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Service manual
School balance

KERN EMB

Version 3.3
4/2009
GB

EMB-SH-e-0933

GB

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Version 3.3 4/2009

Service manual

School balance

Table of Contents

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.

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.

2 Features

- Auto zero
- Full Tare function
- 4 weighing units
- Display segment test function
- Negative value indication
- Auto off function (battery mode only, enable / disable)
- Zero tracking enable / disable
- Two types of Digital Auto Calibration
- Solder pads to prevent end-user internal calibration
- Low battery indicator
- Overload protection / indication
- AC adaptable
- Operated by 2 x AA size alkaline batteries (EMB220-1, EMB2200-0, EMB5.2K5), 9V battery (EMB100-3, EMB200-2, EMB600-2, EMB1000-2, EMB500-1, EMB1200-1, EMB5.2K1)

3 Calibration Procedure (CAL)

1. Turn scale on by pressing the [ON/TARE] key.

2. Press the [OFF] key for approx. 5 seconds. Display will show [CAL] and then the required calibration weight.

3. Gently place the correct calibration weight on the center on the weighing pan. Wait until display shows [F] then turn off.

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

4 Internal Calibration Procedure (Linearity Adjustment)

1. Remove the top housing of the scale.

2. Connect the pads below together by soldering:
   J1 for EMB 220-1, EMB 2200-0, EMB 5.2K5
   J3 for EMB 100-3, EMB 500-1, EMB 1000-2, EMB 1200-1, EMB 5.2K1
   J9 for EMB 200-2, EMB 600-2

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 **3 000** to **5 000**.

   For EMB 200-2 and EMB 600-2 the internal counts shall fall in the range from **50 000** to **80 000**.

   For EMB 100-3 and EMB 1000-2 the internal counts shall fall in the range from **100 000** to **300 000**.

   In case out of this range, connect **J9** (**J4** for EMB 200-2 and EMB 600-2; **J6** for EMB 100-3 and EMB 1000-2) left side or right side to increase or reduce the reading.

   Connecting or disconnecting pads on
   J6, **J7** or **J8** for EMB 220-1, EMB 2200-0, EMB 5.2K5
   J5, **J6**, **J7** or **J8** for EMB 500-1, EMB 1200-1, EMB 5.2K1
   J1, **J2** or **J3** for EMB 200-2, EMB 600-2
   J2, **J3**, **J4** or **J5** for EMB 100-3, EMB 1000-2
   can fine tune the reading.

5. Press [OFF] key once. Display will show the required calibration weight. Place the corresponding calibration weight on the center of the weighing pan. Press [OFF] key while the weight is placed on the weighing pan.

6. Repeat step 5 for other calibration weights until display show [F] then off. Remove all weights from weighing pan.

7. Disconnect the pads below:
   J1 for EMB 220-1, EMB 2200-0, EMB 5.2K5
   J3 for EMB 100-3, EMB 500-1, EMB 1000-2, EMB 1200-1, EMB 5.2K1
   J9 for EMB 200-2, EMB 600-2

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

9. Install the top housing of scale.

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

4.1 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

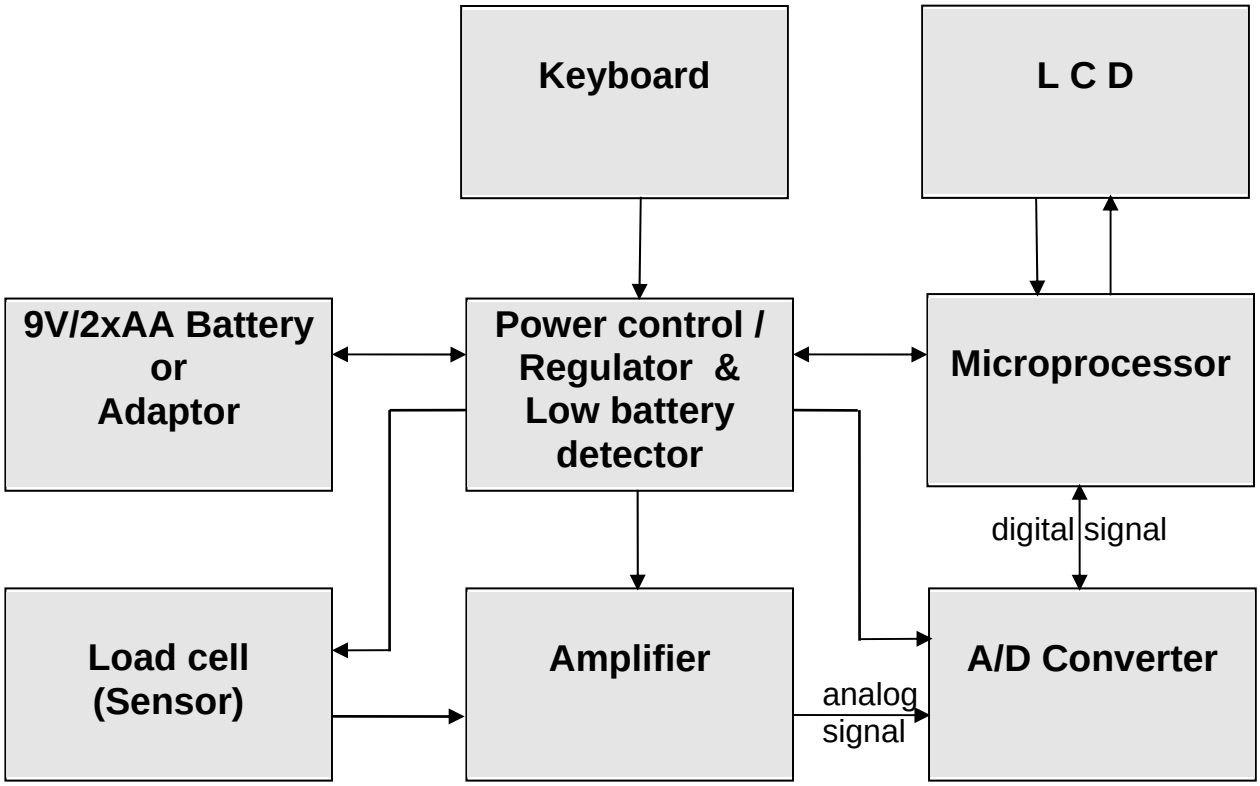
In that case the internal count is **321 580**

5 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.

6 Functional Block Diagram / Description

6.1 Functional Block Diagram



6.2 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, 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/TARE], [OFF] keys are employed to operate the scale.

7 Trouble Shooting

Power on

↓

Full Segments?

If no display, check battery /adaptor, keys, connection between battery/adaptor—main board.
If missing segments, check fixing of LCD frame, zebra connector under LCD.

↓

Display Zero?

If display [LO], check battery >2.6v
(>7.5v for EMB 100-3,EMB 200-2,EMB 600-2,EMB 500-1,EMB 1000-2, EMB 1200-1,EMB 5.2K1)
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.

↓

Normal operation.

8 To Replace PCB

1. Disassemble top housing of scale.
2. Disconnect

   PL1, **SS1** and **flat line** of keyboard (EMB 220-1, EMB 2200-0, EMB 5.2K5)
   PL1, **PL2** and **PL3** (EMB 500-1, EMB 1200-1, EMB 5.2K1)
   PL1, **PL2** and **JP1** (EMB 200-2, EMB 600-2)
   PL1, **PL3**, **JP2**, **J1** (flat line) and **SENSOR** (EMB 100-3, EMB 1000-2)

   from the PCB. Disassemble the PCB screw.
   Replace a new PCB. Assemble the PCB screw and connect the cables and the flat line again.
3. Perform internal calibration as described in section 4.
4. Assemble the top housing.
5. Check accuracy of scale at different weight.

EMB 200-2		**EMB 600-2**		**EMB 220-1**		**EMB 500-1**	
weight (g)	tol. (g)	weight (g)	tol. (g)	weight (g)	tol. (g)	weight (g)	tol. (g)
50.00	0.02	100.00	0.02	50.0	0.2	100.0	0.3
100.00	0.02	200.00	0.02	100.0	0.2	300.0	0.3
150.00	0.02	400.00	0.04	150.0	0.2	500.0	0.3
200.00	0.02	600.00	0.06	200.0	0.2		
EMB 1200-1		**EMB 2200-0**		**EMB 5.2K1**		**EMB 5.2K5**	
weight (g)	tol. (g)	weight (g)	tol. (g)	weight (g)	tol. (g)	weight (g)	tol. (g)
200.0	0.3	500	2	1000	3	1000	10
500.0	0.3	1000	2	3000	3	3000	10
1000.0	0.3	1500	2	5000	3	5000	10
1200.0	0.3	2000	2				

EMB 100-3		**EMB 1000-2**	
weight (g)	tol. (g)	weight (g)	tol. (g)
10.000	0.002	100.00	0.02
20.000	0.002	200.00	0.02
50.000	0.003	500.00	0.03
70.000	0.003	700.00	0.03
100.000	0.003	1000.00	0.03

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

9 To Replace Load Cell Assembly

1. Disassemble top housing of scale.

2. Disconnect the load cell wires from main PCB. Remove the screws fixing the bottom plate of the load cell assembly. Replace the load cell with a new one. Connect the load cell wires and fix the screws.

3. Perform internal calibration as described in section 4.

4. Assemble the top housing.

5. Check accuracy of scale at different weight.

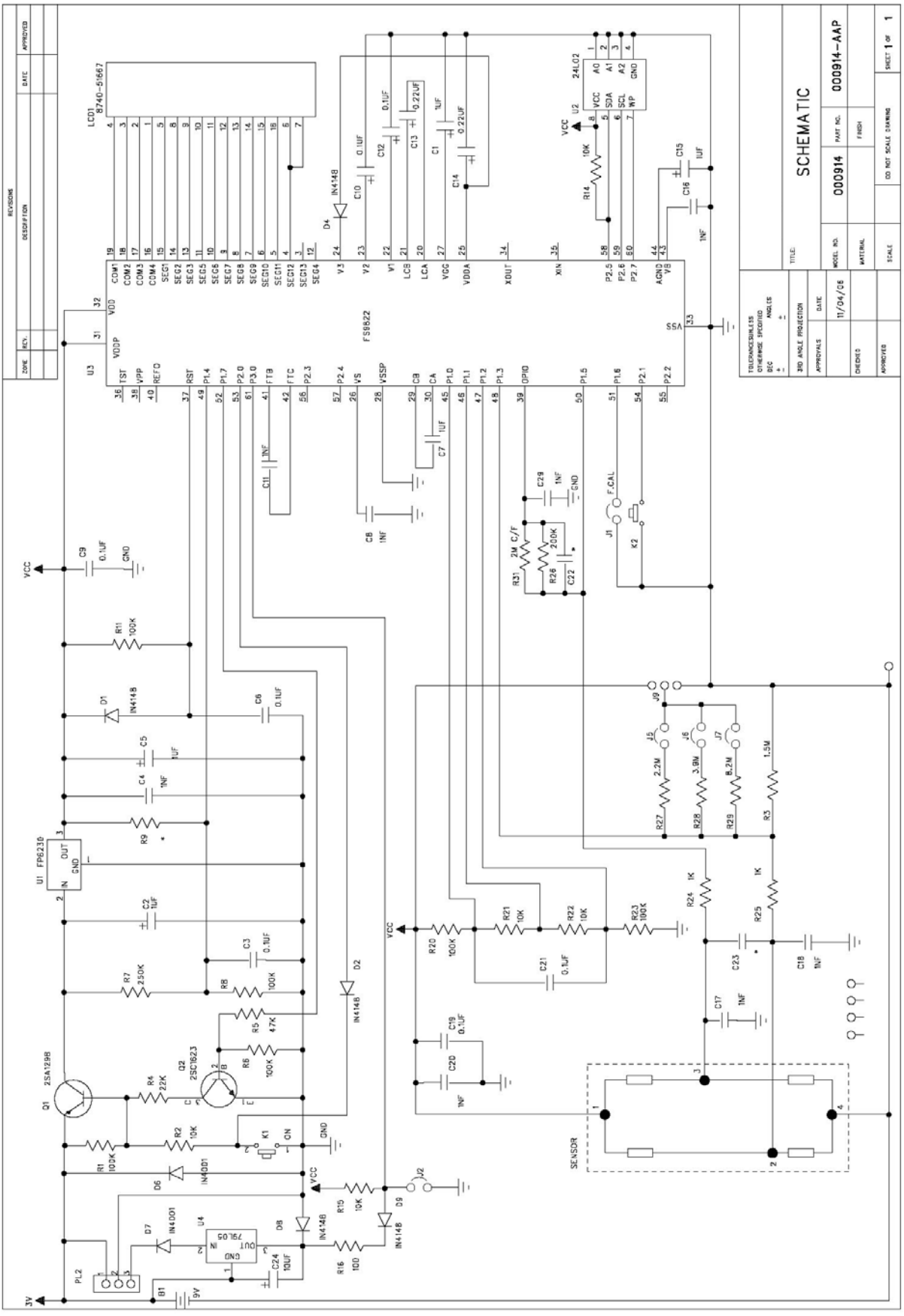
EMB 200-2		**EMB 600-2**		**EMB 220-1**		**EMB 500-1**	
weight (g)	tol. (g)	weight (g)	tol. (g)	weight (g)	tol. (g)	weight (g)	tol. (g)
50.00	0.02	100.00	0.02	50.0	0.2	100.0	0.3
100.00	0.02	200.00	0.02	100.0	0.2	300.0	0.3
150.00	0.02	400.00	0.04	150.0	0.2	500.0	0.3
200.00	0.02	600.00	0.06	200.0	0.2		
EMB 1200-1		**EMB 2200-0**		**EMB 5.2K1**		**EMB 5.2K5**	
weight (g)	tol. (g)	weight (g)	tol. (g)	weight (g)	tol. (g)	weight (g)	tol. (g)
200.0	0.3	500	2	1000	3	1000	10
500.0	0.3	1000	2	3000	3	3000	10
1000.0	0.3	1500	2	5000	3	5000	10
1200.0	0.3	2000	2				

EMB 100-3		**EMB 1000-2**	
weight (g)	tol. (g)	weight (g)	tol. (g)
10.000	0.002	100.00	0.02
20.000	0.002	200.00	0.02
50.000	0.003	500.00	0.03
70.000	0.003	700.00	0.03
100.000	0.003	1000.00	0.03

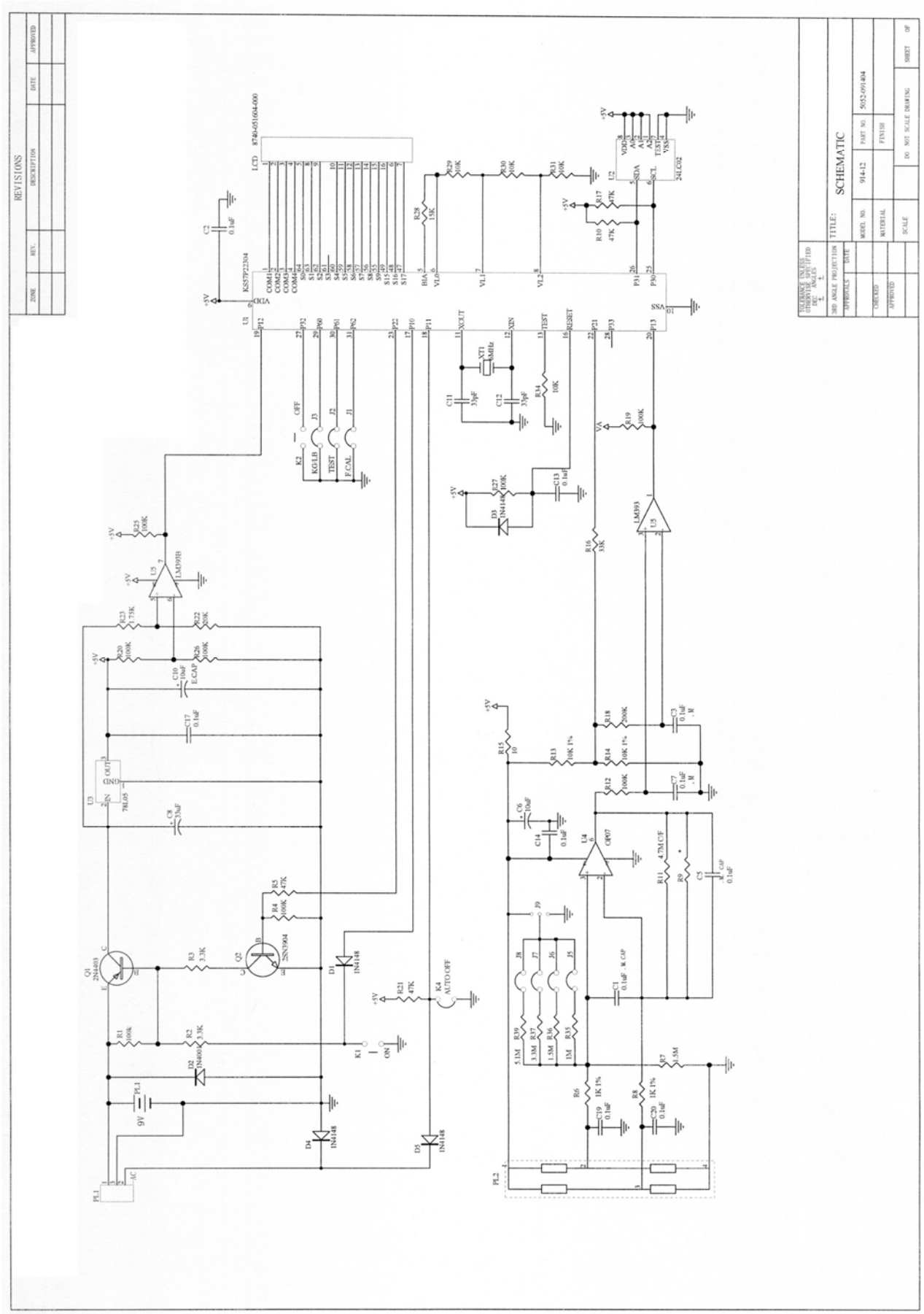
6. Check other functions, such as Tare and Auto-Off.

10 Schematics

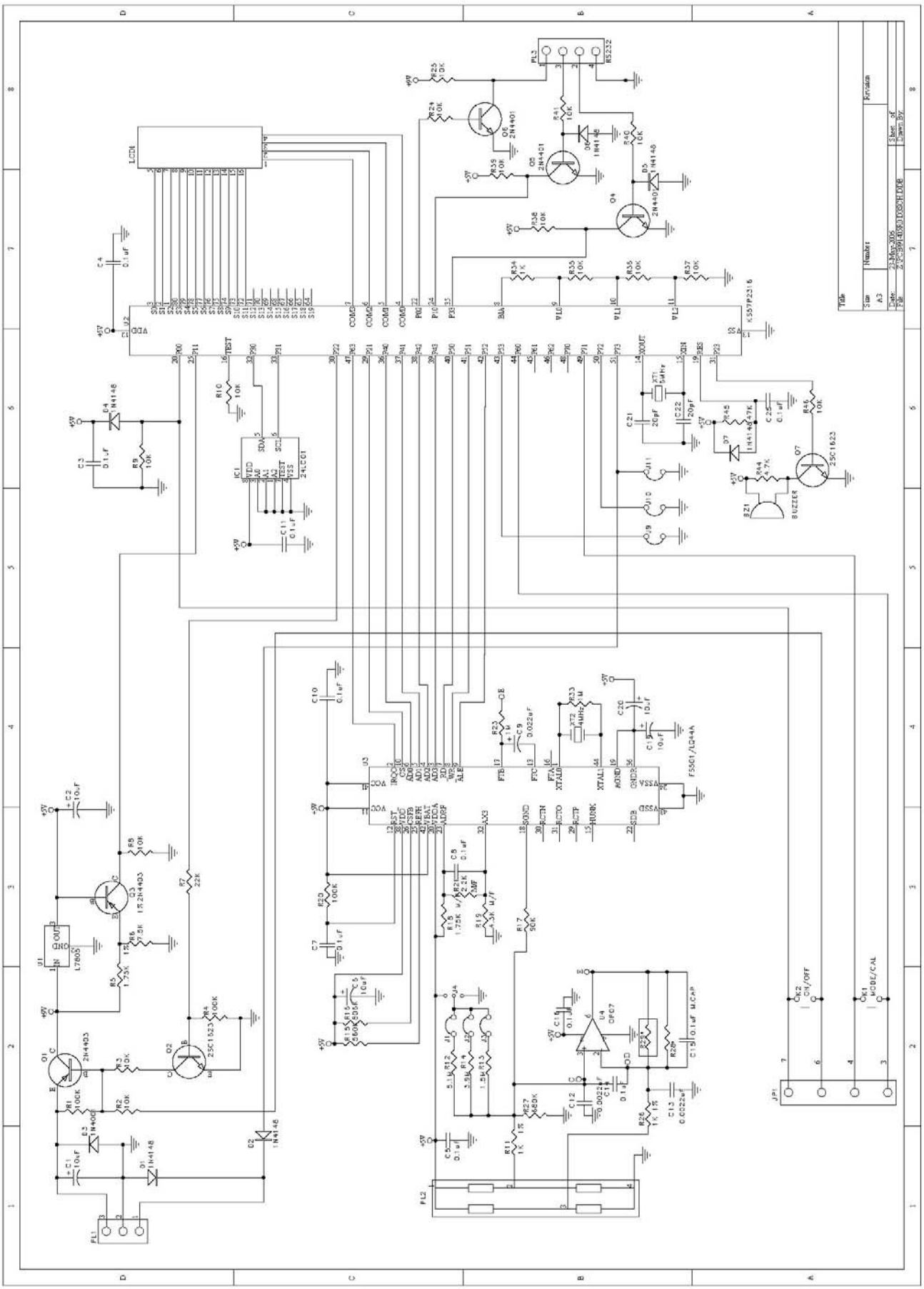
10.1 For EMB 220-1, EMB 2200-0, EMB 5.2K5



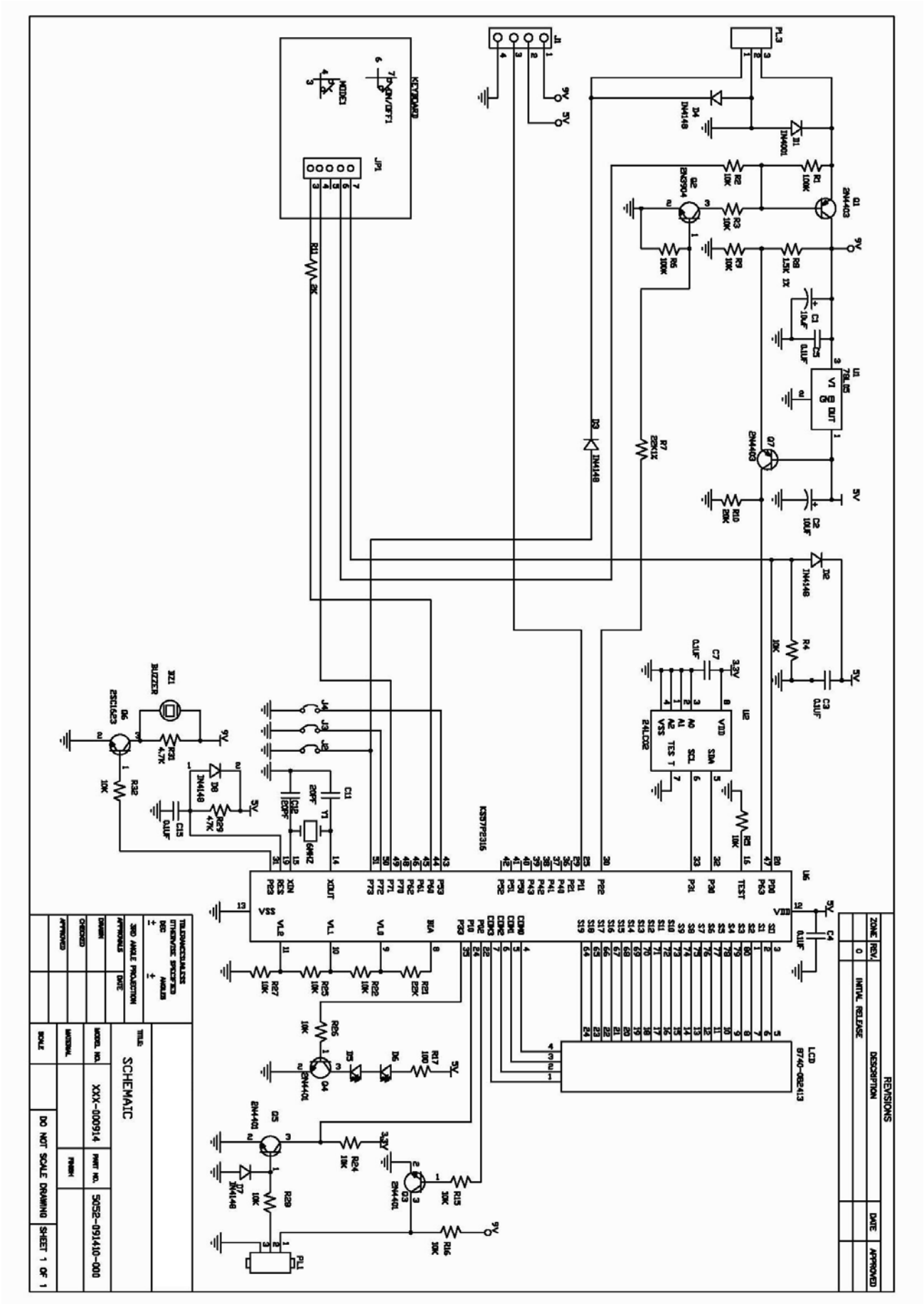
10.2 For EMB 500-1, EMB 1200-1, EMB 5.2K1

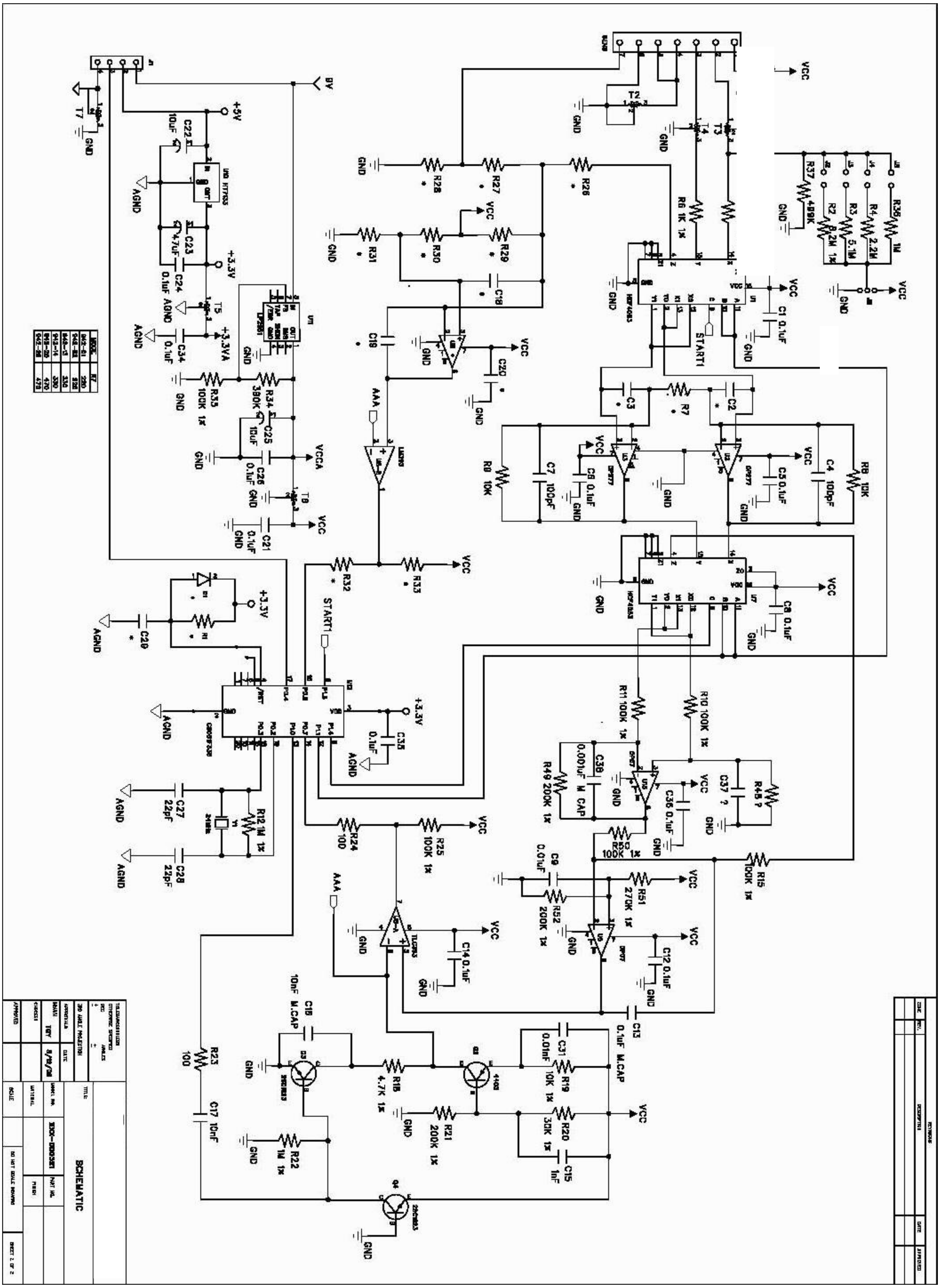


10.3 For EMB 200-2, EMB 600-2



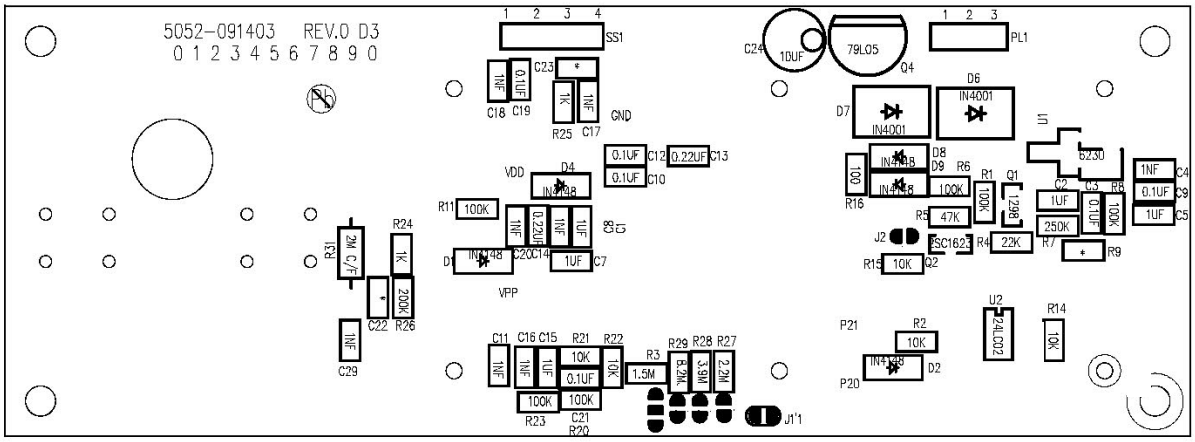
10.4 For EMB 100-3, EMB 1000-2

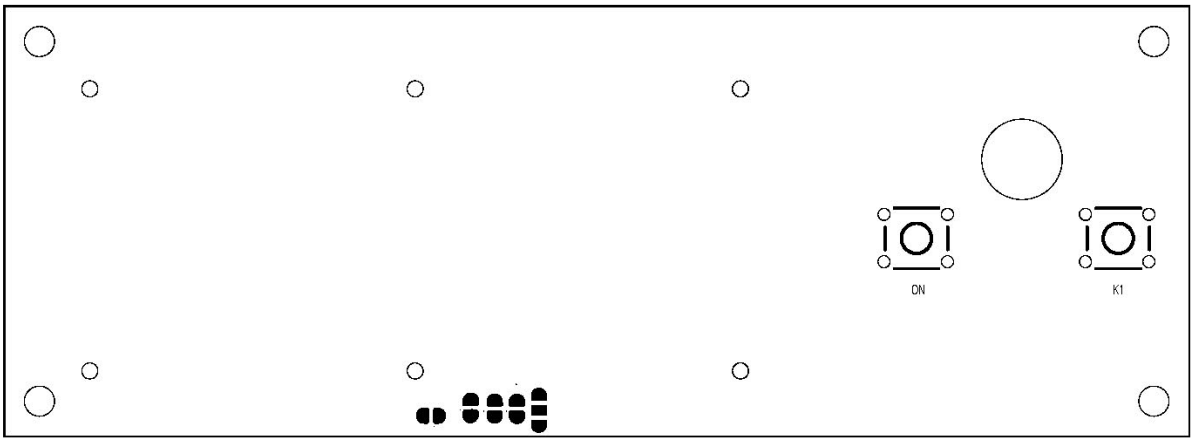



SCHEMATIC
+5V
+3.3V
+3.3VA
VCC
VCCA
GND
AGND
START1
AAA

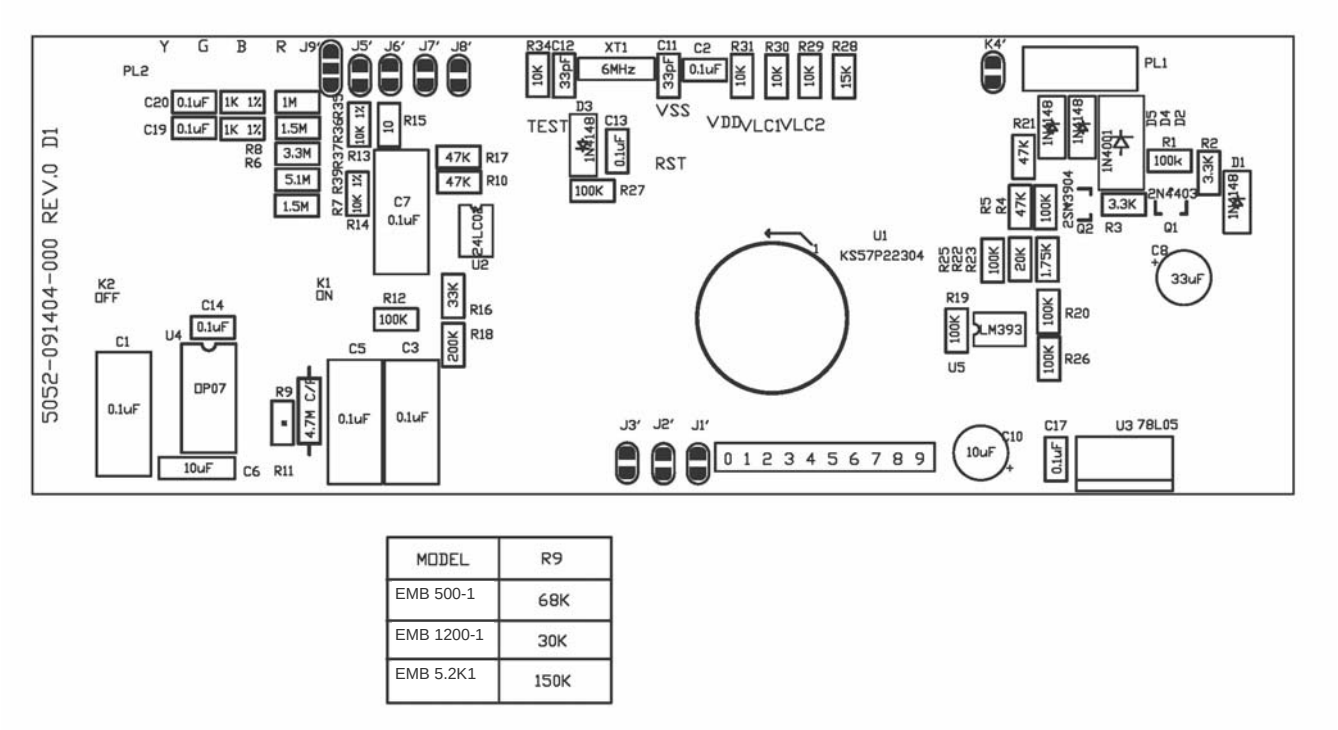
11 Components Layout

11.1 For EMB 220-1, EMB 2200-0, EMB 5.2K5



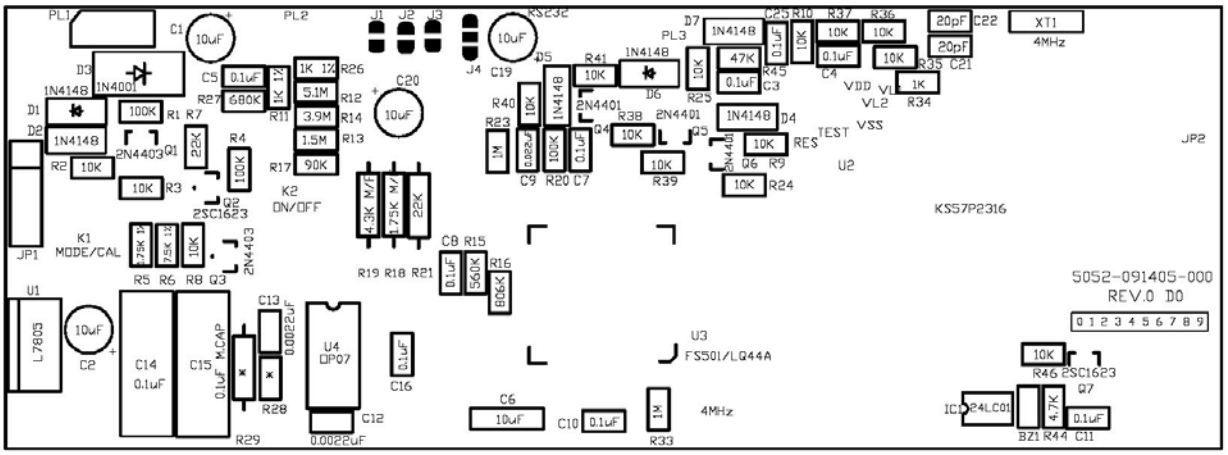


11.2 For EMB 500-1, EMB 1200-1, EMB 5.2K1

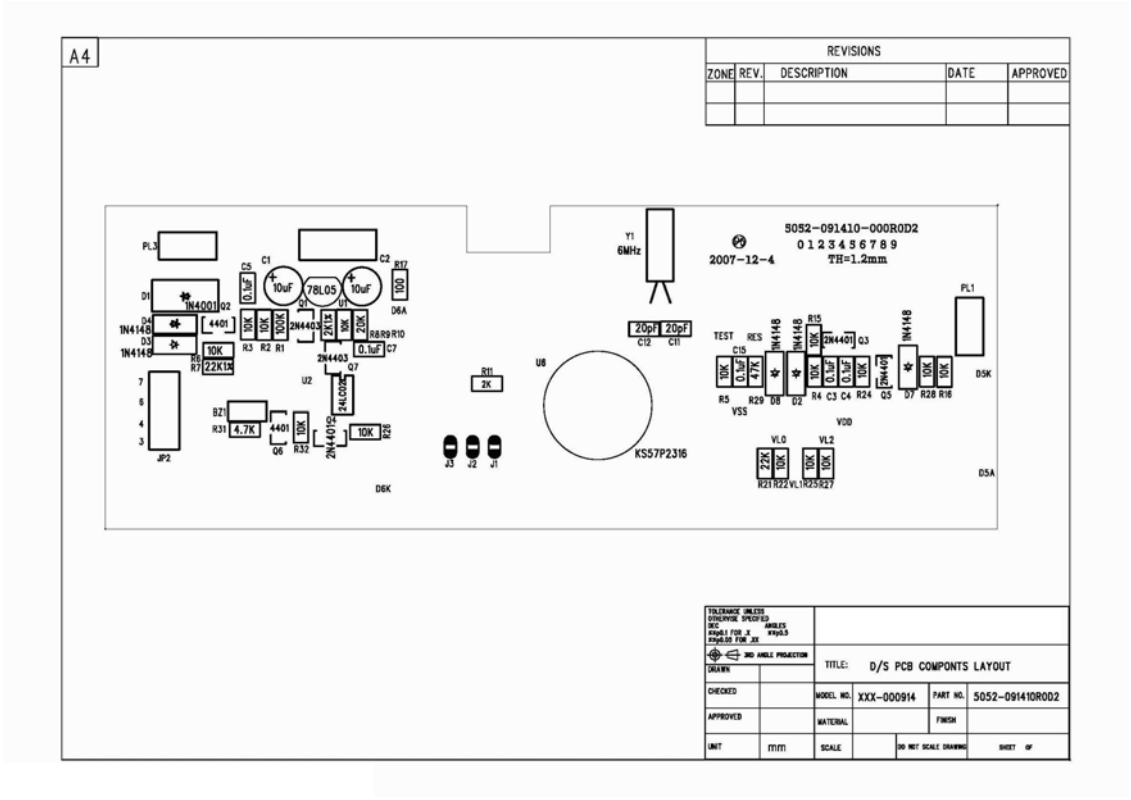


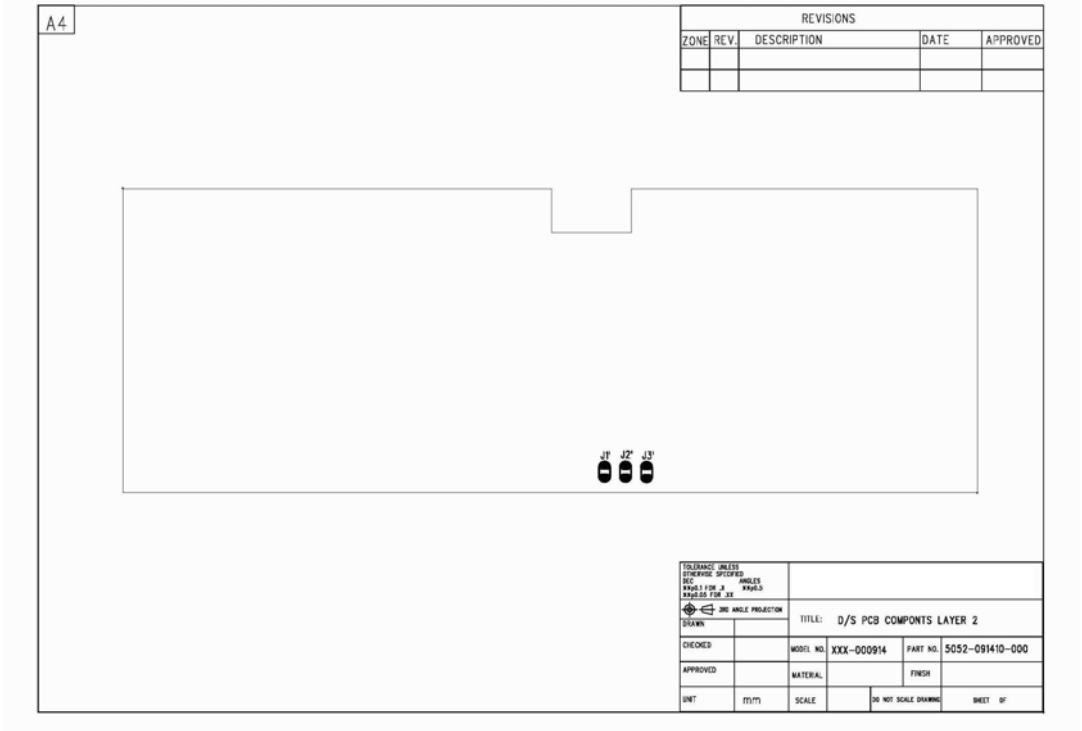
MODEL	R9
EMB 500-1	68K
EMB 1200-1	30K
EMB 5.2K1	150K

11.3 For EMB 200-2, EMB 600-2



11.4 For EMB 100-3, EMB 1000-2





A4
REVISIONS
ZONE
REV.
DESCRIPTION
DATE
APPROVED
5052-032111-000
REV.0.D2
1 2 3 4 5 6 7 8 9 0
SENSOR
P20 /RSTpDD
AGND
mode R7 C38
942-01 220 0.47uF
942-02 220 0.47uF
942-13 330 0.1uF
942-14 330 0.1uF
942-25 330 0.1uF
942-26 330 0.1uF
TOLERANCE UNLESS OTHERWISE SPECIFIED
DECIMALS
X±0.1 FOR .X
X±0.05 FOR .XX
ANGLES ±1°
3RD ANGLE PROJECTION
DRAWN
CHECKED
APPROVED
UNIT
mm
SCALE
MATERIAL
FINISH
DO NOT SCALE DRAWING
TITLE: D/S PCB COMPONENT LAYOUT
MODEL NO. XXX000-321
PART NO. 5052-032111-000
SHEET OF