

Inscale Measurement Technology

www.inscale-scales.co.uk

CBC-M SERIES

Service Manual

Software rev.: 3.06A & above

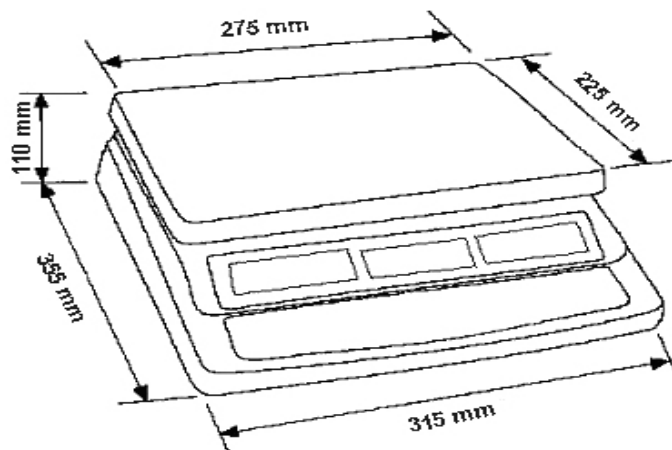
ADAM EQUIPMENT CO. LTD.
P.N. 8227, Rev. B5, October 2007

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1.0 INTRODUCTION

- The **CBC-M** series of scales provide an accurate, fast and versatile counting and check-weighing scales.
- **CBC-M** scales are kilogram only scales
- There are 4 models of approved scales with capacities up to 30kg.
- They all have stainless steel weighing platforms on an ABS base assembly.
- All scales are supplied with a RS-232 bi-directional interface and real time clock (RTC)
- All scales have sealed keypad with colour coded membrane switches and there are three large, easy to read liquid crystal type displays (LCD). The LCD's are supplied with a backlight.
- The scales include automatic zero tracking, audible alarm for pre-set weights, automatic tare, an accumulation facility that allows the count to be stored and recalled as an accumulated total.



2.0 SPECIFICATIONS

CBC-M SERIES				
Model	CBC 3M	CBC 6M	CBC 15M	CBC 30M
Maximum Capacity	3 kg	6 kg	15 kg	30 kg
Readability	0.001 kg	0.002 kg	0.005 kg	0.01 kg
Tare Range	-3 kg	-6 kg	-10 kg	-30 kg
Repeatability (Std Dev)	0.001 kg	0.002 kg	0.005 kg	0.01 kg
Linearity ±	0.002 kg	0.004 kg	0.01 kg	0.02 kg

Common Specifications

Stabilisation Time	2 Seconds typical
Operating Temperature	0°C - 40°C 32°F - 104°F
Power supply	230 VAC 50/60 Hz. 120 VAC available.
Battery	Internal rechargeable battery (~90 hours operation)
Calibration	Not available
Display	3 x 6 digits LCD digital displays
Balance Housing	ABS Plastic, Stainless Steel platform
Pan Size	225 x 275mm 8.9" x 10.8"
Overall Dimensions (wxdxh)	315 x 355 x 110mm 12.4" x 14" x 4.3"
Net Weight	4.1 kg / 9 lb
Applications	Counting Scales
Functions	Parts counting, weighing, accumulating memory, pre-set count with alarm
Interface	RS-232 bi-directional interface
Date/Time	Real Time Clock (RTC), To print date and time information. (Dates in year/month/day, day/month/year or month/day/year formats- Battery backed)

3.0 TROUBLESHOOTING

1.	Unit does not turn on	<p>Check whether the scale is plugged into the power supply properly.</p> <p>Check the operation of the charging circuit.</p> <p>Check whether the battery is charged- LED should turn to green from red.</p> <p>Check the adapter output.</p> <p>.</p>
2.	The scale weighs but is unstable	<p>Air drafts or vibration or unstable table.</p> <p>Pan rubbing against case or not installed correctly.</p> <p>Scale not installed properly.</p> <p>Improper connections on ADC circuit.</p>
3.	Scale shows wrong weight	<p>Scale not installed correctly.</p> <p>Check the Calibration.</p> <p>To check whether a part of product weighed is trapped between the pan and the scale.</p> <p>Incorrect adjustment of the mechanical stops.</p>
4.	An error "E4" displays on the screen	<p>Load cell damage.</p> <p>Scale not installed properly.</p> <p>Incorrect adjustment of the mechanical stops.</p> <p>Factory calibration has been tampered with- check the ADC counts and re-calibrate.</p>

4.0 ERROR CODES

ERROR CODE	DESCRIPTION	POSSIBLE CAUSES
Err 4	Initial Zero is greater than allowed (4% of maximum capacity) when power is turned on or when the [Zero/Enter] key is pressed.	<p>Weight on the pan when turning the scale on.</p> <p>Excessive weight on the pan when zeroing the scale.</p> <p>Improper calibration of the scale.</p> <p>Damaged load cell.</p> <p>Damaged Electronics.</p>
Err 5	Keyboard error.	Improper operation of the scale.
Err 6	A/D count is not correct when turning the scale on.	<p>Platform is not installed.</p> <p>Load cell is damaged.</p> <p>Electronics is damaged.</p>
Err 7	Scale is not stable when setting the percentage weighing.	<p>The scale is not stable.</p> <p>Improper operation of the scale.</p>
FAIL H or FAIL L	Calibration error.	Improper calibration (should be within $\pm 10\%$ of the factory calibration). The old calibration data will be retained until the calibration process is complete.
Err 9	Scale is unstable.	<p>There is vibration or draft making the scale unstable.</p> <p>Electronics may be damaged.</p>

5.0 CBC-M DESCRIPTION

The CBC-M scales have an enclosure with all components mounted within it. To gain access to the components remove the 5 screws securing the cover to the base.

The basic unit consists of:

- ✓ Base
- ✓ Load Cell frame
- ✓ Power switch
- ✓ Main PCB assembly
- ✓ Battery
- ✓ Display PCB assembly
- ✓ Keypad

All models of CBC-M are similar except the selection of load cells and the program.

Normally if a problem is found with a circuit board the most cost effective method of solving the problem is to replace the circuit board.

The main PCB assembly includes:

- ✓ A/D converter (AU1),
- ✓ Microprocessor (DU1) and
- ✓ Power supply/battery charger circuits (DU5, T2).

6.0 LOAD CELL DAMAGE

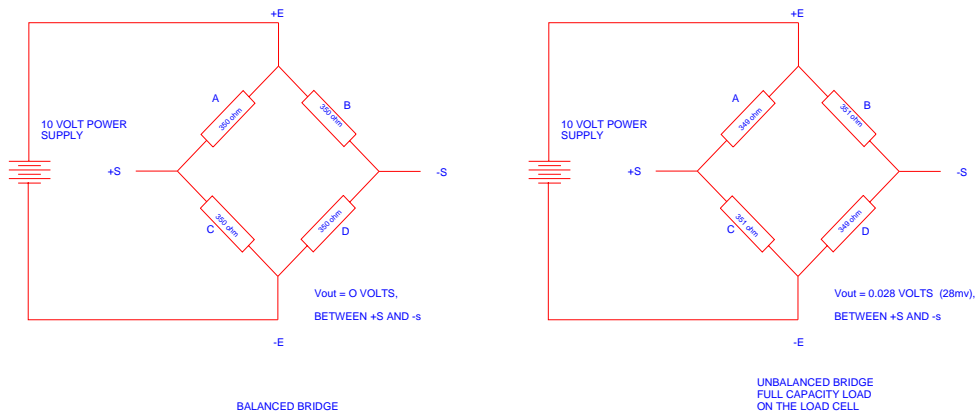
The most common reason a scale fails is that the load cell has been damaged. The damage can be from 2 primary causes. The first is physical damage due to an overload or an impact from the side and the second is damage due to the environment, such as moisture, extreme heat or a cut cable if the cables are exposed.

PRINCIPLE OF OPERATION

The strain gauge load cell is a method of measuring the amount of stress put onto a metal structure due to a weight being supported by the structure. The stress is measured using 4 strain gage sensors mounted in a particular way on the metal structure.

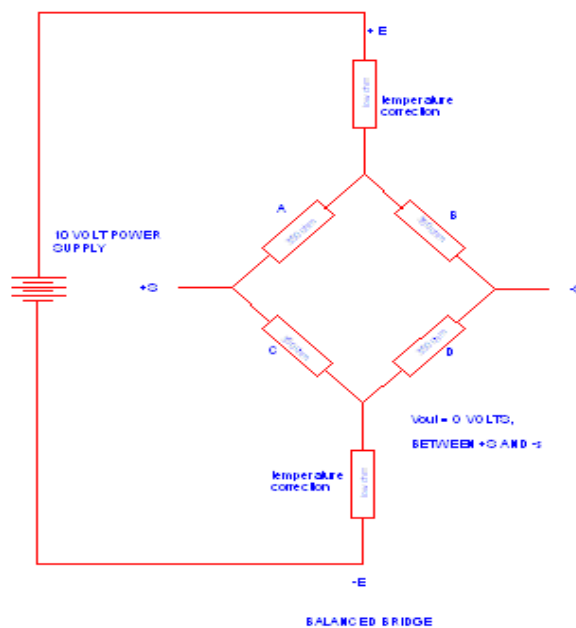
These 4 strain gauges are connected in such a way that they form a wheatstone bridge. See figure below. In the simplest load cells there are only the 4 resistances of the strain

gages to consider. Normally without a load on the load cell all the resistances are the same. However when the load cell has a weight on it 2 of the strain gages will be in compression (A and D) and the resistance will decrease and 2 will be in tension (B and C) and their resistance will increase.



This will cause the bridge to become unbalanced. When the bridge has a voltage across it from +E to -E then the signal output at +S and -S will show a voltage of zero volts with no load and a small voltage proportional to the load as the load is increased. Typical load cells show 20-30mv of signal if the excitation voltage is 10volts and the load cell is fully loaded.

Most load cells used in scales are not as simple as this example. They have additional resistance elements added to compensate for temperature variations and to set the outputs to correct voltages. The circuit of a typical load cell is shown below-



A method to check the basic function and integrity of a load cell can be done using a ohmmeter and voltmeter with up to a 10volt power supply.

Before the load cell is connected to the power supply use the ohmmeter to measure the resistance between the wires. Typical resistance values are:

- +E to -E 410 ohms \pm 30 ohms
- +S to -S 350 ohms \pm 2 ohms
- +E to +S or any other combination similar approximately 270 ohms.

If the load cell has Sense connections in addition they are connected to the excitation internal to the load cell.

Connect the load cell +E and -E to a power supply, typically 10 volts. Never use more than 12 volts as it may damage the load cell.

Measure the voltage between +S and -S.

With no load the voltage should be approximate 0mv \pm 3mv.

With a mass on the load cell the output voltage should increase. The amount by which it increases will be dependent upon the sensitivity of the load cell, capacity of the load cell, the excitation voltage and the amount of mass placed on the load cell. Most load cells have a sensitivity of either 2mv/V or 3mv/V.

The expected change to the output is:

$$V_{out} = \frac{(2\text{mv/V}) * V_{ext} * \text{Mass}}{\text{capacity of load cell}}$$

For example a 2mv/V load cell of 30Kg capacity with 20Kg placed on it. Vext is 5 volts would give a output of approximately:

$$V_{out} = \frac{(2\text{mv/V}) * V_{ext} * \text{Mass}}{\text{capacity of load cell}} = \frac{2\text{mv/V} * 5\text{V} * 20\text{Kg}}{30\text{kg}} = 6.7\text{mv}$$

If the load cell has been damaged the no load voltage will likely be greater than 3mv or the loaded voltage will be grossly different from the expected value. Remember the loaded voltage will be offset by the amount of zero load voltage measured.

The load cell can be tested while it is connected to the A/D converter circuit board, using the scale power supply for excitation voltage.

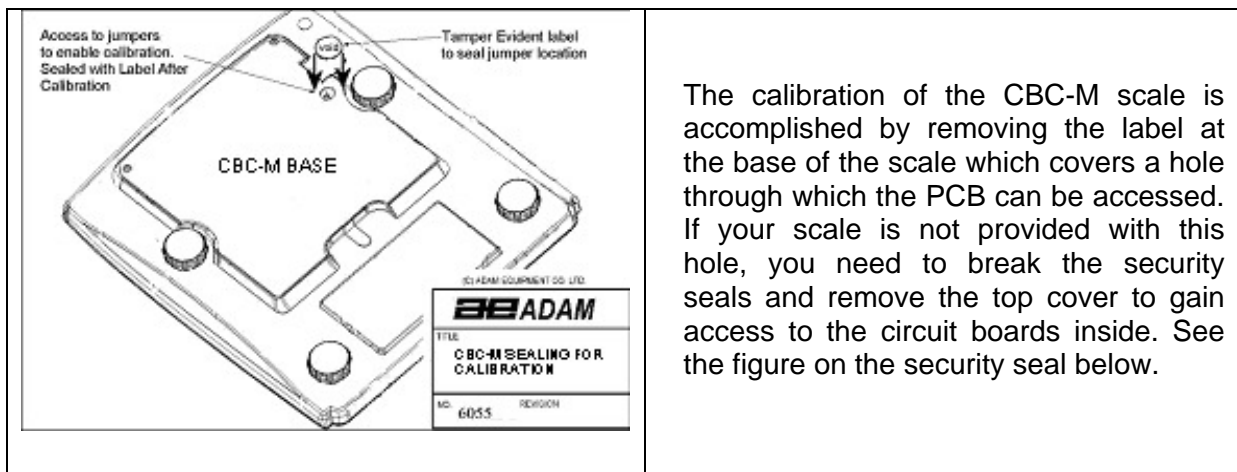
TESTING LOAD CELLS IN THE SCALE

The signal from the load cells is amplified by the circuits on the A/D circuit board. The signal needs to be amplified to make it acceptable for the A/D converter used. The CBW scales amplify the input by 200 and change the no load voltage to about +2.5V. The amplified and offset voltage is measured at pin 6 of IC7, the INA118P amplifier IC. This voltage is sent to the filter and then to the A/D converter.

7.0 CALIBRATION

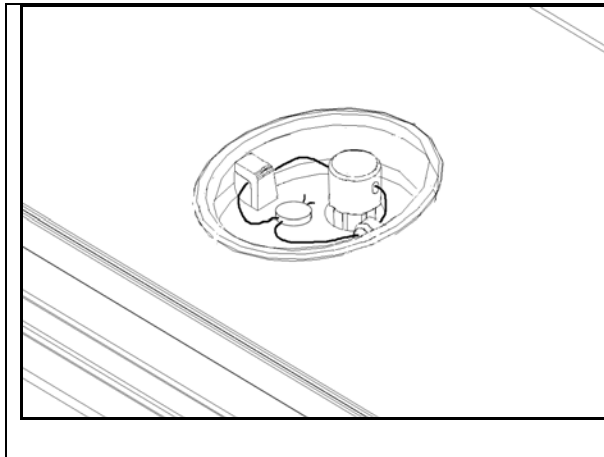
7.1 CALIBRATION PROCEDURE

The scales are sealed to prevent unauthorised calibration.
Contact Adam Equipment or your supplier for more details.



WARNING: CALIBRATION OF THE SCALES MAY MAKE IT ILLEGAL TO USE THE SCALES FOR SALES OF GOODS. CONTACT YOUR TRADING STANDARDS OFFICE FOR FURTHER ASSISTANCE.

7.2 SECURITY SEALS



To seal the scale a lead-wire seal can be used as shown below. The base has a metal pin that protrudes through the cover. The security seal may be threaded through this metal pin, making it impossible to remove the cover without damaging either the security seal or the enclosure.

Metrology labels and additional security measures may be added to the scale as required by the national legislation.

An alternative method of sealing the scales is to have a seal covering the joint between the base and cover. If this seal is broken the scale must be sealed by the relevant authorities, using either the lead wire seal or an acceptable seal between the cover and base.

7.3 CALIBRATION PROCEDURE

The scales are sealed to prevent unauthorised calibration.

CBC-M scales need to be re-calibrated if the variation in gravity takes place due to change in location or if the calibration done earlier was not correct.

The calibration is carried out by removing the label placed on the hole at the base of the scale to gain access to the PCB inside.

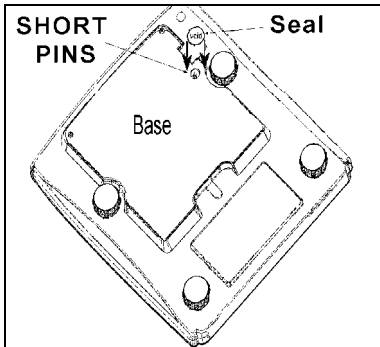
The EC approved models should follow the requirements of the Metrological authorities to have the scale verified for use after calibration.

If calibration is not possible, the load cells or PCBs may have been damaged. Contact Adam Equipment or the supplier.

8.0 SERVICE PARAMETERS

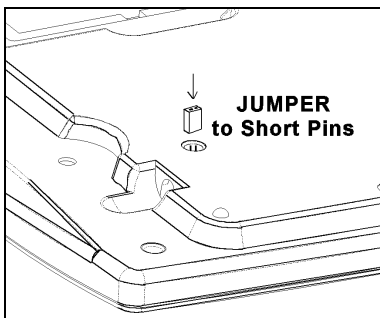
8.1 USING “0000” TO ENTER THE CALIBRATION PARAMETER

Calibration can be enabled by placing a jumper into the pins on the main PCB (marked as position J4) through a hole provided on the base of the scale. After the jumper has been placed in the position shown, apply power to the scale.



Turn the scale upside down.

Remove the seal covering the hole to access the PCB.



Place a jumper through the hole into the pins. If a jumper is not available, short the pins.

Turn on the scale using the switch on the base.

<i>"Pn"</i>	When <i>"Pn"</i> is displayed. Enter <i>"0 0 0 0"</i> and press [Tare]
<i>"UnLORd"</i>	Empty the pan by removing the load, if there is any and press [Tare]
<i>"LoRd" "8" "KiLoS"</i>	Load the requested calibration weight and press [Tare]
<i>"SPAn" "PASS"</i>	If Calibration is complete, <i>"SPAn PASS"</i> will be displayed. Remove the calibration weight.
Or, <i>"SPAn" "FAiLEd"</i>	This means calibration has failed. Remove the calibration weight and repeat the process.
<i>"JP On"</i>	Remove the jumper or shorting of the pins whichever is used. The scale will return to normal weighing.

8.2 USING “2006” TO ENTER THE SERVICE PARAMETERS

After the jumper has been placed in the position shown, apply power to the scale.

The display will ask for a code number, “**Pn** “ on the Weight Display.

Enter the number 2006 when “**Pn** “ is displayed and then press [**Tare**].

The displays will show the first parameters, called “**F1**” “**CAL**”.

To select another parameter press the [**U.Wt./Units**] key to advance through the parameters.

Press the [**Tare**] key to enter a parameter.

To exit a parameter, press the [**Zero**] key.

The **Weight** window will show the parameter number and the **Unit Price** and **Count** windows will show the word describing the function.

When a parameter is entered by pressing the [**Tare**] key, the displays will guide you through the parameter selected and the options available.

The parameters available are:

“ F1 ”	“ CAL ”		To enter the Calibration
“ F2 ”	“ rES ”		Resolution selection
“ F3 ”	“ CAPA ”		Select capacity
“ F4 ”	“ init ”	“ ZErO ”	Initial Zero Range
“ F5 ”	“ rE ”	“ Zero ”	Re-Zero range
“ F6 ”	“ SCSivE ”	“ tArE ”	Successive Tare Enable
“ F7 ”	“ Ad ”	“ CoUnt ”	Display the A/D counts
“ F8 ”	“ Zero ”		Select the zero mode
“ F9 ”	“ Pin ”		To set the password
“ F10 ”	“ Lvd ”	“ mode ”	Low voltage detection

8.2.1 F1 -CALIBRATION

To enter the calibration parameter, press the [**Tare**] key when “**F1**” is displayed.

The display will instruct you to remove any weight from the scale, “**UnloAd**”. Press [**Tare**].

The display will tell you to add weight to the scale: **LoAd** “ 04” **kiloS**”

Add the weight shown, wait for stability then press the **[Tare]** key.

The display will show **SPAn** **PASS**” if the calibration is OK. Or it will show **SPAn** **FAIL**” if calibration could not be completed correctly.

The display will then show **JP** **On**” indicating the jumper is still in place. Remove the weight. Switch off the scale and switch it on again to continue with the other Service parameters.

8.2.2 F2 -RESOLUTION

NOTE: This value can not be changed for the CBC-M scales.

8.2.3 F3 – CAPACITY

To enter this parameter, press the **[Tare]** key when **F3**” is shown.

The display will show the current capacity.

Press the **[U.Wt./Units]** key to change the value.

Press **[Tare]** to accept the displayed value.

NOTE: The scale must be originally built for the capacity selected. The 3kg unit uses the 5kg load cells, 6 kg unit uses 10kg load cells, the 15 kg unit uses 20 kg load cells and the 30 kg unit uses 35 kg load cells.

Press **[Zero]** to return to weighing.

8.2.4 F4 -INITIAL ZERO RANGE

To enter this parameter, press the **[Tare]** key when “**F4**” is shown.

The display will show the current initial zero range.

Press the **[U.Wt./Units]** key to change the value and press **[Tare]** to accept the value.

Press **[Zero]** to return to weighing.

8.2.5 F5 -RE-ZERO RANGE

To enter this parameter, press the **[Tare]** key when “**F5**” is shown.

The display will show the current re-zero range.

Press the **[U.Wt./Units]** key to change the value.

Press **[Tare]** to accept the value.

Press **[Zero]** to return to weighing.

8.2.6 F6 -SUCCESSIVE TARE

To enter this parameter, press the **[Tare]** key when “**F6**” is shown.

The display will show if the successive tare is on or off.

Press the **[U.Wt./Units]** key to change the value.

Press **[Tare]** to accept the displayed value.

Press **[Zero]** to return to weighing.

8.2.7 F7 -A/D COUNT

To enter this parameter, press the **[Tare]** key when “**F7**” is shown.

This parameter allows you to view the A/D counts from the internal A/D converter. This can be an aid to service.

Press the **[Tare]** key to return to the PARAMETER menu.

Press the **[Zero]** key to return to weighing.

Typical value at zero is 30,000-90,000 (approx.)

Typical value at full capacity is 500,000 (approx.)

8.2.8 F8 –ZERO

This parameter allows the normal method of setting zero.

To enter this parameter, press the **[Tare]** key when “**F8**” is shown.

The display will show the current settings, “**modE 1**” or “**modE 2**”.

Press the **[U.Wt./Units]** key to change and press **[Tare]** to accept the value.

Press **[Zero]** to return to weighing.

8.2.9 F9 –PIN

This parameter allows setting of password to enter these Service Parameters.

To enter this parameter, press the **[Tare]** key when “**F9**” “**Pin**” is shown.

The “**WEIGHT**” display will show “**Pin 1**”

Enter the new password. The “**Unit Weight**” display will show dashes. Press **[Tare]**.

The "WEIGHT" display will change to "Pin 2 ", Enter the password again and press **[Tare]**.

The display will show "donE" indicating the new password has been accepted and will return to the menu. "F9" "Pin" is shown. Record the new password in a secured place.

Press **[Zero]** to return to weighing.

8.2.10 F10 –LOW VOLTAGE DETECTION

This parameter allows detection of low voltage when the battery wears down.

To enter this parameter, press the **[Tare]** key when "F10" is shown.

The display will show if the LVD Mode is set to **on** or **off**.

Press the **[U.Wt./Units]** key to change the value.

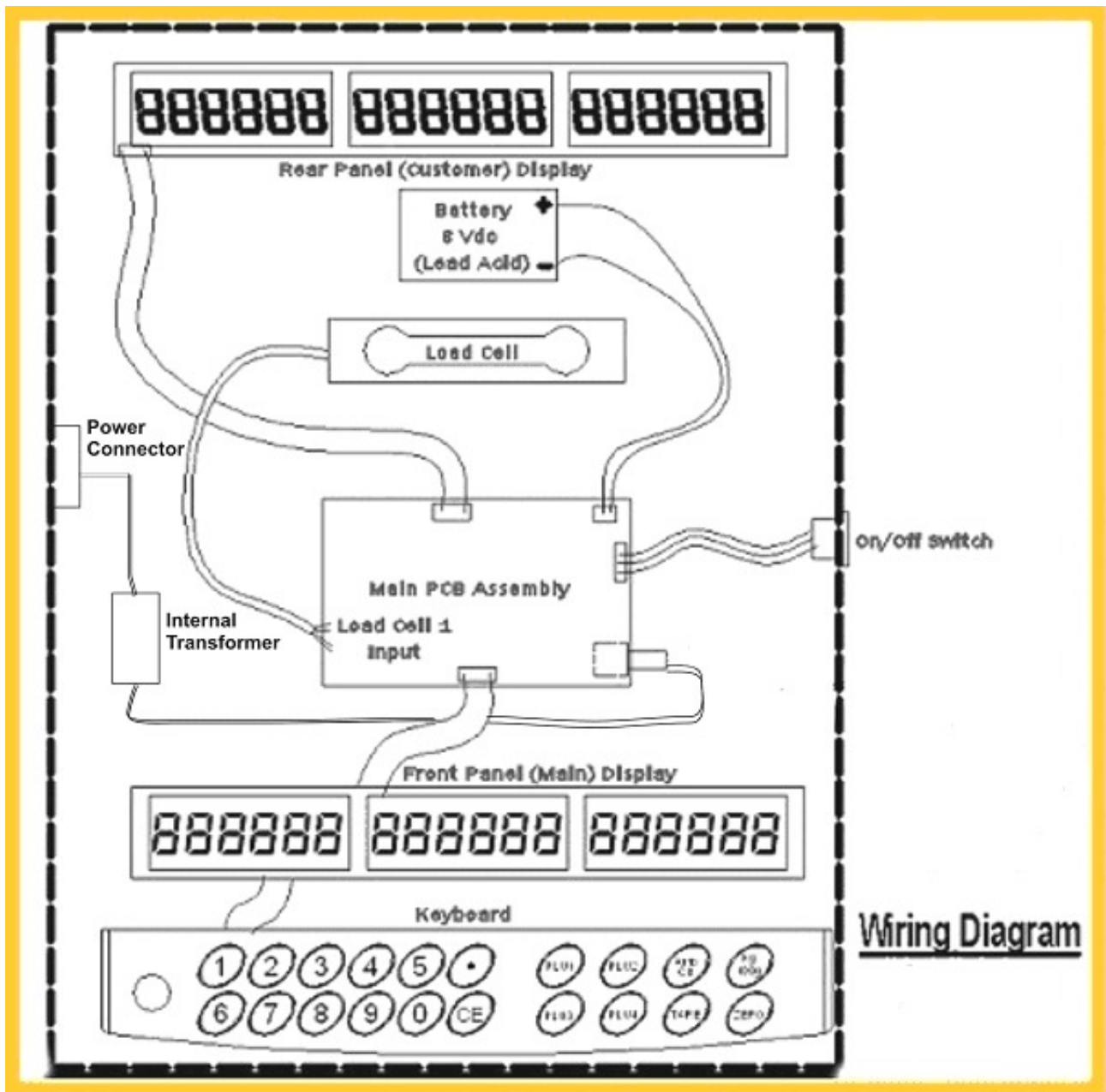
Press **[Tare]** to accept the displayed value.

Press **[Zero]** to return to weighing.

NOTE 1: TO SECURE THE SCALE AFTER CALIBRATION, IT IS NECESSARY TO REMOVE THE JUMPER AND RE-SEAL THE SCALE.

NOTE 2: The scale has a special feature for displaying x10 the value of the weight which is a useful tool during testing. Press the **[00]** key for more than 3 seconds. It will show one extra decimal place making it a high resolution display. Pressing the **[00]** key again for more than 3 seconds will bring the display back to the normal resolution.

9.0 WIRING DIAGRAM



10.0 MECHANICAL ASSEMBLY

REV B, Was no. 4312
REV C, Change to AZC3116

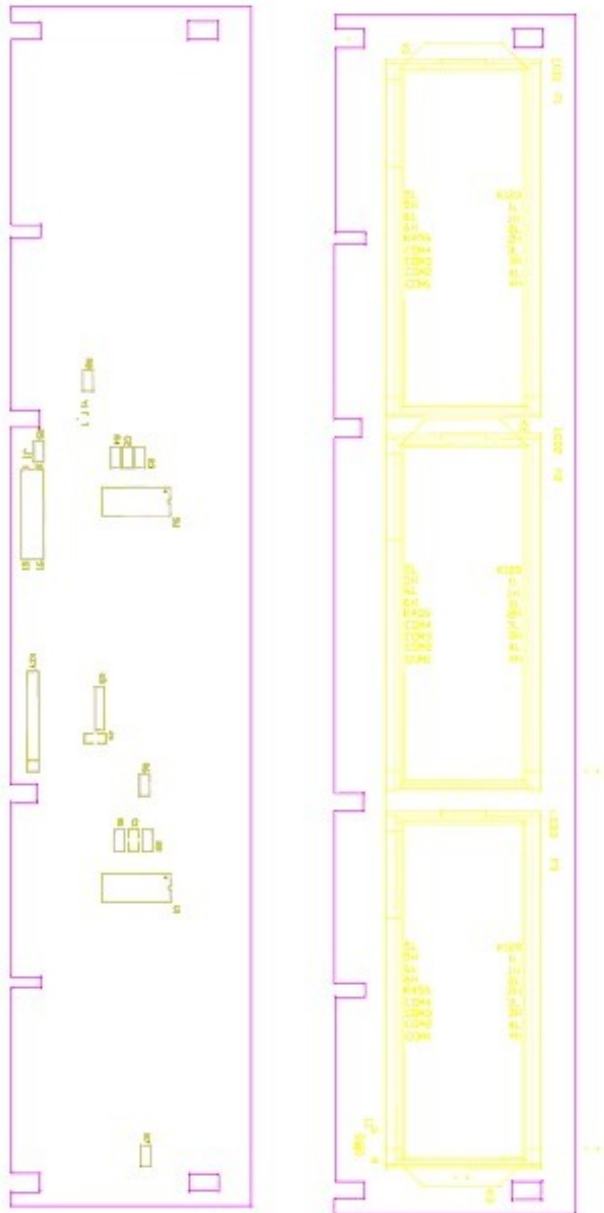
28	Mains input connector	1
27	Power Transformer	1
26	front display overlay	1
25	front keyboard	1
24	screw	1
23	washer	4
22	tapping screw	4
21	washer	4
20	main PCB Assy	1
19	screw	5
18	screw	1
17	washer	4
16	battery cover	1
15	power switch	1
14	support feet	4
13	bottom cover	1
12	rechargeable battery	1
11	rear display PCB Assy	1
10	the load cell lower supporter	1
9	the load cell	1
8	the load cell upper supporter	1
7	washer	2
6	screw	2
5	front display PCB Assy	1
4	upper cover	1
3	rear display overlay	1
2	ABS pan	1
1	SST pan	1

PART.NO.	Name	COUNT
ADAM EQUIPMENT CO. LTD.		
NAME	Drawn by	
Scale	CBC-M	Approved
Dwg No	6654	Date
		04.01.21

10.1 LIST OF MECHANICAL ASSEMBLY

28	Mains input connector	
27	Power Transformer	1
26	front display overlay	1
25	front keyboard	1
24	screw	1
23	washer	4
22	tapping screw	4
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18	screw	1
17	washer	4
16	battery cover	1
15	power switch	1
14	support feet	4
13	bottom cover	1
12	rechargeable battery	1
11	rear display PCB Assy	1
10	the load cell lower supporter	1
9	the load cell	1
8	the load cell upper supporter	1
7	washer	2
6	screw	2
5	front display PCB Assy	1
4	upper cover	1
3	rear display overlay	1
2	ABS pan	1
1	SST pan	1

11.0 DISPLAY ASSEMBLY



Designator	Quantity	Description
LCD1, LCD2, LCD3	3	6 Digit LCD - 16 pin
F1, F2, F3	3	Maxal Zetris Support
F1, F2, F3	6	Zetris 5110
L1	1	Red/Green LED
U1, U2	2	HI 1521B LCD driver
U3	1	74HC138
R9, R6, R7	3	330R resistor
R1, R4, R5	3	1K resistor
R2, R3	2	10K resistor
C1, C7	7	0.1uF 50V 50P
E1	1	10uF 450V 48P
J1	1	19 pin connector
KEY	1	9 pin connector
T1	1	NPN Transistor

(C) ADAM EQUIPMENT CO. LTD.



ADAM

TITLE	
CBC-M FRONT DISPLAY PCB ASSY	
NO. 6306	REVISION A



Adam Equipment

ADAM EQUIPMENT, BOND AVENUE, DENBIGH EAST INDUSTRIAL ESTATE,
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E-Mail Address: info@Adamequipment.co.uk

	Test Certificate Prüfzertifikat Certificat de test	Test certificaat Certificato di prova Certificado de prueba
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The non-automatic weighing instrument
Die nicht-automatischen Wägeapparate
L'instrument de pesage à fonctionnement non automatique

Het niet-automatische weegwerktuig
Strumento per pesatura non automatico
Instrumento para pesaje non automatico



Manufacturer :	Adam Equipment Co. Ltd.
Type:	CBC-M
No of the EC type-approval certificate:	T7095 / TC7096
Corresponds to the production model described in the EC type-approval certificate and to the requirements of the Council Directive 90/384/EEC as amended and to the requirements of the following EC Directives:	
73/23/EEC	Electrical equipment for use within certain voltage limits (Low Voltage Directive)
89/336/EEC	Electromagnetic compatibility

Hersteller :	Adam Equipment Co. Ltd.
Typ:	CBC-M
Nr. der EG-Bauartzulassung:	T7095 / TC7096
Entspricht dem in der Bescheinigung über die Bauartzulassung beschriebenen Baumuster, sowie den Anforderungen der EG-Richtlinie 90/384/EWG in der jeweils geltenden Fassung und den Anforderungen folgender EG-Richtlinien:	
73/23/EWG	Elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen (Niederspannungsrichtlinie)
89/336/EWG	Elektromagnetische Verträglichkeit

Fabricant :	Adam Equipment Co. Ltd.
Type:	CBC-M
N° du certificate d'approbation CE de type:	T7095 / TC7096
Correspond au modèle décrit dans le certificat d'approbation CE de type, aux exigences de la directive 90/384/CEE modifiée et aux exigences des directives CE suivantes:	
73/23/CEE	Matériel électrique pour utilisation dans des limites de tension définies (Directive Basse Tension)
89/336/CEE	Compatibilité électromagnétique

Fabrikant :	Adam Equipment Co. Ltd.
Type:	CBC-M
Nummer van de Verklaring van EG-typegoedkeuring	T7095 / TC7096
Conform met het model beschreven in de verklaring van EG-typegoedkeuring en met de voorschriften van EG richtlijn 90/384/EEC zoals gewijzigd en met de volgende EG richtlijnen:	
73/23/EEC	Laagspanning richtlijn
89/336/EEC	EMC richtlijn

Produttore	Adam Equipment Co. Ltd.
Modello:	CBC-M
N. di certificato di approvazione di tipo CE	T7095 / TC7096
Conforme al modello di produzione descritto nel certificato di approvazione di tipo CE e secondo le richieste CE direttiva 90/384/CEE come modificato e secondo le richieste della seguente direttiva CE	
73/23/EWG	Strumenti elettrici per uso entro certi limiti di voltaggio (Direttivo di voltaggio basso)
89/336/EWG	Compatibilità elettromagnetico

Fabricante	Adam Equipment Co. Ltd.
Tipo:	CBC-M
Numero del certificado de aprobacion de tipo CE:	T7095 / TC7096
Conforme al modelo de produccion descrito nel certificado de aprobacion del tipo CE e segun los requisitos del CE diretiva 90/384/CEE como modificato e segun los requisitos della siguiente direttiva CE	
73/23/CEE	Instrumentos electricos para uso dentro ciertos limites del voltaje (Diretivo di voltaje bajo)
89/336/CEE	Compatibilidad electromagnetico

Signature
Unterschrift
Signature
Handtekening
Firma
Firma

J.S. Cumbach
Technical Manager

Date

Datum
Date
Datum
Date
Fache

1 October 2007

ADAM EQUIPMENT is an ISO 9001:2000 certified global company with more than 35 years experience in the production and sale of electronic weighing equipment.

Adam products are predominantly designed for the Laboratory, Educational, Medical, retail and Industrial Segments. The product range can be described as follows:

- Analytical and Precision Balances
- Compact and Portable Balances
- High Capacity Balances
- Moisture analysers / balances
- Mechanical Scales
- Counting Scales
- Digital Weighing/Check-weighing Scales
- High performance Platform Scales
- Crane scales
- Medical Scales
- Retail Scales for Price computing

For a complete listing of all Adam products visit our website at
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