



SERVICE MANUAL

Catapult™ 1000 Scales





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1.1 INTRODUCTION

This service manual contains the information needed to perform routine maintenance and service on the Ohaus *Catapult™ 1000* Scales. The contents of this manual are contained in five chapters:

Chapter 1 Getting Started – Contains information regarding service facilities, tools and test equipment, measuring masses, specifications, and the mechanical and electronic functions of the scale.

Chapter 2 Troubleshooting – Contains a diagnosis/diagnostics chart and error code table.

Chapter 3 Maintenance Procedures – Contains preventive maintenance procedures and disassembly, repair and replacement procedures.

Chapter 4 Testing – Contains an operational test, segment display test, performance tests and adjustments.

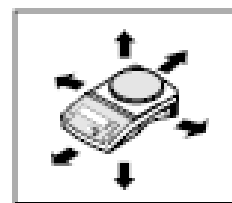
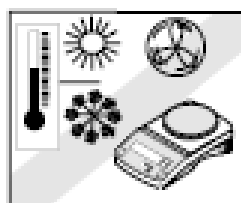
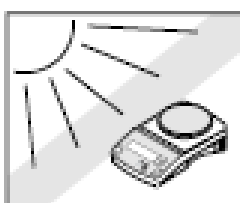
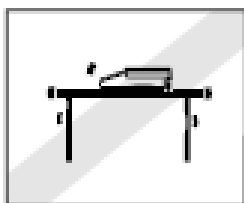
Chapter 5 Drawings and Parts Lists – Contains exploded views of *Catapult™ 1000* Scales, identifying all serviceable components.

Before servicing the scale, you should be familiar with the Instruction Manual which is packed with every scale.

1.2 SERVICE FACILITIES

To service a scale, the service area should meet the following requirements:

- Must be protected from electrostatic discharge.
- Should be temperature controlled and meet the scale specifications for temperature environmental requirements. See specifications for temperature range.
- Must be free of vibrations such as fork lift trucks close by, large motors, etc.
- Area must be clean and air must not contain excessive dust particles.
- Work surface must be stable and level.
- Work surface must not be exposed to direct sunlight or radiating heat sources.



CHAPTER 1 GETTING STARTED

1.3 TOOLS AND TEST EQUIPMENT REQUIRED

The service shop should contain the following equipment:

1. Standard hand tools.
2. Digital Voltmeter (DVM).
3. Load Cell Simulator optional.

1.4 SPECIFICATIONS

TABLE 1-1. SPECIFICATIONS

Specification	C11P9	C11P20	C11P75
Capacity x readability, d	9 kg x 0.05 20 lb x 0.01	20 kg x 0.01 44 lb x 0.02	75 kg x 0.05 165 lb x 0.1
Calibration Weights (fixed)	9 kg, 20 lb	20 kg, 44 lb	75 kg, 165 lb
Weighing Units	Kg, lb		
Application Modes	Weighing, Dynamic Weighing		
Linearity	±1 d		
Repeatability (std. Dev.)	1 d		
Off center load (½ cap, ½ dist.)	3 d		
Operating Temperature range	5°C/41°F to 40°C/104°F at 10 to 80% relative humidity, non-condensing		
Storage temperature range	-10°C/14°F to 60°C/140°F at 10% to 80% relative humidity, non-condensing		
Stabilization time	3 seconds max		
Static over load limit (load cell)	150% capacity		
Power	AC Adapter 9V DC / 100mA 3 "C" (LR14) alkaline batteries (<i>not included</i>)		
Battery Operating Time	300 hours		
Auto-Shutoff	4 minutes with no activity (battery operation only)		

1.5 OPERATION

This section contains information on the basic operation of the *Catapult™ 1000* Scale. Exploded view drawings in Chapter 5 identify all components.

1.5.1 Power Supply

Power to the scale is supplied by a 9 V dc, 100mA Power Adapter, or by 3 “C” size (LR 14) alkaline batteries.

- The batteries allow the unit to run for 300 hours.
- When both the line voltage and battery are present, the scale will take power from line voltage.
- When line voltage is lost, the scale will automatically switch over to battery operation.
- The unit will power off after four minutes of inactivity when running on battery.
- Battery indicator is on when battery is in use.
- Low Battery: Flashing battery symbol indicates a low battery condition. When first displayed, approximately 12 hours of operation remain. When the battery is fully depleted, the scale momentarily displays “Lo bAt” and shuts off.

1.5.2 OVERVIEW OF THE CONTROLS

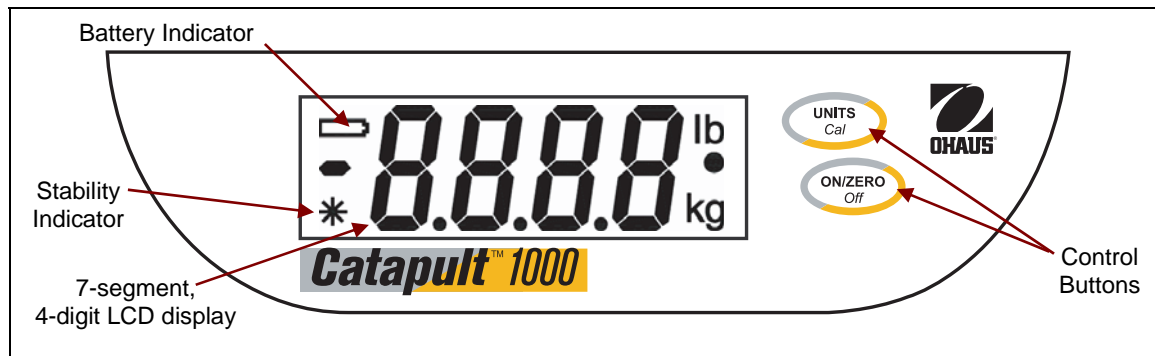


Figure 1-1. *Catapult™ 1000* Display.

- **ON/ZERO Off key:** A short press turns on the scale when it is off. When the scale on, a short press zeroes the scale, and a long press turns the scale off.
- **UNITS Cal key:** A short press changes the weighing unit and weighing mode.
 - In Dynamic Weighing Mode, a short press initiates countdown (after mass is placed on scale and “A” appears while “●” is blinking).
 - A long press initiates calibration.
- **Stability Indicator:** A “*” appears in the left corner when the reading is stable.
- **Weighing Unit:** The selected weighing unit selected appears on the right.
- **Dynamic Weighing Mode:** A “●” blinks next to the selected weighing unit. (See Section 1.54.)

1.5.3 Basic Functions

Power Up Test: When **ON/ZERO Off** button is pressed the scale turns on, all display segments appear, followed by the software version. The display then resets to zero.

Zero Function: By pressing **ON/ZERO Off**, the display returns to zero. When adding additional mass, press **ON/ZERO Off** repeatedly until the scale's full capacity is reached. When using a container, **ON/ZERO Off** may be used to simulate a Tare function. Additional mass may then be added as a NET weight. When removing both the sample and container from the scale, a negative value may appear. Zero the scale again before subsequent usage.

Note: Pressing **ON/ZERO Off** will perform a true zero setting function when displayed values are within $\pm 2\%$ of full capacity. Above 2%, the range is limited to full capacity by subtraction.

Negative Values: When a load is removed from the scale, any previously zeroed value will be displayed as a negative number. To return to normal operation, press **ON/ZERO Off** to clear the negative value.

Overload: If the applied load exceeds the scale's capacity, an "E" appears. Remove the load and the scale will return to normal operation.

Auto Shut-Off: During battery operation, the scale automatically turns off after approximately four minutes of inactivity, to extend battery life.

1.5.4 Dynamic Weighing

Also known as "animal weighing," this feature displays an average weight value during a period of several seconds. Follow these steps to start and complete a Dynamic Weighing process:

1. With the platform empty, press **UNITS Cal** until the indicator "●" flashes next to the desired measuring unit.
2. Place a mass on the platform. The scale will show "-A-".
Note: If using a container, press **ON/ZERO Off** to tare the weight and return to zero.
4. With a mass on the platform or container, short-press **UNITS Cal** to start the averaging countdown from 5 seconds.
5. The averaged weight appears. The indicator "●" stops flashing when the process is complete.
6. The display will hold until a button is pressed.
7. To repeat the process, press **UNITS Cal** with a mass on the platform or container.
8. To exit, remove the mass from the platform or container and press **UNITS Cal**.



1.6 CALIBRATION

For best results, calibrate the scale at regular intervals. Correct calibration weights must be available before starting calibration. (See Specification Table). Multiple weights may be used to equal the required calibration weight. Calibration is unavailable in Dynamic Weighing Mode.

CAUTION!



BE CAREFUL HANDLING CALIBRATION WEIGHTS: THEY ARE VERY HEAVY. IMPROPER LIFTING METHODS OR MISUSE OF CALIBRATION WEIGHTS MAY RESULT IN PERSONAL INJURY.

1. Allow time for the scale to stabilize after moving it from an area which is at a different temperature than the area where it is to be operated: one hour for each 5°F (2.7°C) change. After temperature stabilization, allow an additional 20 minutes after turning the scale on, for the scale electronics to stabilize.
2. To select the weighing unit to be used, press **UNITS Cal** until the correct unit is displayed, then press **Yes**.

Note: Calibration can be stopped at any time: press **UNITS Cal** or turn the scale off.

3. Press and hold **UNITS Cal** until **CAL** is displayed.
4. With the platform empty, press **ON/ZERO Off** to capture the scale zero. The display will show **-C-**.
5. After the zero is captured, the required span calibration weight value in the selected unit appears.
6. Place the calibration weight on the platform and press **ON/ZERO Off**. The display will again show **-C-**.
7. After span capture, the display will return to the normal weighing mode.

Note: The message **CAL E** will appear if an incorrect calibration weight was applied. Repeat the procedure using the correct calibration weight.

Calibration Locking: By use of an internal switch, the calibration function may be locked (disabled), and unauthorized recalibration prevented. (See Figure 2-2.)

1. With the scale powered off, remove the back cover plate of the display by unscrewing the two screws on the bottom.
2. Slide the switch on the PCB (marked **SW3**) to the position marked **CAL LOCK**.
3. Reassemble the housing.
4. If required, place tamper evident seals over the screw holes or the housing edges.

If later recalibration is required, the housing will need to be reopened and the lock switch returned to the original position.

Note: When the lock switch is set to the **CAL LOCK** position, the power-on zero range is reduced to 10% of full capacity.

2.1 INTRODUCTION

This section of the manual covers visual inspection, troubleshooting, and a Diagnostic Guide, Table 2-1. Follow all directions step by step. Make certain that the work area is clean and use care when handling components of the scale.

2.2 VISUAL INSPECTION

Carefully remove the scale from its packing container and remove any packing material. Note all items supplied with the unit such as AC power supply, cables, instruction manual, weights, etc. Keep a record of all items and note their condition.

1. Examine the scale for signs of abuse such as a cracked housing, damage from liquids, cracks on corners, which may suggest the unit was dropped.
2. Open the scale by removing the two screws in the bottom housing.
3. Examine the top of the Main PCB and Load Cell Junction Board for cracks or signs of corrosion.
4. If it appears that corrosion may have affected the boards and you want to examine the bottom of either of them, remove the screw(s) holding it to the housing.
5. If either PCB is cracked or shows signs of corrosion, it requires replacement. See Chapter 3, Maintenance Procedures. (If the Load Cell Junction Board is bad, replace the scale.) If the scale shows no sign of physical damage, continue with procedures.

2.3 DIAGNOSTIC GUIDE

Table 2-1 is a Diagnostic Guide designed to help locate the problem area quickly and easily. The probable causes are listed with the most common cause first. If the first remedy does not fix the problem, proceed to the next remedy. Before attempting any repairs, read all chapters of this manual to be familiar with overall operation and all components.

2.3.1 Diagnosis

1. Isolate and identify the symptom
2. Refer to Table 2-1, Diagnostic Guide and locate the symptom.
3. Follow the suggested remedies in the order they appear.
4. Perform the indicated checks, or see the appropriate section of the manual.
5. Repair or replace the defective part.

NOTE:

If more than one symptom is observed, approach one area at a time, and remember that the symptoms may be interrelated.

If a problem arises that is not covered in this manual, contact Ohaus Corporation for further information.

2.3.1 Diagnosis

TABLE 2-1. DIAGNOSTIC GUIDE TABLE

Symptom	Possible Cause(s)	Remedy
Scale will not turn on	No power to scale Battery power used up	Verify connections and voltage. Connect power and replace batteries.
Poor accuracy	Improper calibration Unstable environment	Perform calibration. Move scale to suitable location.
Unable to calibrate	Unstable environment Incorrect calibration mass	Move the scale to suitable location. Use correct calibration mass.
Display = -R-	Scale is in Dynamic Weighing Mode.	Proceed weighing in Dynamic Weighing Mode if desired. (See Section 1.54.) To exit, remove the mass from the platform and press UNITS Cal .
Display = 000000 or 999999 ; or no weight reading	Load cell cable is disconnected. No calibration data in EEPROM	Connect the load cell cable to the scale. Calibrate the scale.
Display = -E-	Over load	Remove excess weight from platform.
Display = CALE	Calibration Error	Stop calibration and try again after checking for correct weight.
Display = UnSt	Unstable at Power on	Be sure environment is stable and scale is resting on a flat surface. Check adjustable feet.
Display = ErrE	EEPROM read error	Replace PCB.
Display = Lo bAt OFF	Low battery shutdown	Replace batteries.
Display = Lo L inE OFF	Low line voltage shutdown (power adapter problem)	If input voltage is unstable, switch to battery operation.

2.4 CHECKING THE LOAD CELL'S SIGNAL

Remove the PCB Cover to gain access to the PCB and wiring.

2.4.1 Output Voltage Test

Measure the no load, 50% load and full load output. The reading should meet the Load Cell specifications. The Load Cell output should be very close to linear over its capacity range.

NOTE: The following steps involve power applied to the scale. Load Cell solder contacts can be used as measuring points. See Figure 2-2.

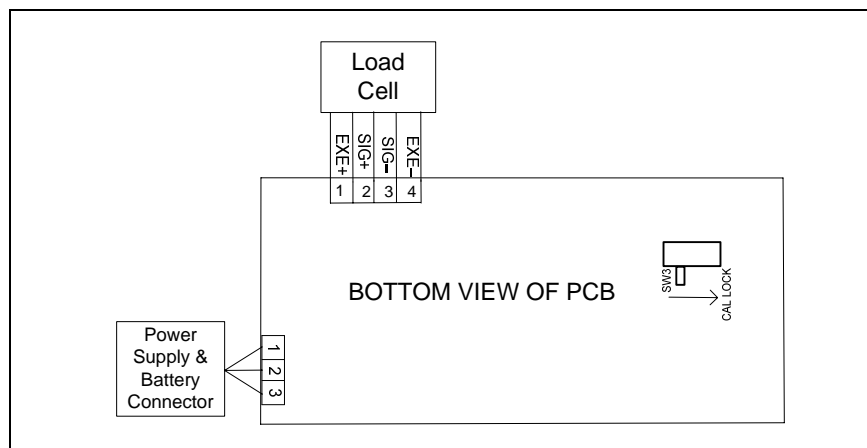


Figure 2-2. Catapult 1000 PCB connections



The EXE+ and EXE– wires should be connected to the PCB, and the SIG+ and SIG– wires must be disconnected. Record the colors for each wire connection before disconnecting. (See Table 2-2 for typical color code for SD Series.)

TABLE 2-2. COLOR CODE FOR LOAD CELL WIRING*

WHITE	GREEN	YELLOW	RED
EXE+	SIG+	SIG–	EXE–

*Color codes may vary.

1. Power on the scale with AC Adapter.
2. Using a voltmeter, with no load on the Platform, measure the voltage across points 1 and 4 of Load Cell connection on the PCB (+EXE and –EXE). This voltage must be approximately 3.0 Volts dc. If the voltage is lower, disconnect the Load Cell cable from the PCB and measure again. If the voltage is 3 Volts dc, the Load Cell is defective and must be replaced. If the voltage remains low, the PCB is defective and must be replaced.



CAUTION:

IN THE NEXT STEP, DO NOT OVERLOAD THE SCALE BEYOND FULL CAPACITY RATING.

2.4.1 Output Voltage Test

3. Measure the voltages on +SIG and –SIG wires, disconnected from PCB.

Note: Measurements *must* be made with these wires disconnected from the PCB. These measurements represent the output of the Load Cell. Record measurements at Zero Load, 50% and full scale capacities. See Table 2-3 for typical readings.

NOTE: Table 2-3 indicates typical readings. Actual values can vary, but should remain linear throughout the range. If readings are out of tolerance, replace the base.

TABLE 2-3. LOAD CELL OUTPUT READINGS (in mV with 3V Excitation)

Model/Capacity	Zero Load	50% Load	100% Load
C11P9 / 9kg	0.8 ± 0.1	Zero + 1.0	Zero + 1.7
C11P20 / 20kg	0.9 ± 2.0	Zero + 4.7	Zero + 7.6
C11P75 / 75kg	0.4 ± 2.0	Zero \pm 4.1	Zero \pm 7.8

2.4.2 Resistance Test

Perform a Resistance Test to determine if the Load Cell is severely damaged or a short circuit has occurred.

Note: The Load Cell must be completely disconnected from the Printed Circuit Board and at no load when the resistance readings are taken.

Using an ohm meter, measure and record resistance between each pair of wires from the Load Cell, as specified in Table 2-2. Compare the measured readings with the specified values in Table 2-4.

If the resistance readings are in the range specified, skip to the next section. If they are outside the expected range, open circuit or short-circuit across any two wires, the Load Cell is defective: replace the Load Cells as a set.

TABLE 2-4. LOAD CELL RESISTANCE READINGS (in Ohms)

Model	Ex+ to Ex–	S+ to S–	Ex+ to S–	Ex+ to S+	Ex– to S+	Ex– to S–
All models	262 ± 10	248 ± 10	186 ± 10	186 ± 10	200 ± 10	200 ± 10

2.5 Testing the Printed Circuit Board (PCB)

The PCB can be tested by measuring voltages and by using a simulator. The simulator replaces the Load Cell during testing and is a useful tool for diagnosing problems.

2.5.1 PCB Voltage Measurements

Note: Prior to the voltage measurements, test and install new batteries.

1. Disconnect the power and remove the PCB Cover.
2. Connect the AC Adapter to the scale and turn it on.
3. Using a DVM, measure the excitation voltage (EXE+ and EXE– in Figure 2-2.) The reading should be 3 volts dc. This is the excitation voltage for the Load Cell and is regulated. If the voltage is lower, replace the PCB. (See Chapter 3.) Then perform Operational Tests. (See Chapter 4.)
4. Measure incoming power from the AC Adapter Connector. (See Figure 2-2.) It should read between 9 and 14 volts dc with power off and above 9 Volts dc with power on.
5. Perform simulator testing.

2.5.2 Simulator Testing

To perform these tests, the use of a Simulator is required. The function of a Simulator is to simulate the output of a full bridge Load Cell, allowing the scale to be separated from the Load Cell for the purposes of troubleshooting and calibration.

2.5.3 General Load Test

This test checks the Main PC Board circuitry by simulating accurate Load Cell voltages at zero load, 50% and 100% load capacities.

1. Disconnect power from the scale, and remove the PCB Cover. Also remove the batteries (if any).
2. Disconnect the Load Cell cable from the PC Board.
3. With the Simulator set to zero, attach it to the PCB, using the Load Cell Cable solder points on the PCB. (See Figure 2-1.).
4. Connect a known good AC Adapter to the scale and connect to a power source.
5. Turn on the scale. An under load error may appear. This is normal.
6. Set the scale to indicate weight in kilograms (kg) and set the calibration value to maximum span value.
7. Adjust the Simulator to simulate 0% load, 50% load and 100% load for the capacity that the unit is rated for. (See Table 2.3 for values to use.) If the resulting readings are unstable, the Main PC Board is defective.
8. Use the Simulator to calibrate the scale in the next procedure.

2.5 Testing the Printed Circuit Board (PCB)

2.5.4 Calibration Test

This test calibrates the scale using the simulator and can verify that the Main PC Board is functioning properly or improperly.

1. With the scale on, press and hold **UNITS** *Cal* to perform a calibration.
(See Section 1.8.)
2. Follow the scale prompts. When the scale indicates a given weight to be placed on the scale, set the simulator to an equivalent value based on Table 2-3.
3. Upon completion of calibration, the PCB can be further checked using the Simulator to simulate various weight values. If simulator settings and weight readings on the scale agree, the PCB is functional. If the scale readings vary, or do not agree with readings in Table 2-3, the Main PC Board is defective and should be replaced.
(See Chapter 3.)

3.1 PREVENTIVE MAINTENANCE

Ohaus scales should be carefully handled, stored in a clean, dry area, and cleaned periodically. Follow these precautionary steps:

- When a scale has had chemicals or liquids spilled on it, all exterior surfaces should be cleaned as soon as possible with warm water on a damp cloth.
- Allow time for the scale to stabilize after moving it from an area which is at a different temperature than the area where it is to be operated: one hour for each 5°F (2.7°C) change. After temperature stabilization, allow an additional 20 minutes after turning the scale on, for the scale electronics to stabilize.

3.1.1 Preventive Maintenance Checklist

The scale should be inspected and checked regularly, as follows:

1. Unplug the AC Adapter before cleaning.
2. Clean the outside using a damp cloth with warm water.



CAUTION

DO NOT USE CHEMICAL CLEANERS OR SOLVENTS OF ANY TYPE.
SOME CLEANERS ARE ABRASIVE AND MAY AFFECT THE SCALE'S FINISH.

3. Check the Power Cord for broken or damaged insulation.
4. Make a visual inspection for faulty connectors, wiring, and loose hardware.

3.2 REPLACEMENT OF MAJOR COMPONENTS

The decision to replace any component should only be made after thoroughly diagnosing the problem. If, after the replacement of any component, the scale is still non-functional and no other information on the subject is available in the manual, contact your local Ohaus office or contact Ohaus Corporation by visiting www.ohaus.com. In the United States call Ohaus Aftermarket toll free, 800-526-0659 between 8:00 a.m. and 4:00 p.m. EST.

3.2.1 Replacing Load Cells

Repairs are not recommended on the Catapult 1000 scale. Some component parts may be replaced. Replacement is recommended rather than repairing.

Load Cells may need to be replaced because of scale instability, or because the scale does not calibrate or repeat, or because it is physically broken or displays an error code.

Follow these steps to replace the Load Cells:

1. Unplug the power adapter, and/or remove the batteries.
2. Remove the two screws that secure the Weighing Pan, and lift it off.
3. Unsolder the Load Cell Cable's leads from the Load Cell Junction Board. (See Figure 3-2.)
4. Remove the two screws that secure each Load Cell, using a 3mm Allen key. Hold each Load Cell by hand while removing the screws.
5. Lift out the Load Cells and replace each one. (See Figure 5.1)
6. Place the square bushings on both sides of the Bottom Housing; then insert the screws. Hold each Load Cell to stabilize it while installing it.
7. Solder the new Load Cells' cable leads to the Load Cell Junction Board.
8. Reinstall the Weighing Pan.
9. Calibrate the scale.
(See Section 1.6.)
10. Perform all tests. (See Chapter 4.)

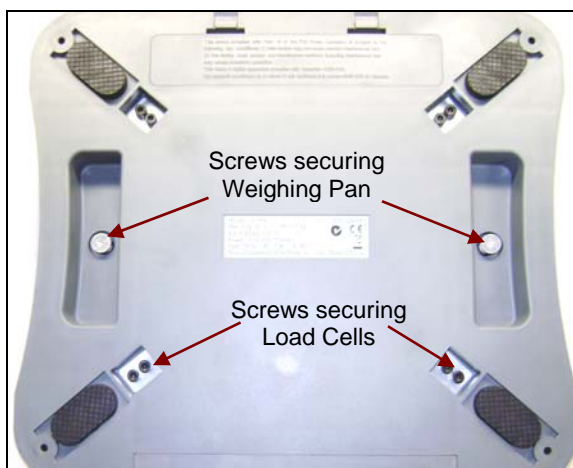


Figure 3-1. Scale Bottom.

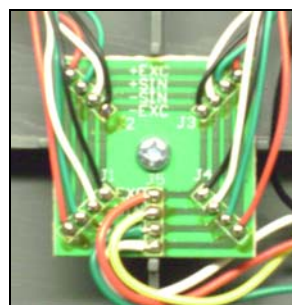


Figure 3-2. Load Cell Junction Board.

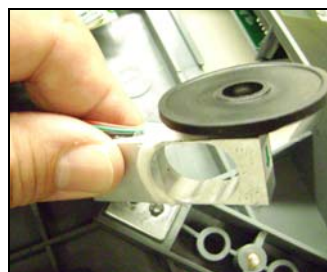


Figure 3-3. Installing a Load Cell.

3.2.2 Printed Circuit Board (PCB) Replacement

Replace the Printed Circuit Board (PCB) for any of the following reasons:

- Display is defective; characters missing or partial display.
- Scale fails to calibrate properly.
- Display is erratic or unstable.
- Scale does not operate at all.



Figure 3-4. Removing screws that secure the PCB Cover.

1. Unplug the power Adapter. If necessary, remove the batteries.
2. Remove the two screws holding the PCB Cover, and lift it out.
3. Unsolder the Load Cell Cable's leads and the Power Cable leads from the PCB. (See Figure 3-5.)
4. Lift out the Main PCB.

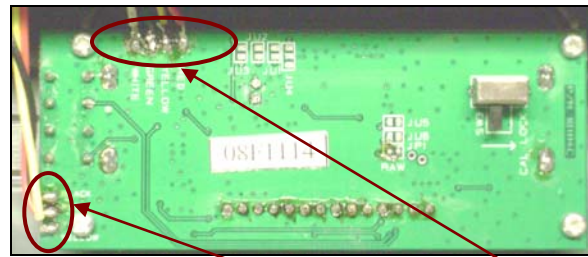


Figure 3-5. Power Cable and Load Cell leads, soldered to the Printed Circuit Board.



CAUTION

When handling the PCB, grasp it by the edges only!
Do not touch the foil side. Static discharge may damage some components.

5. Carefully re-position the replacement PCB over the screw holes in the Bottom Housing, and re-insert and tighten the screws.
6. Re-solder the cable sets removed in Steps 4.
7. Calibrate the scale. (See Section 1.6.)
8. Perform all tests. (See Chapter 4.)

3.2.3 Battery Replacement

1. To replace the Type C (LR14) batteries, press the inset latch lever in the middle of the Bottom Housing.
2. Note the proper direction for inserting new batteries, printed on the inside of the Battery Compartment door.
3. After placing the batteries as indicated, close the Battery Compartment door.

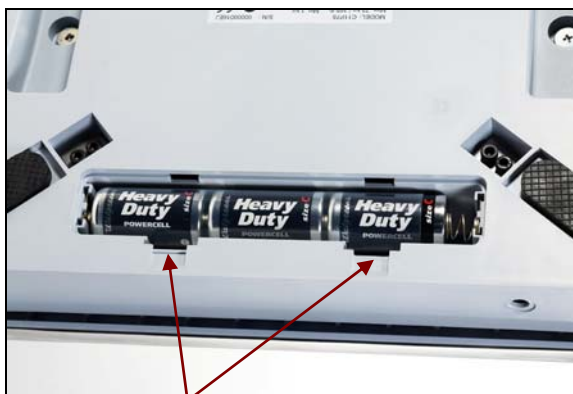


Figure 3-6. Open Battery Compartment door by pressing the two inset latch levers.

3.2.4 Function Label Replacement

1. Unplug the AC Adapter.
2. Lift the Function Label off from the Top Housing. Remove the old Display Window. The Function Label is held in place with a strong adhesive. Clean the Top Cover and remove all traces of adhesive.



CAUTION

Be careful placing the Function Label into position as the adhesive will not allow repositioning once attached to the cover.

3. Put the new Display Window in place.
4. Remove the protective backing from the back of the new Function Label, and carefully position it on the Top Housing, starting at the bottom of the Housing. Use a rolling motion to smooth the Function Label into position.

4.1 TESTING

Before and after servicing the scale, operational and performance tests should be made to determine if it meets specifications. Turn the scale ON and allow it to warm up for at least 20 minutes before performing these checks.

The masses used for calibration should be ASTM Class F or OIML Class M1 tolerance or better.



NOTE:

Make sure the test area is free from drafts and that the scale rests on a level and vibration-free surface.

4.2 Power Test

The purpose of this test is to determine if the electronic circuitry of the scale is functioning properly or not.

1. Connect a functioning AC Adapter to the scale's power plug.
2. Plug the AC Adapter into a suitable power source.
3. With the scale connected to an appropriate power supply, press **ON/ZERO OFF**. The scale performs a self-test, indicates the software revision and then goes into weighing mode.
4. If all of the displays appear normal in this test, continue with the next test. If the display did not appear, check the AC adapter output and repeat the test with a good adapter. If the display was erratic, the PC board is defective and requires replacement.

4.3 Performance Tests Using a Load Cell Simulator

Connect the simulator's leads to the PCB. (See Figure 2-2 and Table 2-2, page 2-4.)

Test the Scale as follows:

1. Set the simulator to zero. Power on the scale. Perform a Span Calibration, with zero at the simulator's zero setting, and 100% capacity at the simulator's millivolt setting in Table 2-3 (page 2-5).
2. Following calibration, check that the scale's display reading is stable at each simulator level, up to the maximum set in the calibration. If the readings are stable, the Scale is functioning properly.

4.4 Calibration Retention Test

This test checks that the scale retains calibration after power is removed and then restored.

1. Turn the Scale OFF and disconnect the AC Adapter.
2. Wait one minute, then reconnect the AC Adapter to the scale.
3. Check to insure that the Scale retained calibration settings.

4.5 Repeatability Test

Repeatability is the Standard Deviation of a set of similar weight readings.

Requirements:

- To perform this test a single mass must be used for all readings.
- The test mass should be approximately $\frac{1}{2}$ of the capacity of the scale.

Before starting a repeatability test, set up the scale as follows:

Set Up:

Enter the menu and set the scale to display the same units as the performance specifications.

TEST PROCEDURE:

1. Zero the scale.
2. Using a test mass approximately half the capacity of the scale, place the mass on the center of platform. Record the reading on the worksheet provided.
3. Remove the mass from the platform.
4. Repeat this test starting at Step 1 until you record a total of ten readings

Fill in the worksheet (Table 4-1) with the ten readings.

4.5 Repeatability Test

TABLE 4-1. REPEATABILITY WORKSHEET

n	Reading	Delta = Reading – Mean	Delta x Delta
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
n = number of Reading Mean = Sum of readings / 10 Delta = Reading – Mean Standard Deviation = Square Root of (sum of (Delta x Delta) / 9)			

5. Add the ten readings and divide the total by 10 to find the Mean (average).

6. Mean = (Reading 1 + Reading 2 + Reading 3 + Reading 4 + Reading 5

7. + Reading 6 + Reading 7 + Reading 8 + Reading 9 + Reading 10) / 10

Mean = _____

6. Calculate the Delta for each reading and record in the work sheet.

Delta = Reading – Mean

7. Calculate the Delta x Delta for each reading and record in worksheet.

8. Add the ten Delta x Delta values and divide by 9

9. Calculate the Standard Deviation by applying the square root of the result from step 8.

Standard Deviation = _____

Note: If the scale does not meet specifications, move it to a suitable location, ensure that it is level, and try again. If it still does not meet specifications, replace the base.

4.6 Off-Center Load Test

The Off-Center Load Test is used to determine whether displayed weight values are affected by moving the sample to different areas of the Pan.

1. Place half of the scale's capacity in the center of the Pan.
2. Note the reading.
3. Move the mass halfway (between the center and the edge) to the front of the Pan. Note any differences in the displayed weight reading.
4. Repeat the test for the back, left, and right position of the Pan.
5. Maximum allowable change in displayed weight readings for each of the four positions can be found in Table 1-1 (Specifications, page 1-2). If this maximum is exceeded, it will be necessary to adjust one or more of the Load Cells. (See next section.)

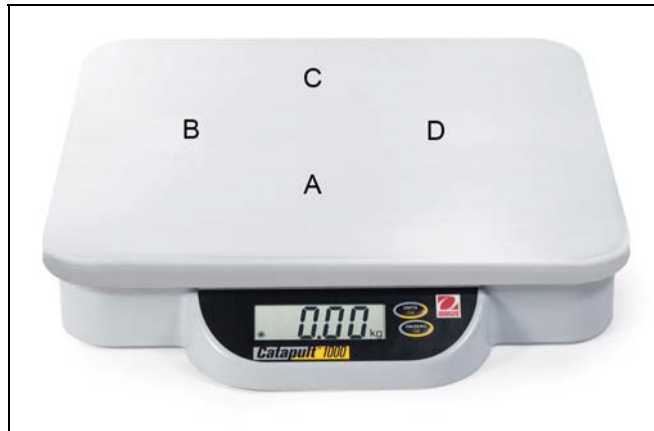


Figure 4-1. Off Center Load Test weighing points.

4.7 Adjusting Off Center Load on Strain Gauge Load Cells

If the Off Center Load (OCL) is excessive, perform adjustment as follows:

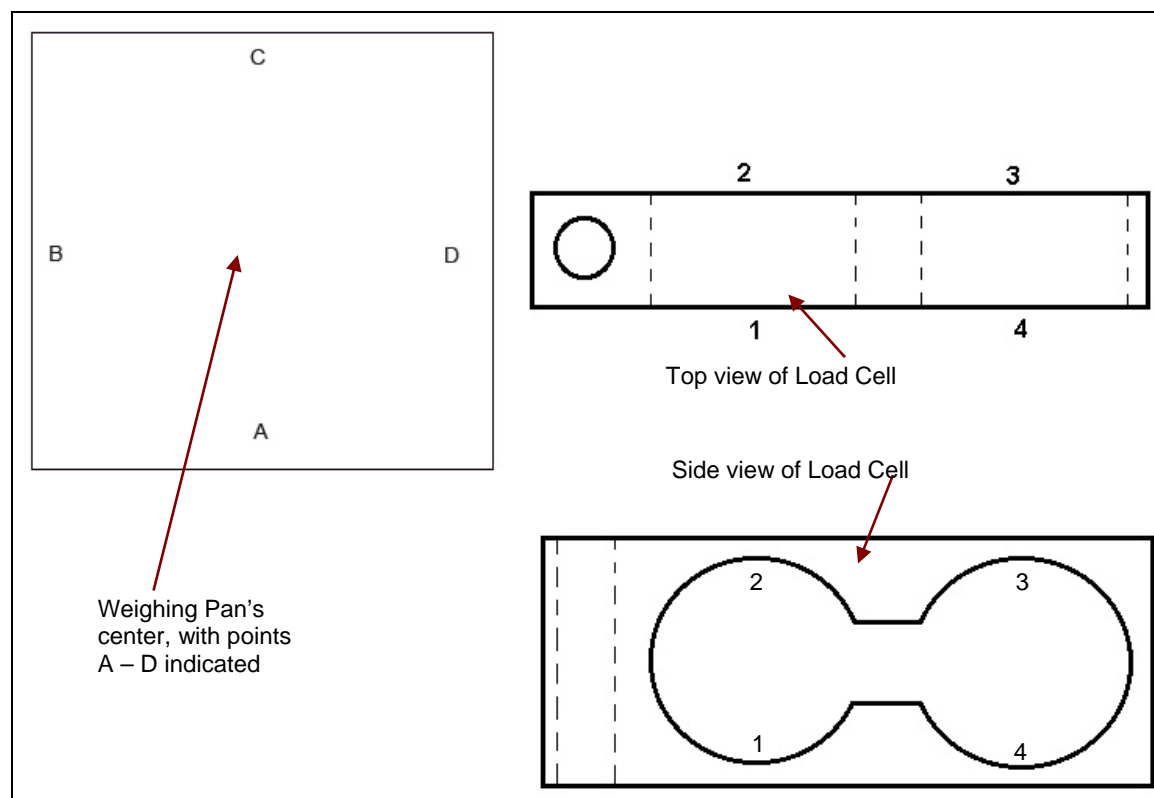


Figure 4-1. Scale drawing of Catapult 1000 Load Cell and Weighing Pan.

4. Place the test weight in the center of the Weighing Pan.
5. Tare the balance.
6. Move the weight to point A and record the reading.
7. Move the weight to point B and record the reading.
8. Move the weight to point C and record the reading.
9. Move the weight to point D and record the reading.
10. If the reading at point A is negative, file at points 1 and 4 AT AN ANGLE.
11. If the reading at point B is negative, file at points 1 and 2 STRAIGHT ACROSS.
12. If the reading at point C is negative, file at points 2 and 3 AT AN ANGLE.
13. If the reading at point D is negative, file at points 3 and 4 STRAIGHT ACROSS.
14. Repeat 1 to 10 until within specifications.



Note: It is not recommended that you try to adjust more than –5 counts if the beam has been filed already. If the beam has not been filed previously, you can adjust –10 counts. Remember, when filing you are weakening the beam. File a little at a time.

4.8 Linearity Test

This test is used to determine the linearity of the unit throughout its operating range. The masses used to perform this test can be utility masses.



NOTE:

The scale must pass the Repeatability and Off Center Load tests, and be calibrated, before the Linearity Test may be performed.

TABLE 4-2. LINEARITY TEST MASSES

Capacity & Readability	C11P9	C11P20	C11P75
Reference Mass	2 kg / 5 lb	5 kg / 10 lb	15 kg / 15 lb
Load 1	2 kg / 5 lb	5 kg / 10 lb	20 kg / 50 lb
Load 2	4 kg / 10 lb	10 kg / 22 lb	40 kg / 100 lb
Load 3	7 kg / 15 lb	15 kg / 34 lb	60 kg / 150 lb

NOTE:

All masses are nominal values. Be certain to use the same reference mass throughout the procedure.

1. Place the reference mass on the Scale, record the weight and remove.
2. Place Load 1 on the Scale and press **ON/ZERO Off**.
3. Place the reference mass on the Scale, record the weight and remove.
4. Place Load 2 on the Scale and press **ON/ZERO Off**.
5. Place the reference mass on the Scale, record the weight and remove.
6. Place Load 3 on the Scale and press **ON/ZERO Off**.
7. Place the reference mass on the Scale and record the weight.
8. The difference in the weights of the test mass should be within the tolerance in the relevant Specification Table in Chapter 1. If not, calibrate (see Section 1.8) and repeat the test.
9. If the Scale remains out of tolerance, the base may need to be replaced.

This section of the manual contains exploded views for the Catapult 1000 Scales. The exploded view drawings are designed to identify the parts which can be serviced in the field.

NOTE:

In all cases where a part is replaced, the scale must be thoroughly checked after the replacement is made. The scale **MUST** meet the parameters of all applicable specifications in this manual.

If further technical information is needed, please contact your local Ohaus office, or:

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5.1 CATAPULT 1000 SCALE: Parts

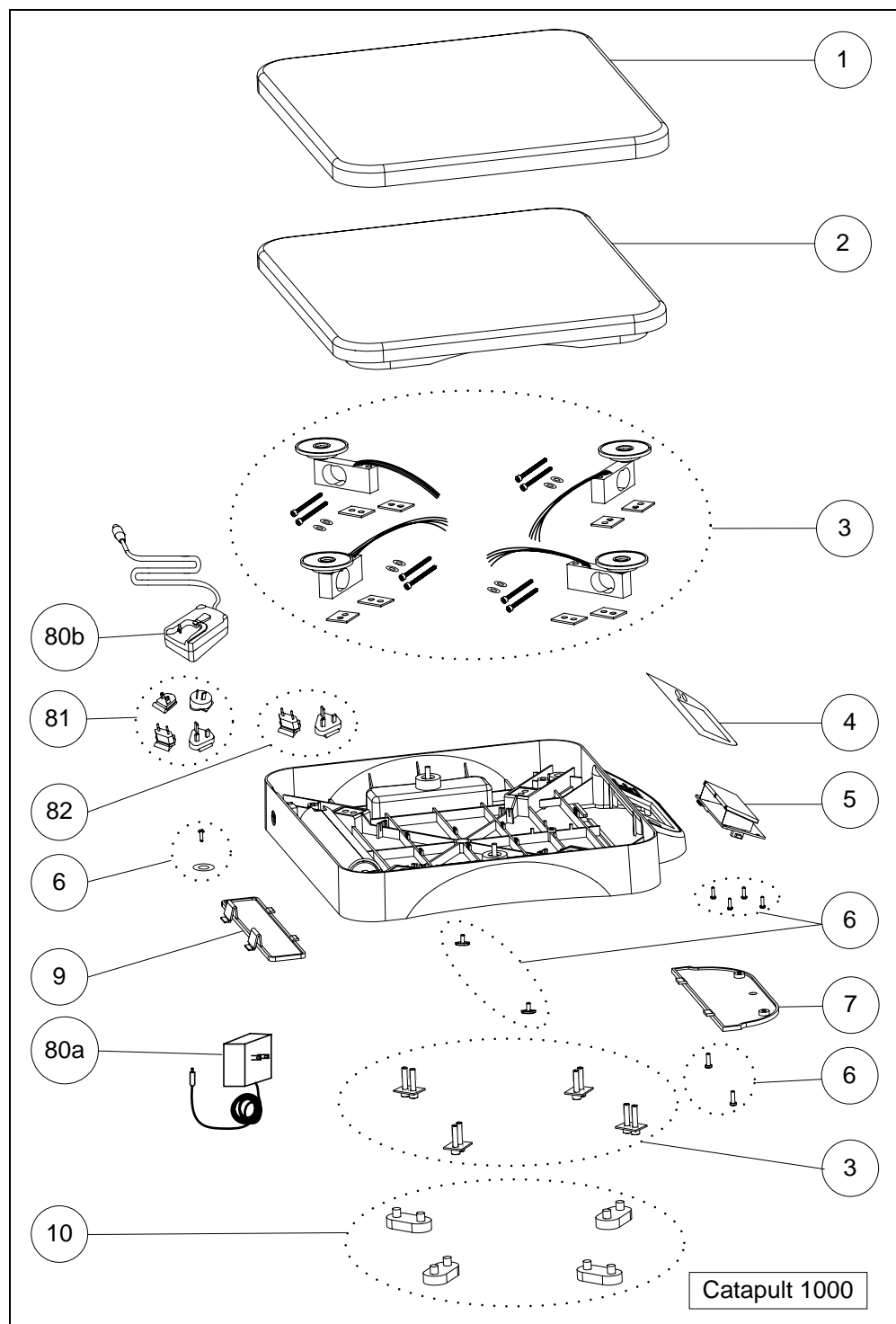


Figure 5-1. Catapult 1000 Scale: Parts.

5.1 CATAPULT 1000 SCALE: Parts

TABLE 5-1. CATAPULT 1000 SCALE: Parts

Drawing Item	Description
1	Pan, Stainless Steel (Optional)
2	Pan, Plastic
3	Load Cell Set
4	Function Label
5	Main PCB with LCD
6	Hardware Kit
7	PCB Cover
9	Battery Cover
10	Rubber Feet (4)
80a	Adapter – Fixed Plug type
80b	Adapter – Interchangeable Plug type
81	Interchangeable Plug Set (UK, EU, US, AU)
82	Interchangeable Plug Set (UK & EU)



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