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GB

Service Manual
Electronic Precision Balances

KERN 440…N
KERN 440…A

Version 4.0 4/2008

GB

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Service Manual

Electronic Precision Balances

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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
- RS232 interface, printing function
- Custom scale by going through SET manual
  - Multiple serial interface modes
  - Different communication baud rates selectable
  - Auto off enable / disable
  - Zero tracking enable / disable
  - Multiple calibration weight selectable
  - Backlight selectable
  - Animal weighing
- Low battery indicator
- Auto off function (battery mode only)
- AC adaptable
- Display segment test function
- Overload protection
- Optional rechargeable battery
- Pre-Tare function

2 Calibration Procedure (CAL)

1. Turn balance on and allow the unit to acclimatize and stabilize for 2 hours.
2. Select the calibration weight according to the operating manual with [Print], [Mode/Cal] and [Set/M] keys.
3. Press and hold the [Mode/Cal] key until the display shows a flashing weight reading. The flashing weight reading indicates the correct weight that must be placed on the weighing pan.
4. Gently place the correct calibration weight on the center on the weighing pan. With the display still flashing, press the [Set/M] key.
5. 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 weighing pan while the display has stabilized.
6. 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.

3 Internal Calibration Procedure (Linearity Adjustment)

1. Remove the top housing of the scale.

2. Connect J3 on the main board by soldering the pads together.

3. Place scale on a hard level surface. With weighing pan installed, turn scale on. Display shall show the internal counts.

4. The internal counts shall fall in the range from **55 000** to **85 000**. In case out of this range, connect J10 left side or right side to increase or reduce the reading. Connecting or disconnecting pads on J7, J8 or J9 can fine tune the reading.

5. Press [Set/M] key once. Display will show [CAL 0] and then the required calibration weight. Place the corresponding calibration weight on the center of the weighing plate. Press [Set/M] again while the weight placed on the weighing pan is stable.

6. Display will now show [CAL 1] and then the next calibration weight. Place the corresponding calibration weight on the weighing plate. Repeat this step until display shows [CAL F]. Remove all weights from weighing pan.

7. Turn the scale off and disconnect J3.

8. Turn scale on and check the accuracy at different weight.

9. Install the top housing of the scale.

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.

3.1 Readout of the Internal Counts

For example:



Without number

In that case the internal count is **66 063**



With number (here 3)

You have to set this number before the value

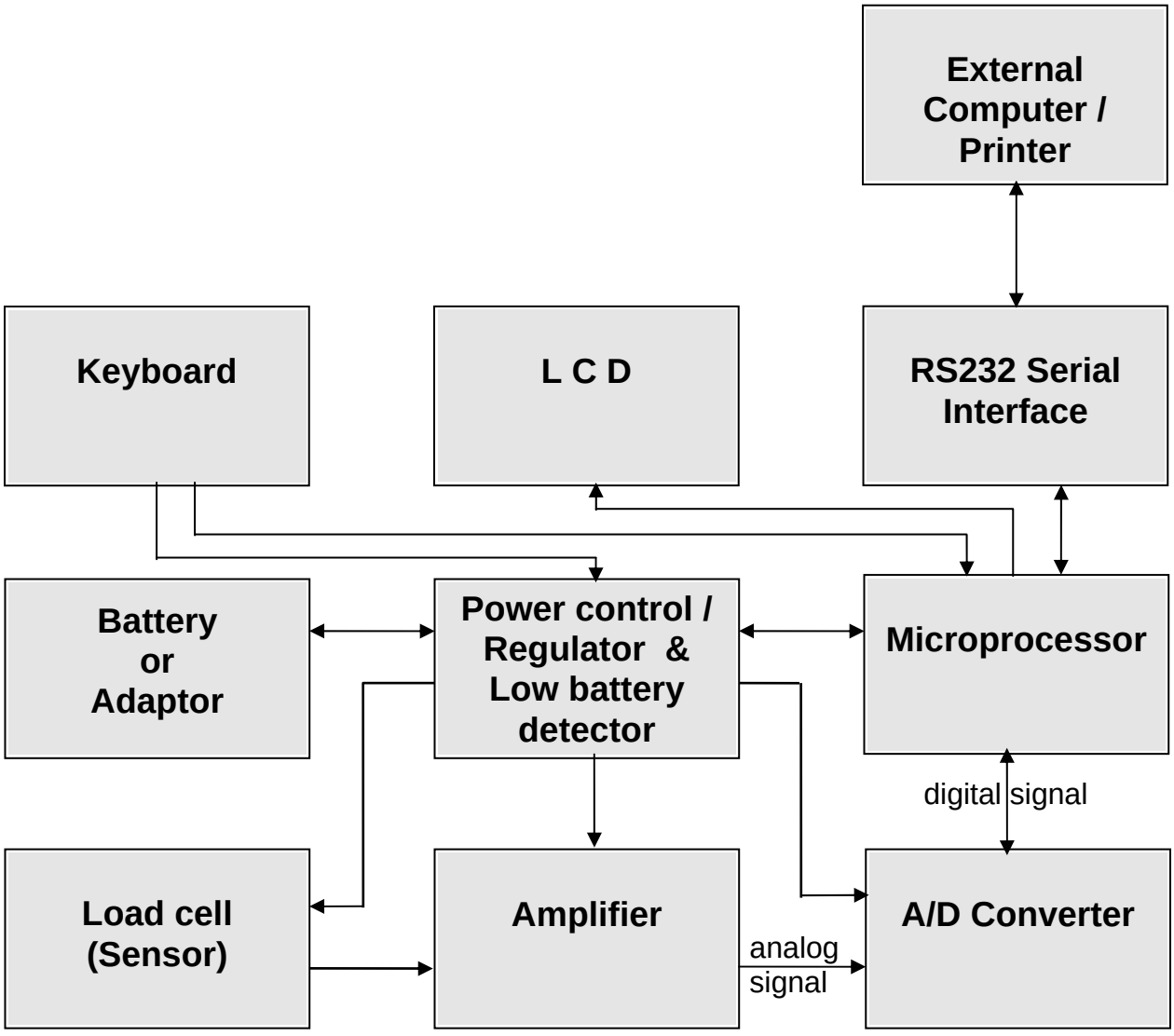
In that case the internal count is **321 580**

4 Display Segment Test

Whenever the scale is power on, all segments of the LCD will be turn on for approx. 5 seconds. Check for any missing segment.

5 Functional Block Diagram / Description

5.1 Functional Block Diagram



5.2 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, display, parts counting, RS232 interface, overload indication, low battery indication, tare, 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. If rechargeable battery is installed, it can be charged up by the charging circuit.

7. ***Keyboard***
   The keyboard provides on user interface. [On/Off], [Mode/Cal], [Set/M], [Print] and [Tare] keys are employed to operate the scale.

8. ***RS232 Interface***
   The RS232 serial interface provides the communication to the external computer or printer.

6 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 weighing plate, overload stopper, load cell and wires, environmental conditions and stable table.

↓

Correct reading?

If not accurate, perform internal calibration.
If cannot reach full capacity, check weighing plate, overload stopper, load cell and internal zero point.
If always zero, check internal zero point. Internal calibration if necessary.

↓

Proper Data to External Device?

If external device not response, check correct RS232 cable and connection, application software running correctly, wires connecting D-sub connector and main PCB.

↓

Normal operation.

7 To Replace PCB

1. Disassemble top housing of scale.
2. Disconnect PL1, PL2, PL3, JP1 and BZ1 from the PCB. Disassemble the ground wire screw.
   Replace a new PCB. Connect PL1, PL2, PL3, JP1 and BZ1 again.
   Assemble the ground wire with screw.
3. Assemble the top housing.
4. Perform internal calibration as described in section 3.
5. Check accuracy of scale at different weight.

440-21N		**440-33N**		**440-35N**		**440-43N**		**440-45N**	
weight (g)	tol. (g)	weight (g)	tol. (g)	weight (g)	tol. (g)	weight (g)	tol. (g)	weight (g)	tol. (g)
10.000	0.003	50.00	0.02	100.00	0.03	100.0	0.2	200.0	0.2
20.000	0.003	100.00	0.02	200.00	0.03	200.0	0.2	500.0	0.2
30.000	0.003	150.00	0.02	300.00	0.03	300.0	0.2	700.0	0.2
40.000	0.004	200.00	0.02	400.00	0.04	400.0	0.2	1000.0	0.2
440-47N		**440-49N**		**440-51N**		**440-53N**		**440-55N**	
weight (g)	tol. (g)	weight (g)	tol. (g)	weight (g)	tol. (g)	weight (g)	tol. (g)	weight (g)	tol. (g)
500.0	0.2	1000.0	0.3	1000	2	1000	2	1000.0	0.6
1000.0	0.2	2000.0	0.3	2000	2	2000	2	2000.0	0.6
1500.0	0.2	3000.0	0.3	3000	2	4000	2	4000.0	0.6
2000.0	0.2	4000.0	0.4	4000	2	6000	2	6000.0	0.6

440-35A		**440-21A**		**440-49A**	
weight (g)	tol. (g)	weight (g)	tol. (g)	weight (g)	tol. (g)
100.00	0.03	10.000	0.003	1000.0	0.3
200.00	0.03	20.000	0.003	2000.0	0.3
400.00	0.04	40.000	0.004	4000.0	0.4
600.00	0.04	60.000	0.004	6000.0	0.4

6. Check other functions, such as Tare, Menory, Print, Mode and Auto-Off.

8 To Replace Load Cell Assembly

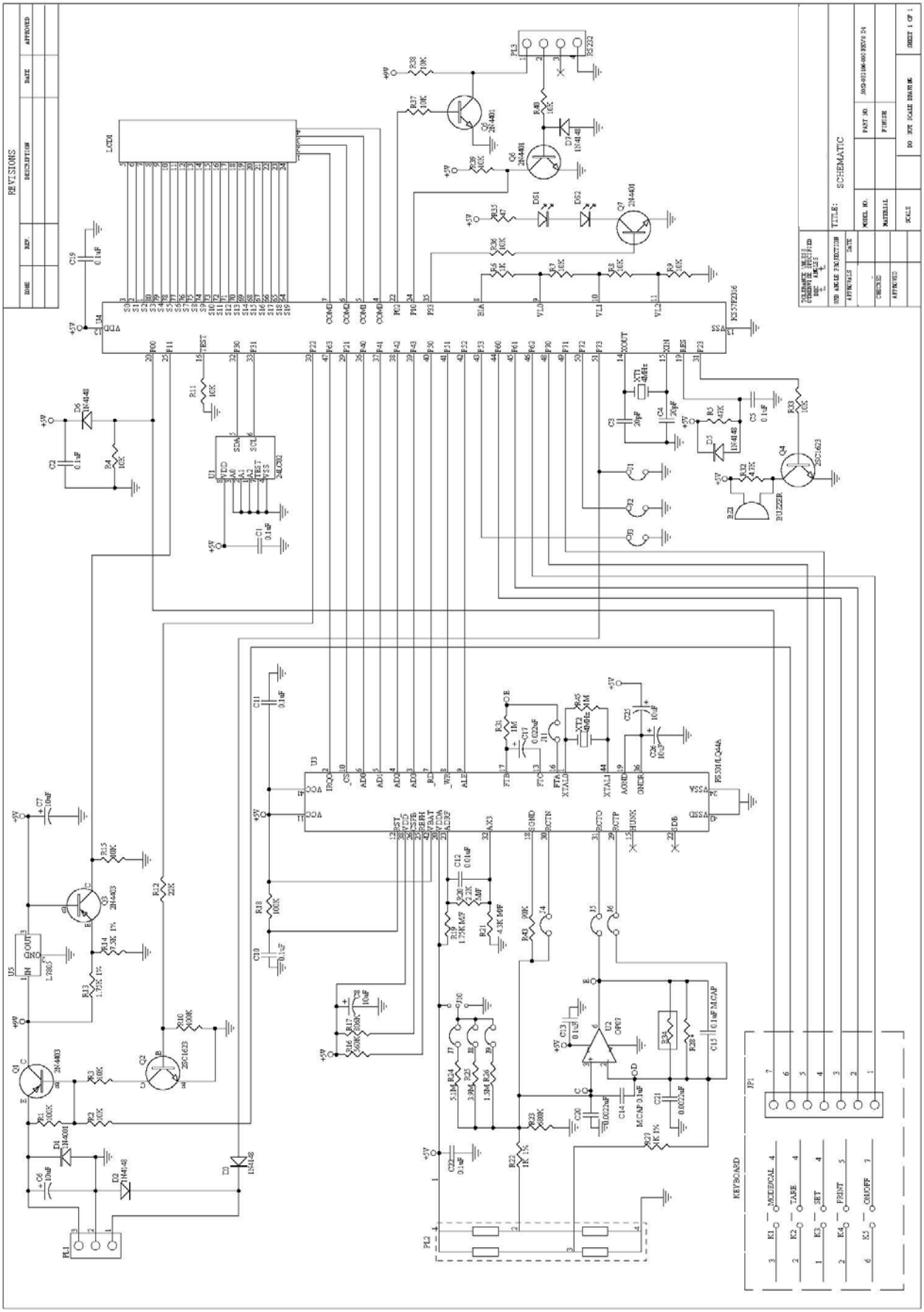
1. Disassemble top housing of scale.
2. Disconnect PL2 from main PCB. Remove the four screws fixing the bottom plate of the load cell assembly. Replace the load cell with a new one.
   Connect PL2 and fix the four screws.
3. Put 110% full capacity loading onto weight stand of scale and adjust the overload screws.
4. Assemble the top housing.
5. Perform internal calibration as described in section 3.
6. Check accuracy of scale at different weight.

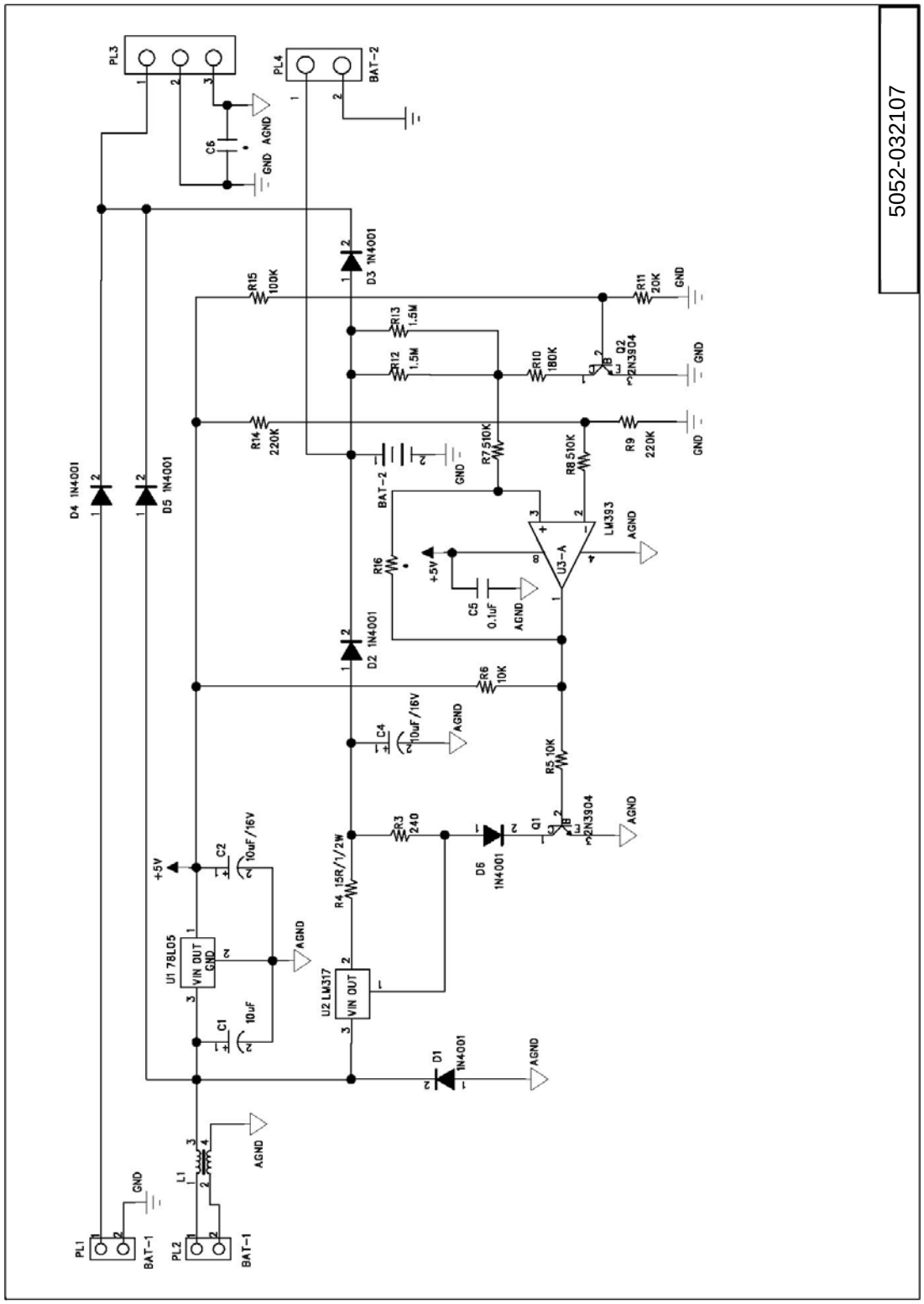
440-21N		**440-33N**		**440-35N**		**440-43N**		**440-45N**	
weight (g)	tol. (g)	weight (g)	tol. (g)	weight (g)	tol. (g)	weight (g)	tol. (g)	weight (g)	tol. (g)
10.000	0.003	50.00	0.02	100.00	0.03	100.0	0.2	200.0	0.2
20.000	0.003	100.00	0.02	200.00	0.03	200.0	0.2	500.0	0.2
30.000	0.003	150.00	0.02	300.00	0.03	300.0	0.2	700.0	0.2
40.000	0.004	200.00	0.02	400.00	0.04	400.0	0.2	1000.0	0.2
440-47N		**440-49N**		**440-51N**		**440-53N**		**440-55N**	
weight (g)	tol. (g)	weight (g)	tol. (g)	weight (g)	tol. (g)	weight (g)	tol. (g)	weight (g)	tol. (g)
500.0	0.2	1000.0	0.3	1000	2	1000	2	1000.0	0.6
1000.0	0.2	2000.0	0.3	2000	2	2000	2	2000.0	0.6
1500.0	0.2	3000.0	0.3	3000	2	4000	2	4000.0	0.6
2000.0	0.2	4000.0	0.4	4000	2	6000	2	6000.0	0.6

440-35A		**440-21A**		**440-49A**	
weight (g)	tol. (g)	weight (g)	tol. (g)	weight (g)	tol. (g)
100.00	0.03	10.000	0.003	1000.0	0.3
200.00	0.03	20.000	0.003	2000.0	0.3
400.00	0.04	40.000	0.004	4000.0	0.4
600.00	0.04	60.000	0.004	6000.0	0.4

7. Check other functions, such as Tare, Memory, Print, Mode and Auto-Off.

9 Schematics




5052-032107
PL3
PL4
BAT-2
C6
GND
AGND
D3 1N4001
R15 100K
R11 20K
R13 1.5M
R12 1.5M
R10 180K
D2 2N3904
R14 220K
R7 510K
R8 510K
R9 220K
D4 1N4001
D5 1N4001
LM393
U3-A
+5V
R16
C5 0.1uF
D2 1N4001
R6 10K
C4 10uF/16V
R5 10K
R3 240
Q1 2N3904
D6 1N4001
C2 10uF/16V
R4 15R/1/2W
U1 78L05
VIN OUT GND
U2 LM317
VIN OUT
C1 10uF
D1 1N4001
L1
PL1
PL2
BAT-1

10 Components Layout

