



CBD SERIES

SERVICE MANUAL

ADAM EQUIPMENT CO. LTD.
P.N. 7951, Rev. A1, March 2007

CONTENTS

1.0	INTRODUCTION.....	2
2.0	TROUBLE SHOOTING GUIDE.....	3
3.0	ERROR CODES	4
4.0	CBD DESCRIPTION	4
5.0	SETTING UP THE REMOTE SCALE	5
6.0	USER PARAMETERS	7
7.0	USER CALIBRATION	9
8.0	TECHNICAL PARAMETERS	10
9.0	LOAD CELL DAMAGE	12
10.0	REPLACEMENT PARTS AND ACCESSORIES	15
11.0	SCHEMATICS.....	15

1.0 INTRODUCTION

The CBD series of scales are general purpose counting scales.

Refer to the Operators Manual for details of operation.

This manual will cover details of calibration and troubleshooting.

If you have a problem with the scales that is not directly addressed by this manual then contact your dealer or Adam Equipment for more assistance.

In order to provide further assistance, the supplier will need the following information which should be kept ready:

A. Details of your company

- Name of your company:
- Contact person's name:
- Contact telephone, e-mail, fax or any other methods:

B. Details of the unit purchased

(This part of information should always be available for any future correspondence. We suggest you to fill in this form as soon as the unit is received and keep a print-out in your record for ready reference.)

Model name of the scale:	CBD _____
Serial number of the unit:	
Software revision number (Displayed when power is first turned on):	
Date of Purchase:	
Name of the supplier and place:	

C. Brief description of the problem

Include any recent history of the unit. For example:

- Has it been working since it's delivered
- Has it been in contact with water
- Damaged from a fire
- Electrical Storms in the area
- Dropped on the floor, etc.

2.0 TROUBLE SHOOTING GUIDE

PROBLEM

POSSIBLE CAUSE

Display is blank No turn on test	Power Switch is faulty or not turned on Battery is faulty or not charged Power supply is incorrect
Display all zeros after turn on or E6 is displayed	Pan not installed Unstable weight Load cell damaged Electronics faulty
'- - - -' appears on display	Maximum capacity exceeded Load Cell damaged Electronics is faulty
Display is unstable	Drafts or air currents Obstruction under pan Sample is moving (animal weighing) Vibrations through table Temperature changed dramatically Electronics faulty Battery low
Weight value incorrect	Calibration error, Recalibrate Unit calibrated with inaccurate weight Balance not level Obstruction between sample and cover Wrong unit of weight displayed
Cannot use Full Capacity	Over-load Stops hitting pan support or hitting bottom of load cell Electronics faulty Parameters set incorrectly Load Cell Damaged
Not Linear	Overload stops hitting too soon Faulty Factory Calibration
Off Centre Loading error	Overload Stops not correct Obstruction under pan
Battery will not charge	Charging circuit failure Battery failure Incorrect adapter (below 800 mA) Processor failure

3.0 ERROR CODES

ERROR CODE	DESCRIPTION	POSSIBLE CAUSES
Err 4	Initial Zero is greater than the permissible value (typically 4% of maximum capacity) when power is turned on or when the [Zero] key is pressed,	Weight on the pan when turning the scale on. Excessive weight on the pan when zeroing the scale. Improper calibration of the scale. Damaged load cell. Damaged Electronics.
Err 5	Keyboard error.	Improper operation of the scale.
Err 6	A/D count is not correct when turning the scale on.	Platform is not installed. Load cell may be damaged. Electronics may be damaged.
FAIL H or FAIL L	Calibration error	Improper calibration. If the problem persists contact your dealer or Adam Equipment for assistance.

4.0 CBD DESCRIPTION

The CBD scales have an enclosure with all components mounted within it. To gain access to the components remove the 4 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 CBD 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.

Schematics are attached in order to complete the documentation. However it is rare that the problem due to a faulty component on the PCB is traced by a user.

The main PCB assembly includes:

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

5.0 SETTING UP THE REMOTE SCALE

The CBD Series can be connected to any size of load cell type weighing base via the Remote scale port on the right side of the scale case. Ensure you have the correct base for the scale as each is matched for calibration.

Place the remote scale platform in the position where it is to be used. Level the scale by adjusting the four feet. If fitted with a spirit level then it should be adjusted such that the bubble is in the centre.

Press [**Local/Rem**] and test weighing performance.

REMOTE SCALE CONNECTION

The cable for the load cell goes to a 9 pin D-subminiature plug connector with the following connections:

Pin numbers	Connection
Pins 1,2	- Excitation (0v)
Pins 4,5	+ Excitation (+5v)
Pin 7	+ Signal
Pin 8	- Signal

(The sense wires connections of a six wire load cell are not used but can be connected to the respective Excitation pins).

REMOTE SCALE SET UP

The remote scale should set for a realistic resolution with respect to the input provided by the load cell/s.

If a single 2mV/V load cell is fitted and more than 60% of the load cell is used for full capacity then the high output of >6mV span makes it possible to set a high resolution.

If this criterion is met then the remote scale can be set to a high resolution with a maximum of 1:30,000, i.e. 300kg x 10g.

It will also be possible to sample on the remote scale with the same accuracy as the Local.

Where more than one load cell is fitted or the total load cell capacity is not utilised then a reduced resolution should be selected in the remote scale technical set up. For example, if a system uses four 2mV/V 1000kg load cells for a scale of 1000kg capacity then the span output at full scale will be only 2.5mV.

In this situation the resolution should be reduced to give a good number of ADC counts per displayed division. i.e. Set to 1:5000 or 1000kg x 0.2kg.

Setting a high resolution without providing a good input to the remote scale ADC will not give better accuracy and may make the scale difficult to meet performance specification.

For best performance ensure a minimum of 0.1µV/d.

6.0 USER PARAMETERS

Enter the User Parameters section by pressing the **[Pst]** key during the self-test when the power is turned on. This will allow the user to set the way he wants the scale to work by choosing specific values from some options.

Press the **[U.Wt./Units]** key to scroll through the other parameters. To enter any parameter, press the **[Print]** key.

Press **[U.Wt./Units]** to scroll through the sub-parameters. To see the earlier setting, press the **[Print]** key. To change and scroll through the other available settings, press **[U.Wt.]**. To choose the desired setting and thereby go back to the sub-parameter, press the **[Print]** key.

To return to the parameter, press the **[Tare/Zero]** key.

PARA-METER	SUB-PARAMETER	DISPLAYS AND SETTINGS	
F1 off	bEEP	"bEEP"" "oFF""	Beeper is set to off
		"bEEP"" "on l n ""	Beeper is set to on between limits
		"bEEP"" ""on oUt"" "	Beeper is set to on outside limits (>0)
	EL	"LitE"" ""oFF""	Backlight is set to off
		"LitE"" "on""	Set to on at all times
		"LitE"" "AUt"	Set to work automatically when a weight is placed on the scale or a key is pressed.
	Un l t	"Unl t"" "KG/ Lb"	Kg/Lb both are enabled
		"Unl t"" "KiLo"	Kg only is enabled

		"Unit" "Lb"	Lb only is enabled
F2 Prt	P Mo dE	Print	Au off Prints only when the Auto-Accumulation is set to off. Au on Prints only when the Auto-Accumulation is set to on.
		P Cont	Sets the RS-232 interface to print continuously and the accumulation function is disabled.
		SErrE	Sets the RS-232 to print continuously the weight only.
	P bAU d	b 600 b 1200 b 2400 b 4800 b 9600	Sets the required baud rate (speed for the RS-232 communications). Default rate is 4800.
	PAritY	8 n 1 7 E 1 7 o 1	8 data bits, no parity 7 data bits, even parity 7 data bits, odd parity
U id	"U id" " Abc234" " "	Shows the current user ID (if any). Enter a new User ID as described in the Description under the PLU section. The ID can be alpha-numeric but is limited to 6 characters.	
SC id	"Sc id" " Abc234" " "	Shows the current scale ID (if any). Enter a new Scale ID as described in the Description under the PLU section. The ID can be alpha-numeric but is limited to 6 characters.	
tECH		Allows access to the Technical parameters using a password. Not normally accessed by user.	

7.0 USER CALIBRATION

ACTION	DISPLAYS
Press the [Tare/Zero] key during the self-test at power on. The scale will ask to enter the password.	"Pi n"
Default Password is 0000. Enter "0" four times. Password can be changed in technical parameters. Press [Print] .	"Pi n" " ----"
Select the scale to be set up by using the [Local/Remote] key. Press the [Print] key to enter the technical section.	"tEch" " LocAL" " " "tEch" "rEmo tE" " "
Use the [U.Wt.] to select the weighing unit to be used for setting of the calibration. The arrow in the "Weight" window will indicate the unit selected. Press the [Print] key to continue.	"tEch" " Uni t" " "
You will enter the first parameter - Calibration. Display will ask to unload any weight on the platform. Press the [Print] key to continue.	"Un L o Ad"
Enter the calibration weight to be loaded and press [Print] . Load the calibration weight onto the scale and press [Print] again. The Calibration is complete, the scale will run the self-test during which the weight should be removed.	"SEL" " 0010" "Lo Ad"

8.0 TECHNICAL PARAMETERS

The technical parameters are accessed via the “**tEch**” prompt at the end of user parameters and are password controlled to prevent unauthorised access. These parameters set the metrology for the scales. Each scale is set independently. The parameters will set capacity, division, decimal point position, initial zero range, auto and manual zero range as well as factory calibration.

ACTION	DISPLAYS
From the “ tech ” user parameter, Press the [Print] key. The scale will ask you to enter the password.	“ Pi n ”
Default Password is 0000. Enter “0” four times. 9999 will override any other user password. Press [Print].	“ Pi n ” “----”
Select the scale to be set up by using the [Local/Rem] key. Press the [Print] to enter the technical section for that scale.	“ tEch ” “ Lo c AL ” “ ” “ tEch ” “ r E mo t E ” “ ”
Use the [U.Wt./Units] to select the weighing unit to be used for setting up the parameters for the scale. The arrow in the “ Weight ” window will indicate the unit selected. Press the [Print] key to continue.	“ tEch ” “ Uni t ” “ ”
Press the [U.Wt./Units] key to scroll through the menus for the chosen scale. User [Print] to select and set parameters and the [Tare/Zero] to escape as without changing data as with the user parameter section.	“ Cn t ” Both scales have the same menus except that the capacity of the local scale is fixed and cannot be entered.
Press the [U.Wt/Unit] to go to next menu. Press [Print] to enter.	

<p>Use [U.Wt/Unit] to select the decimal point position and press [Print]. To change the remote scale cap press CE to clear and then enter new value followed by [Print].</p>	<p>"CAp". Scale capacity setting.</p> <p>"dESC" " 0.00"</p> <p>"SEL" "0060"</p>
<p>Press the [U.Wt/Unit] to go to next menu. Press [Print] to enter. Use [U.Wt/Unit] to select the division which you would like the display to increment in followed by [Print].</p>	<p>"div" weighing division.</p> <p>"inc 5"</p>
<p>Press the [U.Wt/Unit] to go to next menu, use [Print] key to enter. Use [U.Wt/Unit] to increment the values then [Print].</p>	<p>"Azt" Autozero tracking range.</p> <p>Select from 0.5d, 1d, 2, 4,d</p>
<p>Press the [U.Wt/Unit] to go to next menu, use [Print] key to enter. Use [U.Wt/Unit] to increment the values then [Print].</p>	<p>"0 Auto" Zero auto range at power on.</p> <p>Select form 0%, 2%, 5%, 10% or 20%</p>
<p>Press the [U.Wt/Unit] to go to next menu, use [Print] key to enter. Use [U.Wt/Unit] to increment the values then [Print].</p>	<p>"0 manl" Zero manual range.</p> <p>Select form 0%, 2%, 4%, 10%, 50% or 100%</p>
<p>Press the [U.Wt/Unit] to go to next menu, use [Print] key to enter. Enter the new PIN number and press [Print]. Confirm the new PIN number and press [Print].</p>	<p>"Pin" Password number for "tEch".</p> <p>"Pin1"</p> <p>"Pin2"</p> <p>"donE"</p>
<p>Press [U.Wt./Units] to continue or escape the parameters with the [zero/Tare]</p>	

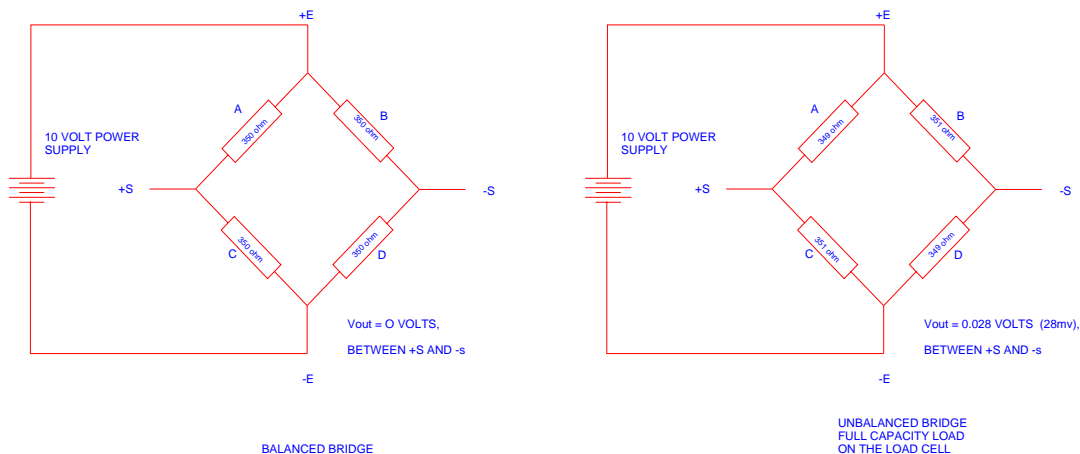
9.0 LOAD CELL DAMAGE

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

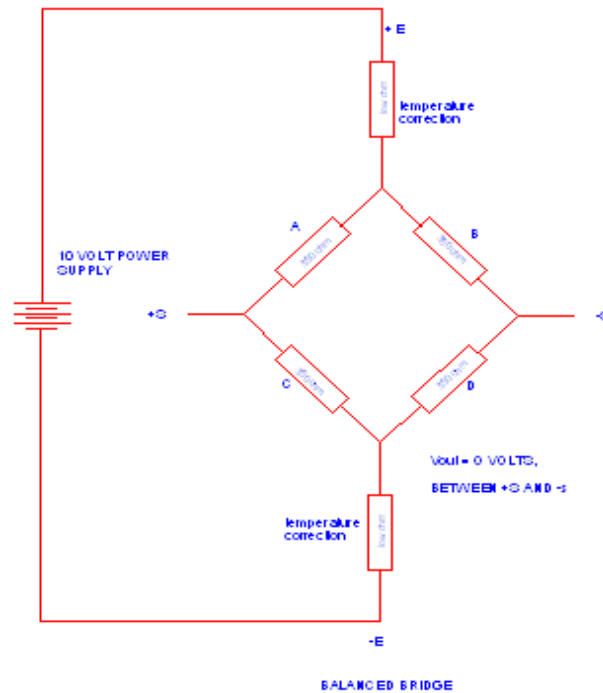
The strain gauge load cell is a method of measuring the amount of stress put onto a metal structure due to a weight being supported by the structure. The stress is measured using 4 strain gauge sensors mounted in a particular way on the metal structure.

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 gauges 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, two of the strain gauges will be in compression (A and D) and the resistance will decrease and two 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 an 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 of increase will depend 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 CBD/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.

10.0 REPLACEMENT PARTS AND ACCESSORIES

If you need to order any spare parts and accessories, contact your supplier or Adam Equipment. A partial list of such items is as follows-

<ul style="list-style-type: none">• Power Supply Module• Main Power cord• Replacement Battery• Stainless Steel Pan	<ul style="list-style-type: none">• In use cover• RS-232 option• Printer, etc.
---	---

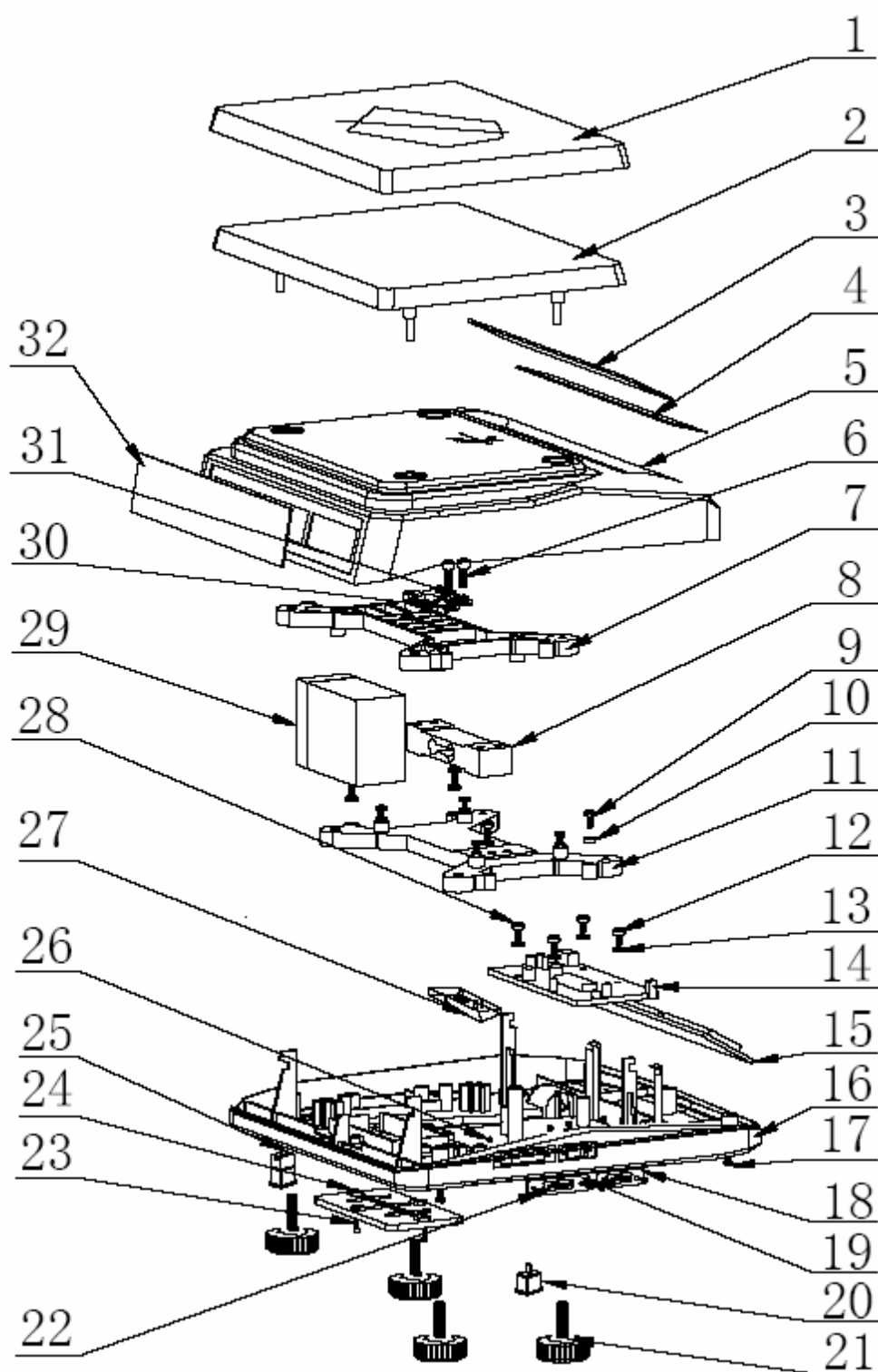
11.0 SCHEMATICS

The following schematics are included as a guide for the experienced Service Technician. If you are not experienced we do not advise you to change parts on the circuit boards or otherwise disturb the electronics.

If you require assistance please contact your dealer or Adam Equipment. We will be happy to help you resolve problems or determine the cause of a problem if you send us a full description of the scale and the problem.

CBD Parts List

Part Number	Revision	Diagram Number	Description	Qty Used
1.0001		1	Stainless Steel Pan	1
1.0002		2	ABS Pan	1
1.0044		3	Front Overlay	1
1.0045		4	Keyboard	1
1.0004		5	Upper case	1
0.0026		6	Screw M6 x 20	2
1.0025		7	Upper Bracket of Load Cell	1
1.0026		8	Load Cell	1
0.0013		9	Screw M4 x 20	4
1.0046		10	Washer	4
1.0027		11	Bottom Bracket of Load Cell	1
0.0008		12 / 28	Screw M4 x 12	4
1.0047		13	Washer	4
1.0048		14	Main PCB	1
1.0022		15	Display PCB	
1.0011		16	Bottom Cover	1
0.0011		17	Case screw M4 x 15	5
1.0049		18	Serial Port RS-232	1
1.0050		19	Dual Scale connector	1
1.0032		20	Power Switch	1
1.0012		21	Foot	4
0.0003		22	Screw M3 x 10	4
0.0013		23	Screw M4 x 20	4
1.0014		24	Battery Cover	1
1.0051		25	Internal Transformer (SA only)	1
1.0052		26	Nut	1
1.0057		27	Serial PCB board	1
0.0008		28 / 12	Screw M4 x 12	4
1.0010		29	Battery (6V / 4MH)	1
1.0024		30 / 31	Washer	2
1.0003		32	Rear Overlay	1
0.1003			AC Adapter 9VDC 800mA-1A	1
0.5006			In use wet cover	



WARRANTY INFORMATION

Adam Equipment offers one year Limited Warranty (Parts and Labour) for the components failed due to defects in materials or workmanship. Warranty starts from the date of delivery.

During the warranty period, should any repairs be necessary, the purchaser must inform its supplier or Adam Equipment Company. The company or its authorised Technician reserves the right to repair or replace the components at the purchaser's site or any of its workshops depending on the severity of the problems at no additional cost. However, any freight involved in sending the faulty units or parts to the service centre should be borne by the purchaser.

The warranty will cease to operate if the equipment is not returned in the original packaging and with correct documentation for a claim to be processed. All claims are at the sole discretion of Adam Equipment.

This warranty does not cover equipment where defects or poor performance is due to misuse, accidental damage, exposure to radioactive or corrosive materials, negligence, faulty installation, unauthorised modifications or attempted repair or failure to observe the requirements and recommendations as given in this User Manual.

Repairs carried out under the warranty does not extend the warranty period. Components removed during the warranty repairs become the company property.

The statutory right of the purchaser is not affected by this warranty. The terms of this warranty is governed by the UK law. For complete details on Warranty Information, see the terms and conditions of sale available on our web-site.



Manufacturer's Declaration of Conformity

This product has been manufactured in accordance with the harmonised European standards, following the provisions of the below stated directives:

Electro Magnetic Compatibility Directive 89/336/EEC

Low Voltage Directive 73/23/EEC

Adam Equipment Co. Ltd.
Bond Avenue, Denbigh East
Milton Keynes, MK1 1SW
United Kingdom

11.1.1.1.1 FCC COMPLIANCE

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. The equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Shielded interconnect cables must be employed with this equipment to insure compliance with the pertinent RF emission limits governing this device.

Changes or modifications not expressly approved by Adam Equipment could void the user's authority to operate the equipment.

11.1.1.1.2 WEEE COMPLIANCE



Any Electrical or Electronic Equipment (EEE) component or assembly of parts intended to be incorporated into EEE devices as defined by European Directive 2002/95/EEC must be recycled or disposed using techniques that do not introduce hazardous substances harmful to our health or the environment as listed in Directive 2002/95/EC or amending legislation. Battery disposal in Landfill Sites is more regulated since July 2002 by regulation 9 of the Landfill (England and Wales) Regulations 2002 and Hazardous Waste Regulations 2005.

ADAM EQUIPMENT is an ISO 9001:2000 certified global organisation with more than 30 years experience in the production and sale of electronic weighing equipment. Products are sold through a world wide distributor network supported from our company locations in the UK, USA, SOUTH AFRICA and AUSTRALIA.

ADAM's products are predominantly designed for the Laboratory, Educational, Medical and Industrial Segments. The product range is as follows:

- Analytical and Precision Laboratory Balances
- Counting Scales for Industrial and Warehouse applications
- Digital Weighing/Check-weighing Scales
- High performance Platform Scales with extensive software features including parts counting, percent weighing etc.
- Crane scales for heavy-duty industrial weighing
- Digital Electronic Scales for Medical use
- Retail Scales for Price computing

<p>Adam Equipment Co. Ltd. Bond Avenue Milton Keynes MK1 1SW UK</p> <p>Tel: +44 (0)1908 274545 Fax: +44 (0)1908 641339</p> <p>E-mail: sales@adamequipment.co.uk</p>	<p>Adam Equipment Inc. 26, Commerce Drive Danbury, CT 06810 USA</p> <p>Tel: +1 203 790 4774 Fax: +1 203 792 3406</p> <p>E-mail: sales@adamequipment.com</p>	<p>Adam Equipment S.A. (Pty) Ltd. 7 Megawatt Road, Spartan EXT 22, Kempton Park, Johannesburg Republic of South Africa</p> <p>Tel: +27 (0)11 974 9745 Fax: +27 (0)11 392 2587</p> <p>E-mail: sales@adamequipment.co.za</p>	<p>Adam Equipment (S.E. ASIA) Pty Ltd. 2/71 Tacoma Circuit Canning Vale, Perth WA 6155, Australia</p> <p>Tel: +61 (0) 8 6461 6236 Fax: +61 (0) 8 9456 4462</p> <p>E-mail: sales@adamequipment.au.com</p>
---	---	--	---

© Copyright by Adam Equipment Co. Ltd. All rights reserved. No part of this publication may be reprinted or translated in any form or by any means without the prior permission of Adam Equipment.

Adam Equipment reserves the right to make changes to the technology, features, specifications and design of the equipment without notice.

All information contained within this publication is to the best of our knowledge timely, complete and accurate when issued. However, we are not responsible for misinterpretations which may result from the reading of this material.

The latest version of this publication can be found on our Website.

Visit us at www.adamequipment.com