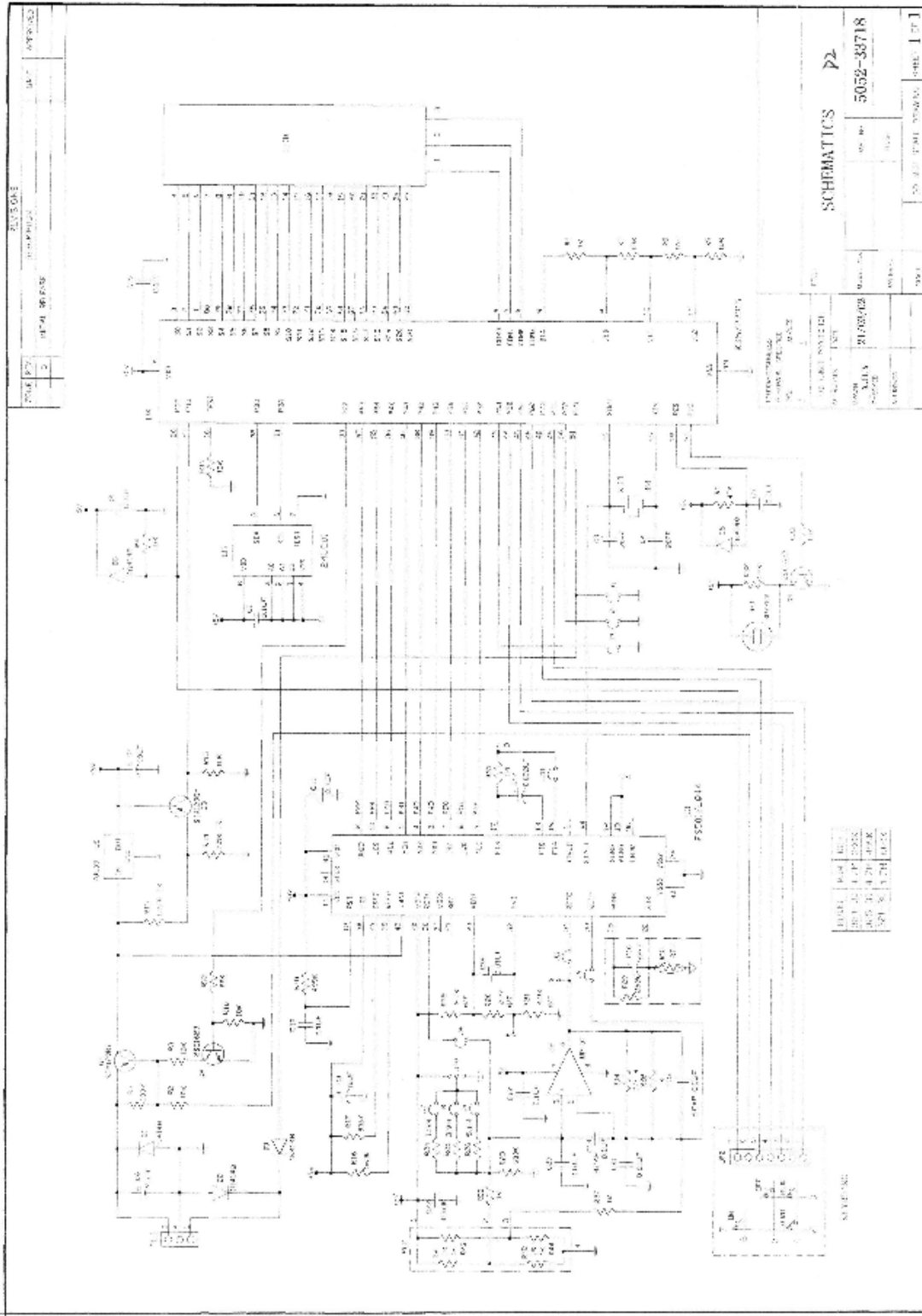
5. To Replace Loadcell Assembly

1. Disassemble top housing of scale.
2. Disconnect PL2 from main PCBA. Remove the four screws fixing the bottom plate of the loadcell assembly. Replace the loadcell with a new one. Connect PL2 and fix the four screws.
3. Put 110% full capacity loading onto weight stand of scale. Adjust the overload screws on the weight stand until they just not touch the bottom plate.
4. Assemble the top housing.
5. Perform internal calibration as described in section 1.
6. Check accuracy of scale at different weight.

440-33		440-45		440-47	
weight(g)	tolorance	weight(g)	tolorance	weight(g)	tolorance
50.00	0.02g	200.0	0.2g	500.0	0.2g
100.00	0.02g	400.0	0.2g	1000.0	0.2g
150.00	0.02g	600.0	0.2g	1500.0	0.2g
200.00	0.02g	800.0	0.2g	2000.0	0.2g

7. Check other functions, such as TARE, MEMORY, and Auto-Off.

6. Schematics



SET OF DOCUMENT NO. DPG-

7. Components Layout

