GB

**Service Manual
Electronic Moisture Analyzer**

Page 2

KERN MLS 50-3…N

Version 1.2   10/2008

CONTENTS

1.   Keyboard Description

Key	Function
ON OFF	• Switch machine on/off
M	• Change display during drying process
START STOP	• Start/Stop drying
ESC	• Cancel an entry • Leave menu
← ↑ → ↓	• Arrow keys for navigation in menu • Change the value of a parameter
PRINT	• Data export to external device • Confirm/save settings
TARE	• Tara key scales zero digits
MENU	• Invoke user menu (drying parameter setting)
F	• Invoke user menu

2.   Troubleshooting

1	Unit does not turn on	Check mains cable Check fuses Check cable connections Problem on power board Problem on display board Problem on main board
2	Balance is weighing but is unstable	Mechanical damage Pan rubbing against case or not installed correctly Air drafts or vibration or unstable table Not good parameters for the working conditions Dirt inside the measurement system or inside the coil
3	No zero point after turning on the balance	Pan needs to zero Mechanical damage
4	Balance shows wrong weight	Wrong calibration Mechanical damage to weighing mechanism Pan not installed correctly Off center load error Dirt inside the measurement system
5	Off center load error	Check if the horizontal stat is being kept mechanical damage
6	Intense creeping (drift)	Mechanical damage Dirt inside the measurement system
7	Linearity error	Linearity correction Mechanical damage
9	No communication between balance and PC	Wrong parameter Check connection RS-232 to PC Wrong interface cable
10	Time and date does not work	Check voltage TTL 2 Hz (0/+5V DC on measuring point **SQW** Problem on main board Batteries are damaged
11	Display shows program number, no function	Quartz does not work Processor damage Check tension **RST** (reset) **"1"** +5V and exchange main board when RST does not work
12	Outside maximum range	Mechanical damage Check voltage on measuring resistor
13	Balance works OK but drying is not correct	Check parameters and mode selected Check samples are not hitting the temp. sensor Check temperature of chamber Check lamps
14	Temperature of chamber is incorrect	Recalibrate temperature sensor Temperature sensor damaged Lamp circuits damaged
15	Heating lamps will not turn on at any time	Check lamps Check wiring of lamps Temperature sensor
16	Lamps will not turn off	Damaged temp. sensor Recalibrate temp. sensor Lamp control circuits damaged

3. Error Messages

| Fault messages	Error number	Description
Error of control sum	1.1	Error data transfer
Error A/D	1.2	Error A/D converter
Overcrossed range	2.1	Outside maximum range
Overcrossed range	2.2	Outside maximum range
A/D Null	2.3	Error A/D converter
A/D Full	2.4	Error A/D converter
Tare/zero above the range	2.5	Outside of weighing range
Tare above the range	2.6	Outside of taring range
Result > 10% Max	2.7	Result > 10 %
Result > 4% Max	2.8	Load on weighing plate too heavy
Difference > 1% Max	2.9	Difference between cal. weight stored/current cal. weight > 1%
Sample mass < 20 mg	2.10	Sample < 20 mg
Sample mass above the range	2.11	Sample out of set range
Above the range	3.1	Value of parameter outside
Faulty value	3.2	Value of parameter outside
Incorrect password	3.4	Wrong password
Error of notice	4.1	Error data transfer
Parity error	4.2	
Table error	4.3	
Suspended transmission CTS	4.4	
Suspended transmission XOFF	4.5	
Incorrect date	5.1	Wrong data
Overcrossed time	6.1	Timeout

4. Factory Menu (service menu)

Contents of the factory menu are parameters needed to start, settings and regulations.

4.1 How to enter the service menu

Open the housing and set jumper „**JP1**" on main board 172xxx.PCB to access the service menu.
Plug the balance into the power outlet and enter service menu.
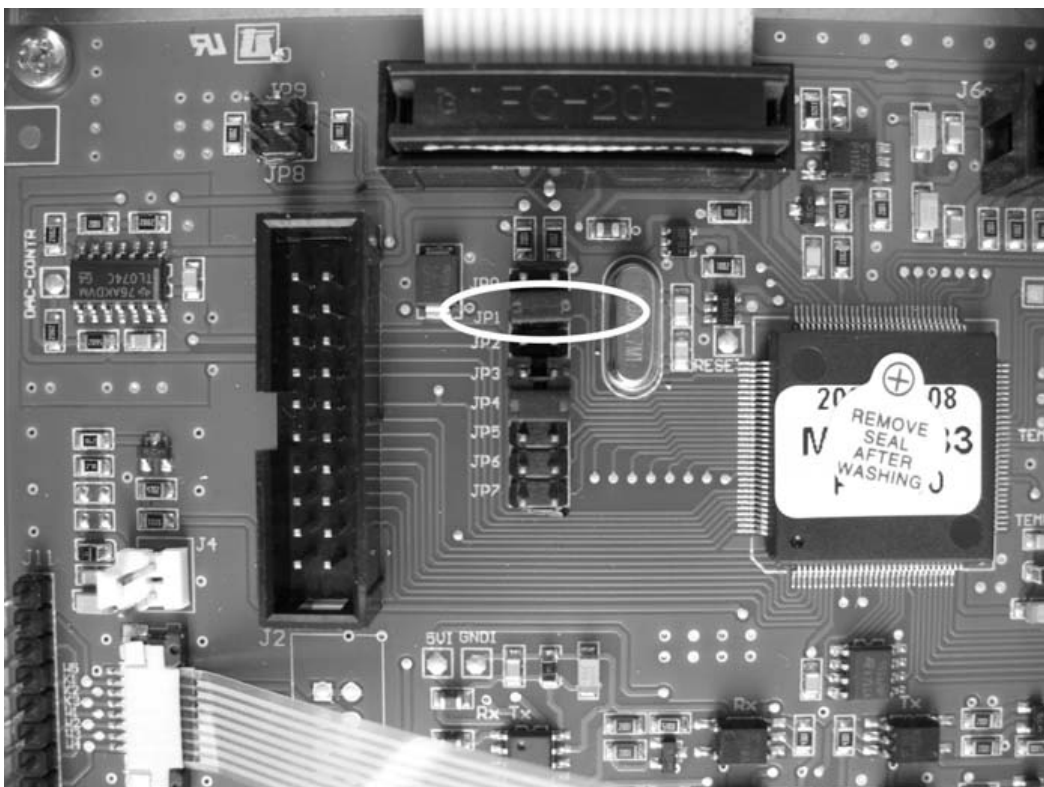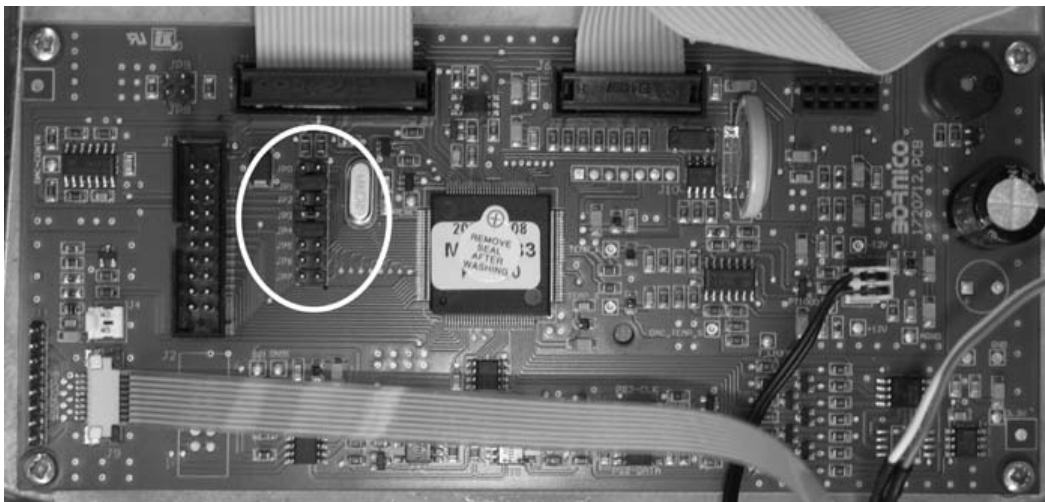
4.2   Description of factory parameters

Press the ON/OFF key (main switch) to turn on the balance

| F | Enter main menu |

| ↑ | Set index next to parameter **P0 Factory** |

```
10/10/03          Setup          10:10:1
P0 ▶Factory
P1  Calibration
P2  GLP
P3  Date/Time
P4  Readout
P5  RS-232
P6  Printouts
```

| → | Enter submenu **P0 Factory** |

Parameter number	Parameter name	*Description*
P0 01	Factory deff	Delete all settings in balance and load program primal settings » Factory setting (Reset) / **PLEASE NOTICE you have to set all parameters new!!!**
P0 02	Balance Id	Change factory number (serial number)
P0 03	Full scale (scale capacity)	Scale capacity (max) = weighing range +9 divisions: e.g. max range **50,09g**
P0 04	Div	Reading precision (resolution), e.g. 0.001
P0 05	Ext. cal. mass	Value of external calibration weight [**g**], e.g. 50.0g
P0 06	Autozero range	Range of autozero function (possibility to change value from 0.1d to 10.0d) Normal **12= 3.0 d**
P0 07	Autozero delay	Time of autozero (possibility to change value from **0.2s** to **3.0s**) Normal **6= 2.0 s**
P0 08	Stable range	Stable range of measuring results (possibility to change value from 0.1d to 10.0d) Normal **11= 2.0 d**
P0 09	Stable speed	Time to define stable measuring results (possibility to change value from 0.2s to 3.0s) Normal **6= 2.0 s**
P0 10	Filter range	Digital filter (possibility to change value from 1d to 10000d) Normal **5 – 20 d**
P0 11	Show A/D div	Value of A/D converter (of the load)
P0 12	Show A/D T1	A/D value of temperature sensor in the coil
P0 13	Show A/D T2	A/D value of temperature sensor in the drying chamber
P0 14	Factory cal.	Starts factory calibration with external calibration weight
P0 15	Factory T cal.	Starts calibration of the temperature sensor inside the drying chamber
P0 16	Linear. corr.	Starts linearity procedure *with* external weights. You can inscribe max. 16 points of linearity.

P0	17	Temp. corr.	Starts temp. compensation in a room with regulated temperature (range ± 1°C). Correction is done in temp. 18°C up to 28°C. The parameters/values are stored after doing temperature compensation (parameters P0 27, P0 28).
P0	18	Start div	Preload (with pan) - balance find it automatically
P0	19	Cal. factor	Calibration factor during factory calibration
P0	20	Start div f.	Preload after correction
P0	21	Cal. factor f.	Not documented
P0	22	T. max	Not documented
P0	23	Start T	Not documented
P0	24	Factor T	The factor during the temperature compensation
P0	25	Start f. T	Not documented
P0	26	Factor f. T	The factor during temperature compensation after filtering
P0	27	1'st point T	First temperature correction set by 18°C
P0	28	Start T 2	Not documented
P0	29	Factor T 2	Factor during temperature compensation 2'nd point
P0	30	Start f.T2	Not documented
P0	31	Factor f. T 2	The factor during temperature compensation after filtering 2'nd temperature point
P0	32	2'nd point T	Second temperature correction set by 28°C
P0	33	Temp. Z factor	Temperature compensation factor of zero
P0	34	Temp. S factor	Temperature compensation factor of sensitivity
P0	35	Lin. points	Those parameters are stored after doing linearity correction. These parameters (the stored values) can be changed manually (max. 16 points). Here you can change the linearity factor manually also *without* doing the linearity correction by using external weights.
		Lin. value 1	
		Lin. factor 1	
		Lin. value 2	
		Lin. factor 2	
		Lin. value 3	
		Lin. factor 3	
.		.	
.		.	
.		.	
.		.	
P0	64	Lin. value 15	
P0	65	Lin. factor 15	
P0	66	Lin. value 16	
P0	67	Lin. factor 16	
P0	68	Lin. factor A	Parabolic linearity factor
P0	69	Lin. factor B	Parabolic linearity factor
P0	70	Up/Down par.	Printout of factory parameters, printout of moisture analyzer parameters or receipt of moisture analyzer parameters
P0	71	Stack info.	Information about the stored settings when the moisture analyzer will be started
P0	72	Bootloader	Select this parameter for software download / update

P0 73	Fat perc. fun	Function of large content in user menu **0= disabled** (function not available in user menu) **1= enabled** (function available in user menu)
P0 74	Heater type	Type of heating element in moisture analyzer: **0= Halogen** **1= IR**
P0 75	Cor, factor T	Service parameter for characteristic of drying chamber thermometer

5. Factory Calibration

Enter submenu **P0 Factory** and press ![→] key to start factory calibration **P0   14**

Return to weighing mode:

Press the **ESC**-key repeatedly until the query "**SAVE**?" appears. Confirm query by pressing the **PRINT**-key or reject it by pressing the **ESC**-key.

6. Temperature Calibration

We recommend checking the temperature value of the device from time to time. Before you do this, allow the device to cool down for at least 3 hours after the last heating phase. Push the probe into the designated hole in the disk. Push the probe as closely as possible to the thermal sensor of the MLS. The temperature is measured at two points and it is possible to correct it at both temperature points.

Procedure using temperature calibration set MLB-A11

Select by using the arrow keys (↓ ↑) „**04 Temp.cal**" Press ➔ key Temperature calibration starts.	29.12.04　Setup　13:47:56 P1▶01　Ext. calibr.　|********|function 　02　User calibr.　|********|function 　03　Calibr.test　|********|function 　04▶Temp. Calibr.　|********|Function 　05　Print report　　　1|on 29.01.08　Setup　13:47:56 Temperature calibration 1 point　14:59
Temperature calibration of first point will take 14.59 min after which you will hear an acoustic signal. Now you can correct the temperature value (e.g. 25/24), as required, by using the arrow keys (↓ ↑).	29.01.08　Setup　13:47:56 Temperature calibration 1 point　00:00 29.01.08　Setup　13:47:56 Temperature calibration Set temp. value　[°C] 25 29.01.08　Setup　13:47:56 Temperature calibration Set temp. value　[°C] 24
To import the temperature values, press the **PRINT**-key; temperature calibration for the second point will be started.	29.01.08　Setup　13:47:56 Temperature calibration 2 point　14:59
Temperature calibration of first point will take 14.59 min after which you will hear an acoustic signal. You can now correct the temperature value (e.g. 120/122), as required by using the arrow keys (↓ ↑). To import the temperature values, press the **PRINT**-key.	29.01.08　Setup　13:47:56 Temperature calibration 2 point　00:00 29.01.08　Setup　13:47:56 Temperature calibration Set temp. value　[°C] 120 29.01.08　Setup　13:47:56 Temperature calibration Set temp. value　[°C] 122

Return to weighing mode:
Press the **ESC**-key repeatedly until the query "**SAVE**?" appears. Confirm query by pressing the **PRINT**-key or reject it by pressing the **ESC**-key.
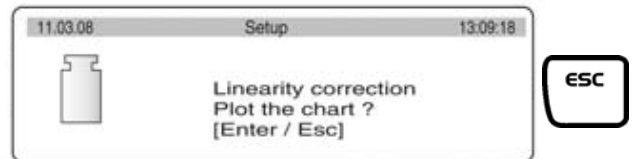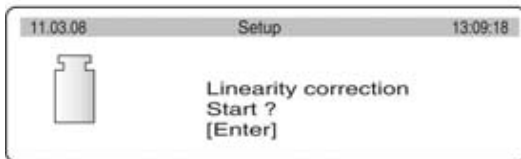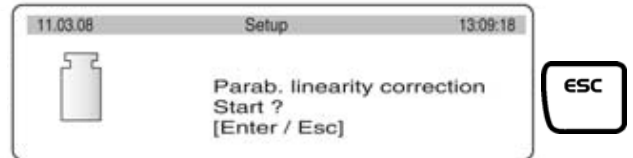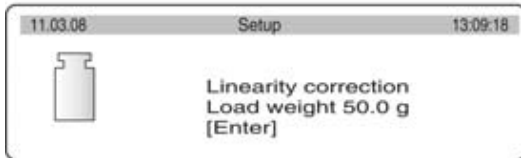
7. Linearity Correction

7.1 Linearity correction (single-stage)

Enter submenu **P0 Factory**

10/11/01 Setup 13:47:56 P0▶11 Show A/D div. ******** function 12 Show A/D T1 ******** function 13 Show A/D T2 ******** function 14 Factory cal ******** function 15 Factory T cal. ******** function 16▶Linear. corr. ******** function 17 Temp. corr. ******** function	**→**	Set index next to parameter **P0 16** and press the **➔** button

11.03.08 Setup 13:09:18 Linearity correction Start ? [Enter / Esc]	PRINT ↵	11.03.08 Setup 13:09:18 Linearity correction Clear the pan [Enter]	PRINT ↵

11.03.08 Setup 13:09:18 Linearity correction Load weight 50.0 g [Enter]	PRINT ↵	11.03.08 Setup 13:09:18 Parab. linearity correction Start ? [Enter / Esc]	ESC

11.03.08 Setup 13:09:18 Linearity correction Start ? [Enter]	ESC	11.03.08 Setup 13:09:18 Linearity correction Plot the chart ? [Enter / Esc]	ESC
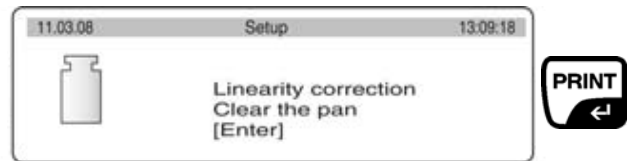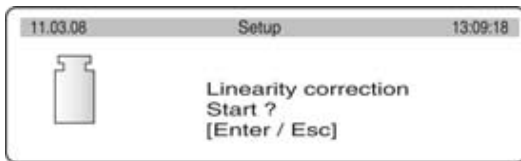
Return to weighing mode:

Press the **ESC**-key repeatedly until the query "**SAVE**?" appears. Confirm query by pressing the **PRINT**-key or reject it by pressing the **ESC**-key.
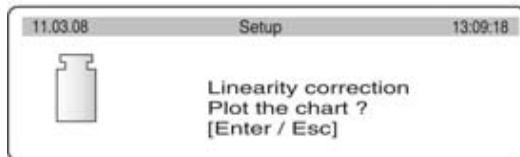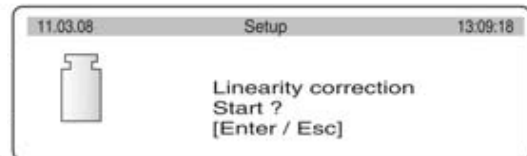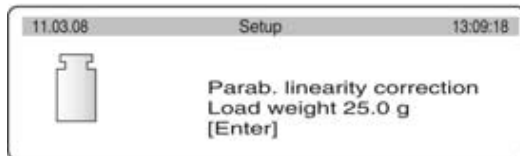
7.2 Parabolic linearity correction

Enter submenu **P0 Factory**

10/11/01	Setup	13:47:56
P0 ▶11 Show A/D div.	********	function
12 Show A/D T1	********	function
13 Show A/D T2	********	function
14 Factory cal	********	function
15 Factory T cal.	********	function
16▶Linear. corr.	********	function
17 Temp. corr.	********	function

→

Set index next to parameter **P0 16**
and press the ➔ button

11.03.08	Setup	13:09:18
	Linearity correction Start ? [Enter / Esc]	

PRINT ↵

11.03.08	Setup	13:09:18
	Linearity correction Clear the pan [Enter]	

PRINT ↵

11.03.08	Setup	13:09:18
	Linearity correction Load weight 50.0 g [Enter]	

PRINT ↵

11.03.08	Setup	13:09:18
	Parab. linearity correction Start ? [Enter / Esc]	

PRINT ↵

11.03.08	Setup	13:09:18
	Parab. linearity correction Load weight 25.0 g [Enter]	

PRINT ↵

11.03.08	Setup	13:09:18
	Linearity correction Start ? [Enter / Esc]	

ESC

11.03.08	Setup	13:09:18
	Linearity correction Plot the chart ? [Enter / Esc]	

ESC
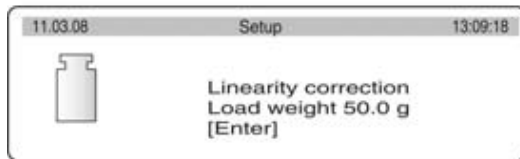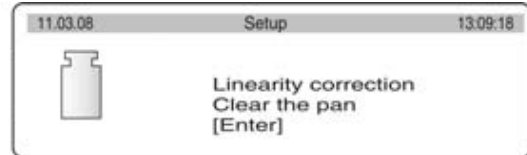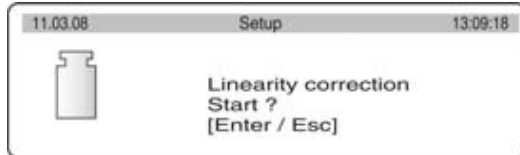
Return to weighing mode:

Press the **ESC**-key repeatedly until the query "**SAVE**?" appears. Confirm query by pressing the **PRINT**-key or reject it by pressing the **ESC**-key.
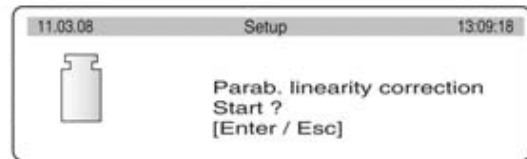
7.3 Linearity correction (multi-stage)

Enter submenu **P0 Factory**

10/11/01	Setup	13:47:56
P0 ▶11 Show A/D div.	********	function
12 Show A/D T1	********	function
13 Show A/D T2	********	function
14 Factory cal	********	function
15 Factory T cal.	********	function
16▶Linear. corr.	********	function
17 Temp. corr.	********	function

→

Set index next to parameter **P0 16**
and press the ➔ button

11.03.08	Setup	13:09:18

Linearity correction
Start ?
[Enter / Esc]

PRINT ↵

11.03.08	Setup	13:09:18

Linearity correction
Clear the pan
[Enter]

PRINT ↵

11.03.08	Setup	13:09:18

Linearity correction
Load weight 50.0 g
[Enter]

PRINT ↵

11.03.08	Setup	13:09:18

Parab. linearity correction
Start ?
[Enter / Esc]

ESC

11.03.08	Setup	13:09:18

Linearity correction
Start ?
[Enter / Esc]

PRINT ↵

11.03.08	Setup	13:09:18

Linearity correction
Next point ?
[Enter / Esc]

PRINT ↵

11.03.08	Setup	13:09:18

Linearity correction
Key in weight value [g]:
0.000000

← ↑ → ↓

11.03.08	Setup	13:09:18

Linearity correction
Key in weight value [g]:
5.000000

PRINT ↵

11.03.08	Setup	13:09:18

Linearity correction
Load weight 5.0 g
[Enter]

PRINT ↵

11.03.08	Setup	13:09:18

Linearity correction
Next point ?
[Enter / Esc]

PRINT ↵

11.03.08	Setup	13:09:18

Linearity correction
Key in weight value [g]:
5.000000

← ↑ → ↓

11.03.08	Setup	13:09:18

Linearity correction
Key in weight value [g]:
10.00000

PRINT ↵

11.03.08	Setup	13:09:18

Linearity correction
Load weight 10.0 g
[Enter]

PRINT ↵

11.03.08	Setup	13:09:18

Linearity correction
Next point ?
[Enter / Esc]

ESC

11.03.08	Setup	13:09:18

Linearity correction
Load weight 50.0 g
[Enter]

PRINT ↵

11.03.08	Setup	13:09:18

Linearity correction
Plot the chart ?
[Enter / Esc]

ESC

Return to weighing mode:

Press the **ESC**-key repeatedly until the query "**SAVE**?" appears. Confirm query by pressing the **PRINT**-key or reject it by pressing the **ESC**-key.

7.4   Changing linearity factors

1. After come back to weighing mode do calibration.

2. Check balance readings in all measuring points.

3. In case of differences make a note.

4. If there is a positive difference you should add this difference to the factor.
    If there is a negative difference you should subtract this difference to the factor.

    → changing in the factory menu (service menu), parameters **P0 37** until **P0 67**

    E.g.:

    weight mass 40g → reading 40.007
    stored linearity factor at 40g → 0.001
    input *new linearity factor* at 40g → **0.008**

    weight mass 40g → reading 39.995
    stored linearity factor at 40g → 0.001
   input *new linearity factor* at 40g → **- 0.004**

5. After inscribing correction you should do calibration again.

6. Check balance readings in all measuring points.

7. Repeat this process until you will get the expected results.

8. Off-Center Load Adjustment

Scews to adjust the off-center load
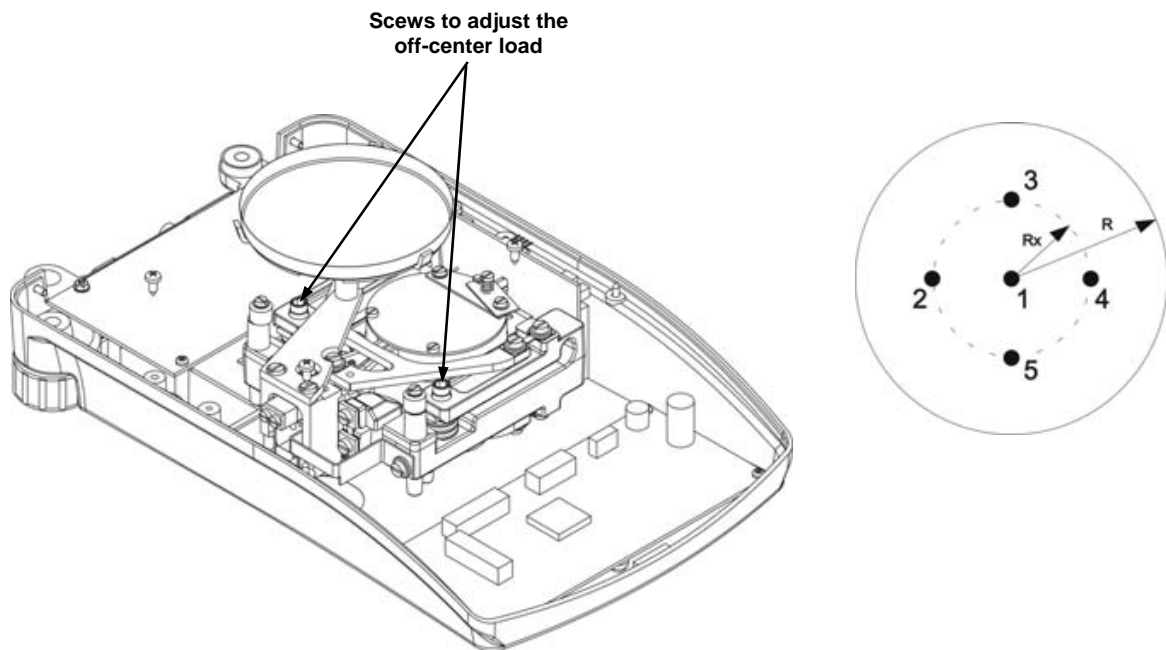
Zero the display with nothing on the pan. Place a mass of ⅓ of maximum load at the centre, than at the left, rear, right and front side of the pan, ½ of the way out from the centre. The readings should agree within ± 5mg.

Using the attached figure. It is necessary to change the screws to make the readings of the weight equal as it is moved around the pan.
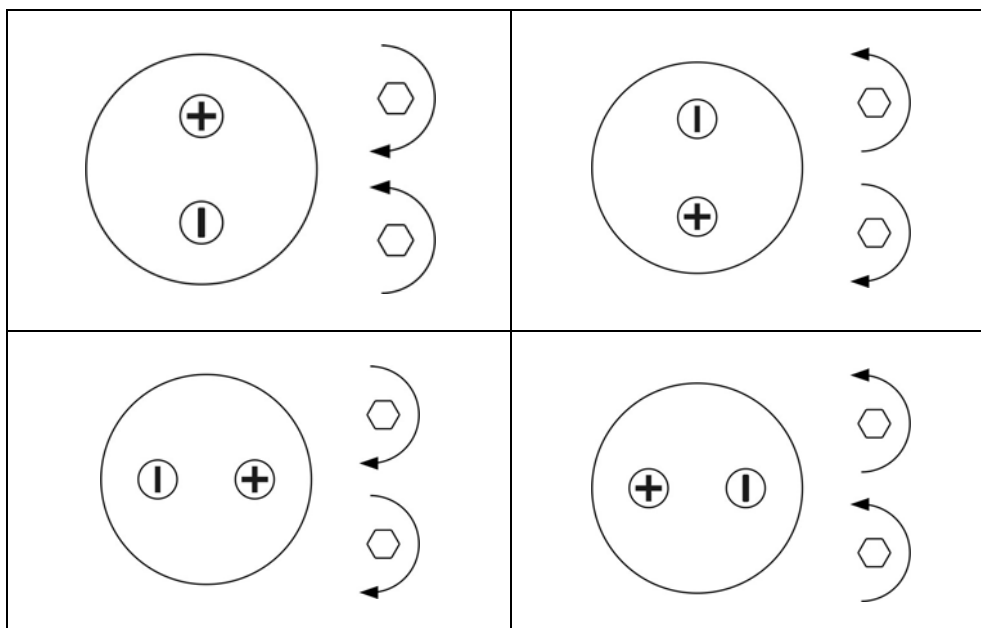
Recheck corner load after 1 hour again.

9.   Printout of Factory Parameters

Open the housing and set jumper „**JP1**" on main board 172xxx.PCB to access the service menu.

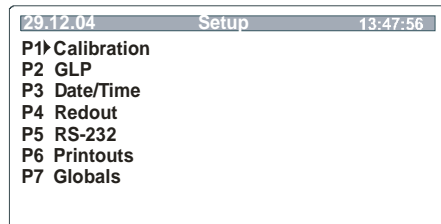Connect a standard printer to RS 232 data interface of the moisture analyzer.

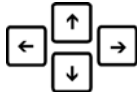Press the ON/OFF key (main switch) to turn on the balance.

| F | Enter main menu |

| ↓ | Set index next to parameter **P7 Globals** |

```
29.12.04          Setup          13:47:56
P1▶Calibration
P2 GLP
P3 Date/Time
P4 Redout
P5 RS-232
P6 Printouts
P7 Globals
```

| → | Enter menu **P7 Globals** |

| → | Enter submenu **P7 09 Par. printout** |

To get a printout of the factory parameters **P0 01** to **P0 75** set

Start= 0.01
Stop= 0.75

```
0/08          Setup
 ?    Start    ▶0.01
      Stop      7.12
      Print setup ???
```

| PRINT | Confirm your setup with PRINT |

```
0/08          Setup
 ?    Start     0.01
      Stop     ▶0.75
      Print setup ???
```

| PRINT | Press PRINT to start the printout |

```
11.03.08        Setup        13:09:18
 ➡ 📄    Printing . . .
 0%                        100%
```