



EC SERIES SCALES

SERVICE MANUAL



EC SERIES SCALES SERVICE MANUAL



The information contained in this manual is believed to be accurate at the time of publication, but Ohaus Corporation assumes no liability arising from the use or misuse of this material. Reproduction of this material is strictly prohibited.

Material in this manual is subject to change.

© Copyright 2005 Ohaus Corporation, all rights reserved.

® Registered trademark of Ohaus Corporation.

TABLE OF CONTENTS

CHAPTER 1 INTRODUCTION

	Page
1. Introduction	1-1
1.1 Service Facilities	1-1
1.2 Tools and Equipment	1-2
1.2.1 Standard Tools and Test Equipment	1-2
1.2.2 Special Tools	1-2
1.3 Calibration Masses Required	1-2
1.4 Service Strategy	1-2

CHAPTER 2 DIAGNOSIS

2. Diagnosis	2-1
2.1 Scale Setup and Examination	2-1
2.2 Preliminary Checks	2-1
2.3 Troubleshooting Tables	2-1
2.4 EC Series Scales Error Code Table	2-5

CHAPTER 3 SCALE TESTING AND CALIBRATION

3. Testing and Calibration	3-1
3.1 Testing the AC Adapter	3-1
3.2 Testing the Membrane Switch	3-1
3.3 Testing the Load Cell Assembly	3-2
3.3.1 Resistance Test	3-2
3.3.2 Excitation and Output Voltage Test	3-2
3.4 Testing the Main PC Board	3-4
3.4.1 Main PC Board Voltage Measurements	3-4
3.4.2 Simulator Testing	3-5
3.5 Testing the Battery	3-6
3.5.1 Precautions for Battery Handling	3-6
3.5.2 Battery Tests	3-6
3.6 Performance Tests	3-8
3.6.1 Segment Display Test	3-8
3.6.2 Repeatability Test	3-8
3.6.3 Off-Center Load Test	3-10
3.6.4 Linearity Test	3-11
3.7 Specifications	3-13
3.8 Calibration	3-14
3.8.1 Calibration Points	3-14
3.8.2 Span Calibration	3-14
3.9 Scale Settings	3-15

TABLE OF CONTENTS (Cont.)

CHAPTER 4 REPAIR PROCEDURES

	Page
4. Repair Procedures	4-1
4.1 Removing Top Housing	4-1
4.2 Replacing the Membrane Switch	4-2
4.3 Main PC Board	4-4
4.3.1 Main PC Board Replacement	4-4
4.3.2 Display PC Board Replacement	4-7
4.3.3 LCD Replacement	4-8
4.4 Replacing the Load Cell Assembly (with frame)	4-9
4.5 Replacing the Load Cell Component	4-11
4.5.1 Overload Protection Stop Adjustment	4-12
4.6 Replacing the Battery	4-13

CHAPTER 5 PARTS LISTS

5. Parts Lists	5-1
5.1 EC Series Scales Components	5-2

APPENDIX A SERVICE MODES

A. Introduction	A-1
A.1 Entering Service Menu	A-1
A.2 Select Weight Units	A-1
A.3 Select Display Increment	A-2
A.4 Select CAP Value	A-2
A.5 Select Decimal Point Position	A-3

APPENDIX B SERVICE CALIBRATION

B.1 Introduction	B-1
B.2 Calibration	B-1

1. INTRODUCTION

This service manual contains instructions for the diagnosis and repair work to be performed by Ohaus Dealers or Ohaus authorized service centers. Knowledge of the operation of the Scale is assumed. Instruction manuals may be required with this service manual. For complete information on operation, refer to the Instruction Manual.

This manual covers maintenance on the following:

EC Series Scales, Models EC3, EC6, EC15 and EC30

The contents of this manual are contained in five chapters and two Appendixes with service menu and calibration instructions.

Chapter 1 Introduction - Contains information about service facilities, tools, test equipment, test masses, and service strategy.

Chapter 2 Diagnosis - Contains information on problem verification, scale examination, preliminary checks and troubleshooting tables.

Chapter 3 Testing - Contains testing procedures, an interconnection diagram, performance tests, battery tests, specifications and calibration.

Chapter 4 Repair Procedures - Contains detailed repair procedures for all major components.

Chapter 5 Parts Lists - Contains overall views identifying all major serviceable replacement components with associated parts lists.

Appendix A Service Modes - Contains Capacity and Readability for the EC Series Scales in a service mode.

Appendix B Service Calibration - Contains Service Calibration instructions.

1.1 SERVICE FACILITIES

The service area should be a stable environment.

The bench area should be clean and should contain an antistatic mat with a personnel-grounding clip to protect internal circuit boards. The ideal electrical power source for the scales should be a dedicated line to avoid sudden fluctuations or voltage drops caused by external equipment drawing heavy current.

The service area for the scales should be away from direct sunlight, overhead heating or air conditioning ducts, magnetic fields such as motors, large transformers or vibrating sources such as machinery.

The power outlet should be grounded for safety. Sufficient space should be provided around the scale as not to be affected by other equipment. This will ensure that the scale is operated under ideal conditions.

CHAPTER 1 INTRODUCTION

1.2 TOOLS AND EQUIPMENT

1.2.1 Standard Tools and Test Equipment

The service shop should contain the following equipment:

1. Digital Voltmeter (DVM).
2. Standard Electronics tool kit.
3. Desk magnifier on a stand.
4. Grounding mat and clip.
5. Razor blades.

1.2.2 Special Tools

To service the Ohaus EC Series Scales, the following equipment is recommended:

1. A Load Cell Simulator.
2. AC Adapter, 220 V, 60 Hz (US) Ohaus P/N 80120000
3. AC Adapter, 230 V, 50 Hz (EU) Ohaus P/N 80120001
4. AC Adapter, 230 V, 50 Hz (GB) Ohaus P/N 80120002
5. AC Adapter, 240 V, 50 Hz (AU) Ohaus P/N 80120003
6. AC Adapter, 100 V, 50 Hz (JP) Ohaus P/N 80120004
7. AC Adapter, 230V, 50 Hz (KR) Ohaus P/N 80120025

NOTE: Adapters required for servicing are location dependent.

1.3 CALIBRATION MASSES REQUIRED

The masses required to test the EC Series Scales must meet the requirements of ASTM Class 4 or OIML Class F2. The mass values are listed in Table 1-1.

TABLE 1-1. CALIBRATION MASSES

MODEL Cal in kg:	Calibration Masses Totaling
EC3	3kg
EC6	6kg
EC15	15kg
EC30	30kg

Note: The EC Scales can be calibrated over a wide range, however, it is recommended that the calibration mass used is at or near the full capacity of the scale for maximum accuracy.

1.4 SERVICE STRATEGY

The repair method for the EC Series Scales is the direct substitution of major assemblies. The available repair parts are listed in Table 5-1.

The EC Series Scales contains 6 major replaceable assemblies: Top Housing, Membrane Switch, Load Cell Assembly with Frame, Lead Acid Rechargeable Battery, Display PC Board with LCD and the Main PC Board.

NOTE: The Load Cell and LCD may also be ordered and replaced separately.

This service manual contains sufficient information to isolate the problem, replace the component, test and restore the Scale to original factory specifications.

2. DIAGNOSIS

This section contains information needed to properly evaluate the reported problem and diagnose its cause.

2.1 SCALE SETUP AND EXAMINATION

Set up the scale according to the Instruction manual. Allow the scale to stabilize to room temperature. Examine the scale for signs of corrosion or physical damage.

2.2 PRELIMINARY CHECKS

Power up the scale using the customer's ac adapter. In the case where the scale will not power up, check the ac adapter. Observe and record the error codes and software revision. Record all menu settings as received.

2.3 TROUBLESHOOTING TABLES

Troubleshooting tables 2-1 through 2-7 identify actual types of problems that could be encountered with the scale.

The troubleshooting tables refer to an interconnection diagram in Section 3 to assist in locating the problem.

2-1 SCALE WILL NOT TURN ON WITH AC ADAPTER.

SYMPTOM	PROBABLE CAUSE	REMEDY
Scale will not turn on with AC adapter supplied.	Adapter defective.	Refer to Section 3.1 and check the ac adapter voltage output. If voltage is low or nonexistent, replace the ac adapter. If OK, proceed.
	Membrane Switch defective.	Refer to Section 3.2 and test the Membrane Switch. Replace if necessary. See Repair Procedure 4.2
	Main PC Board is defective.	If the scale fails to turn on with a new Membrane Switch, the Main PC Board should be tested in accordance with section 3.4. The Main PC Board if defective should be replaced. See Repair Procedures 4.3. After repair, proceed with Performance Tests in Section 3.6.

TABLE 2-2 SCALE WILL NOT TURN ON USING BATTERY POWER.

SYMPTOM	PROBABLE CAUSE	REMEDY
Scale will not turn on using battery power.	Battery discharged or defective.	Refer to Section 3.5 and test the battery. Replace if necessary. See Repair Procedure 4.6.
	Wiring harness defective or battery clips connection broken.	Refer to section 4.1 and open the scale. Check voltage at battery contacts first. Check dc voltage at the battery connector on the Main PC Board. Voltage should read approximately 6 Volts dc minimum. If voltage is not present at the connector, disconnect the leads from the battery and make a continuity test between the connectors on the Harness to the connector on the Main PC Board. Resistance should be 0 ohms for the red lead and 0 ohms for the black lead. If an open condition exists, replace wiring and connector as necessary. If OK, proceed.
	Membrane Switch defective.	Refer to Section 3.2 and test the Membrane Switch. Replace if necessary. See Repair Procedure 4.2
	Main PC Board is defective.	If the scale fails to turn on with a new Membrane Switch, the Main PC Board should be tested in accordance with Section 3.4. The Main PC Board if defective should be replaced. See Repair Procedures 4.3. After repair, proceed with Performance Tests in Section 3.6.

TABLE 2-3 SCALE DOES NOT RESPOND TO FRONT PANEL CONTROLS.

SYMPTOM	PROBABLE CAUSE	REMEDY
Scale does not respond to front panel controls.	Membrane Switch is defective.	Refer to Section 3.2 and test the Membrane switch. Replace if necessary. See Repair Procedure 4.2. If membrane switches are OK, refer to Section 3.4 and test the Main PC Board. If defective, replace the Main PC Board. See Repair Procedures 4.3. After repair, proceed with Performance Tests in Section 3.6.

TABLE 2-4 NO DISPLAY OR PARTIAL DISPLAY.

SYMPTOM	PROBABLE CAUSE	REMEDY
Display is not on or partial characters are displayed.	<p>Display PC Board is defective or LCD may be defective.</p> <p>NOTE: If the LCD shows signs of damage such as cracked, dim or partial characters, the LCD should be replaced</p>	<p>The Display PC Board is replaced as a whole assembly. Check procedures in Tables 2-1, 2-2 and 2-3 first and verify that other problems do not exist. Then, refer to Section 3.6.1 and test the LCD Display.</p> <p>Replace Display PC Board or LCD. See Repair Procedures 4.3.2. After repair, proceed with Performance Tests in Section 3.6.</p>

CHAPTER 2 DIAGNOSIS

TABLE 2-5 BALANCE READING INCORRECT OR UNSTABLE.

SYMPTOM	PROBABLE CAUSE	REMEDY
Balance reads incorrectly.	Needs calibration.	Perform Service Calibration in Appendix B. If calibration fails, refer to Table 2-6.
Balance reading unstable.	Load Cell is damaged.	Test the Load Cell, refer to Section 3.3. If defective replace, see Section 4.4. After repair, proceed with Performance Tests in Section 3.6.
	Main PC Board defective.	The Main PC Board should be tested in accordance with Section 3.4. The Main PC Board if defective should be replaced. See Repair Procedures 4.3. After repair, proceed with performance Tests in Section 3.6.

TABLE 2-6 CANNOT CALIBRATE THE SCALE.

SYMPTOM	PROBABLE CAUSE	REMEDY
Scale can be turned on but will not calibrate.	Incorrect weights.	Verify that proper weights are used.
	Load cell assembly defective.	Test the Load Cell, refer to Section 3.3. If defective replace, see Section 4.4. After repair, proceed with Performance Tests in Section 3.6.
	Main PC Board defective	The Main PC Board should be tested in accordance with Section 3.4. The Main PC Board if defective should be replaced. See Repair Procedures 4.3. After repair, proceed with Performance Tests in Section 3.6.

2.4 EC SERIES SCALES ERROR CODE TABLE

The EC Series Scales is equipped with software which will display an error condition when it occurs. Review the listed codes and follow instructions to correct the problem.

TABLE 2-7. EC SERIES SCALES ERROR CODES

ERROR CODE	CAUSE	REMEDY
E1, E2, E3 displayed	The pan is placed incorrectly.	Reposition the pan correctly.
	Zero limit exceeded during power up.	Ensure the Pan is empty before switching the scale on.
	Load Cell Assembly Defective.	Test the Load Cell, refer to Section 3.3. If defective replace, see Section 4.4. After repair, proceed with Performance Tests in Section 3.6.
	Main PC Board defective	The Main PC Board should be tested in accordance with Section 3.4. The Main PC Board if defective should be replaced. See Repair Procedures 4.3. After repair, proceed with Performance Tests in Section 3.6.
--OL-- displayed	Load exceeds scale capacity.	Reduce the load on the Pan.
	Load Cell Assembly Defective.	Test the Load Cell, refer to Section 3.3. If defective replace, see Section 4.4. After repair, proceed with Performance Tests in Section 3.6.
	Main PC Board defective	The Main PC Board should be tested in accordance with Section 3.4. The Main PC Board if defective should be replaced. See Repair Procedures 4.3. After repair, proceed with Performance Tests in Section 3.6.

CHAPTER 2 DIAGNOSIS

3. TESTING AND CALIBRATION

This section of the manual contains testing procedures of the individual replaceable components and the scale. Before and after servicing the EC Series Scales, an operational test and various performance tests should be made to ascertain whether or not the scale meets specifications.

3.1 TESTING THE AC ADAPTER

The AC Adapters are available with different input voltages. Before testing the Adapter, make sure the Adapter rating agrees with the power source being used. All Adapters are rated with an output of 12 V dc at 800mA. Adapters can fail by having shorted internal windings producing low voltage output or no output at all.

1. Plug the AC Adapter in a suitable power source and measure the open circuit voltage on connector it should be 10 V dc to 16 V dc.
2. Refer to Section 4.1 and remove the Top Housing. Plug the AC Adapter into the scale and measure the voltage on the battery terminals. Turn the scale on. The voltage should be 6.5 Volts dc minimum, and 7.5 Volts dc maximum. If the voltage is below or above these readings, replace the Adapter. This is the actual battery voltage while charging.

3.2 TESTING THE MEMBRANE SWITCH

The Membrane Switch can be tested after removing the Top Housing from the Bottom Housing.

1. Refer to Section 4.1 and remove the Top Housing.
2. Disconnect the Membrane Switch connector from the Display PCB.
3. Refer to Table 3-1. Using an Ohmmeter, measure the resistance between the pins shown in the table. The readings should be less than 70 Ohms for each button. If continuity is not present or the resistance is higher than 100 Ohms, the Membrane Switch is defective. Replace the Membrane Switch. Figure 3-1 illustrates the cable connector and pin locations.
4. Reassemble Top Housing to Bottom Housing.

TABLE 3-1. MEMBRANE SWITCH PIN CONNECTIONS.

PANEL BUTTON	PINS
SAMPLE	8 to 3
TARE	9 to 3
M+	6 to 1
PT	7 to 1
APW	6 to 2
ZERO	7 to 2
•	9 to 5
C	9 to 4
0	9 to 2
1	8 to 2
2	8 to 5
3	8 to 4
4	7 to 5
5	7 to 4
6	7 to 3
7	6 to 5
8	6 to 4
9	6 to 3

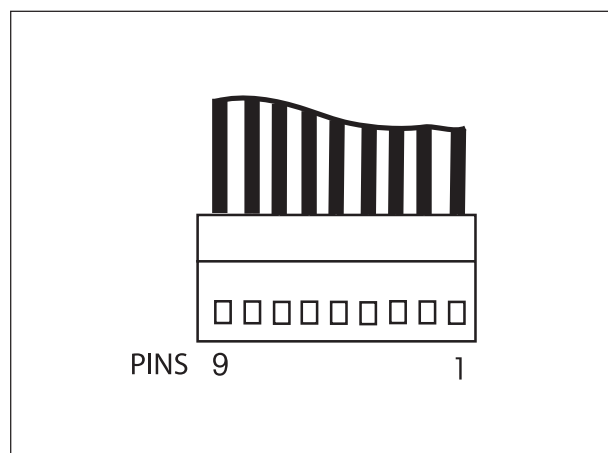


Figure 3-1. Membrane Switch Connector.

CHAPTER 3 SCALE TESTING AND CALIBRATION

3.3 TESTING THE LOAD CELL ASSEMBLY

This section contains two methods of testing the Load cell.

3.3.1 Resistance Test

1. Refer to Section 4.1 and remove the Top Housing.
2. Refer to Figure 3-2 and record color code and position of the wires from the Load Cell.
3. Unsolder the Load Cell cable from the Main PC Board. Using an Ohmmeter, measure in accordance with Table 3-2 Load Cell Resistance Readings on the cable. If the resistance readings vary more than the table readings allow, replace the Load Cell in accordance with the procedure in Section 4.4 or 4.5. This resistance test is useful in determining if the Load Cell has been severely damaged by a short or open circuit which has occurred on the cell or wiring. If the Load Cell resistance readings are good, continue with this procedure.

TABLE 3-2 LOAD CELL RESISTANCE READINGS

MEASUREMENT POINTS	READING
Wires 2 & 5	415 \pm 15 Ohms
Wires 3 & 4	350 \pm 3 Ohms

NOTE: Wires 2, 3, 4 and 5 must be isolated from chassis ground and shield. Resistance should be greater than 5 megohms. A lower reading indicates a short in either in the Load Cell cable or the Load Cell.

4. Reconnect Load cell cable to the Main PCB.

3.3.2 Excitation and Output Voltage Test

NOTES: 1. The following steps involve power applied to the scale.
2. Load Cell solder contacts can be used as measuring points. See Figure 3-2.

1. Insert the Pan Support into the Load Cell Frame and place the Pan on top.
2. Turn on power to the scale.
3. With no load on the Pan, first measure the excitation voltage across point 2 and 5 Load Cell connection on the PCB. This voltage must be 5.0 Volts dc with the Load cell connected. If the voltage is lower, disconnect the Load Cell cable from the PC Board and measure again. If the voltage is 5 Volts dc, the Load Cell is defective and must be replaced. If the voltage remains low, the PC Board is defective and the Main PC Board must be replaced. For Main PC Board replacement, see Section 4.3.

3.3.2 Excitation and Output Voltage Test (Cont.)

- Refer to Figure 3-2 and measure the voltages on points 3 and 4, +SIG and –SIG points. These measurements represent the output of the Load Cell. Repeat measurements at 50% and full scale capacities. See Table 3-3 for typical readings.

NOTE: Table 3-3 indicates typical readings, actual values can vary, but should remain linear throughout the entire range.

If readings are out of tolerance, replace the Load cell. See Section 4.4 or 4.5 for Load Cell replacement.

TABLE 3-3. LOAD CELL OUTPUT READINGS.

NOMINAL OUTPUT IN MILLIVOLTS AT 5 VOLTS EXCITATION			
CAPACITY	NO LOAD	50%	100%
3 kg	2.7 \pm 1.5	no load + 3.2	no load + 6.4
6 kg	1.9 \pm 1.5	no load + 4.4	no load + 8.8
15 kg	1.2 \pm 1.5	no load + 5.2	no load + 10.3
30kg	0.5 \pm 1.5	no load + 4.9	no load + 10.4

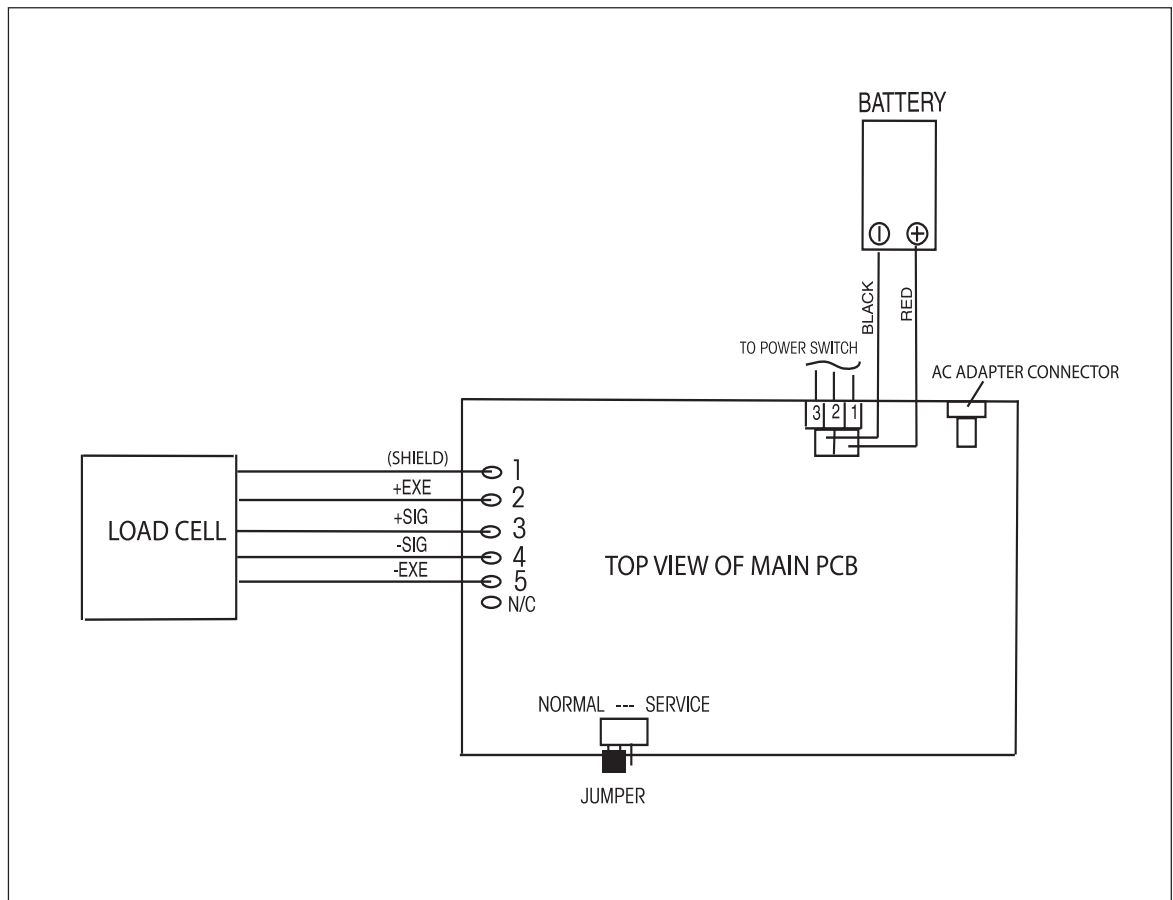


Figure 3-2. EC Series Scales Interconnection Diagram.

CHAPTER 3 SCALE TESTING AND CALIBRATION

3.4 TESTING THE MAIN PC BOARD

The Main PC Board 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.

3.4.1 Main PC Board Voltage Measurements

Prior to making the voltage measurements, the battery should have been fully charged and tested.

1. Disconnect power from the scale.
2. Remove the Top housing, refer to Section 4.1 and leave the Membrane Switch connected to the scale.
3. Disconnect the battery from the Main PC Board.
4. Remove screws and washers holding the Main PC Board and lift the board and lay flat.
5. Connect the AC Adapter to the scale.
6. Refer to Figure 3-2, Interconnection Diagram which illustrates the interconnections to the Main PC Board and is shown as a top view.
7. Turn the scale on.
8. Using a DVM, measure the excitation voltage across +EXE and -EXE leads it should be 5 volts dc. This is the excitation voltage for the Load Cell and is regulated. If the voltage is lower, replace the Main PC Board, refer to Section 4.3 and then proceed with Performance Tests in accordance with Section 3.6.
9. Measure incoming power from the AC Adapter connector shown in Figure 3-2. The voltage should read above 6 Volts dc with power on.
10. Connect the battery to the Main PC Board and measure the voltage across Black and Red leads on the battery connector. The full battery voltage should read a minimum of 6.0 Volts dc. If the voltage is lower, the battery may require charging or it may be defective. Refer to section 3.5 and test the battery.
11. Perform simulator testing.

3.4.2 Simulator Testing

To perform these tests, the use of a Simulator is required. The basic 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. The Load Cell used in the scale is rated at 2mV/V output with a 5 Volt excitation voltage applied.

General Load Test

This test checks the Main PC Board circuitry by simulating accurate load cell voltages at 0%, 50% and 100% load capacities.

1. Disconnect power from the scale.
2. Remove the Top housing, refer to Section 4.1 and leave the Membrane Switch connected to the scale.
3. Disconnect the battery.
4. Unsolder the Load Cell cable from the Main PC Board. Refer to Figure 3-2 for location.
5. With the Simulator set to zero, connect the Simulator test leads to the Main PCB by soldering test leads in place of the load cell. Make sure connections are correct.
6. Connect a known good AC Adapter to the scale and connect to a power source.
7. Turn on the scale, an error may be displayed. This is normal.
8. Review Table 3-3 and adjust the Simulator to simulate 0% load, 50% load and 100% load for the rated capacity of the scale. If the resulting readings are unstable, the Main PC Board is defective. Use the Simulator to calibrate the scale in the next procedure to verify if the Main PC Board is good or bad.

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 and the Membrane Switch connected, enter calibration mode by pressing and holding the **Zero** switch until CAL is displayed and perform calibration.
2. Follow the scale prompts. When the scale indicates a given weight should be placed on the scale, set the simulator to an equivalent value based on Table 3-3. For example, when a span value of 3 kg for a 3 kg scale is shown, the simulator should be set to output 9.1mV (2.7 + 6.4).

CHAPTER 3 SCALE TESTING AND CALIBRATION

Calibration Test (Cont.)

3. Upon completion of calibration, the Main PC Board can be further checked using the Simulator to simulate various weight values. If simulator settings and weight reading on the scale agree, the Main PC Board is functional. If the scale readings vary, or do not agree with readings in Table 3-3, the Main PC Board is defective and should be replaced.
4. Remove power from the scale and proceed with Section 4.3 and replace the Main PC Board.
5. After Main PC Board replacement and assembly of the scale, proceed with Performance Tests in Section 3.6.

3.5 TESTING THE BATTERY

The EC Series Scales contains a rechargeable, 6.0 Volt, 5.0 Ampere rated, Lead-Acid Battery.

3.5.1 Precautions for Battery Handling

WARNING DEATH OR SERIOUS INJURY CAN OCCUR



- **Charge the battery only with the charger in the scale. Charging the battery under any other conditions may cause the battery to overheat, emit hydrogen gas, Leak, ignite or burst.**
- **Operate the battery at normal temperature range as specified for the scale.**
- **Do NOT short the battery terminals under any conditions.**
- **Do NOT dispose of the battery in incinerators, or crush or try to open. Dispose of the defective battery in accordance with local regulations for lead-acid type batteries.**

CAUTION



- **Check the battery for any sign of irregularities in appearance. If there is any damage to the case such as cracks, deformation or leakage, replace the battery with a new one.**
- **Do NOT charge the battery with the charger terminals reversed.**

3.5.2 Battery Tests

A new battery when installed in the EC Series Scales will provide many years of useful service. The length of service depends upon the type of use of the scale. If left connected to the AC Adapter all of the time, the battery receives a small charge when the battery voltage is low, service life can be many years.

The EC Series Scales can be operated for up to 80 hours per charge. Battery life can be maximized by frequent charging.

1. Upon receipt of the scale, plug in the AC Adapter to a power source and the scale. Allow the battery to charge. If the battery required a charge, the battery indicator on the front of the LCD display will indicate charging. Green indicates fully charged, yellow indicates a partial charge and red, indicates the battery is nearly discharged.
2. Refer to Section 4.1 and remove the Top Housing. Leave the Membrane Switch on the cover connected to the scale.

3.5.2 Battery Tests (cont.)

3. With the AC Adapter connected, measure the battery voltage at the battery terminals; the voltage should be approximately **6 to 7 Volts dc** when charging. The voltage should be above **6.0 Volts dc** ten minutes after charging stops.

NOTE: If the scale operates less than 80 hours, charge the battery and turn on the scale and test how long the scale operates. If the scale operates less than 40 hours with no backlight, the battery should be replaced. This is 50% capacity.

4. If the battery requires replacement, refer to Section 4.6, charge the new battery overnight and check scale performance.

CHAPTER 3 SCALE TESTING AND CALIBRATION

3.6 PERFORMANCE TESTS

Accurate performance of the EC Series Scales is determined by a series of three performance tests, Repeatability Test, Off-Center Load Test and Linearity Test. These tests are used to evaluate the scale performance before and after repairs. Each scale tested must meet the requirements specified in each test as well as the specifications listed in Table 3-4. A scale passing each of these three tests complies with Ohaus specifications. A segment display test determines if the display is working properly.

3.6.1 Segment Display Test

Connect the AC Adapter into a suitable power source and connect it to the scale. Turn the scale on, all 999999 segments are displayed followed by a countdown of 8's, 7's, 6's and so on until all zeros are reached briefly followed by a software revision number. This is a segment display test. Figure 3-3 illustrates the starting of the display test.



Figure 3-3. Segment Display.

3.6.2 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 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 adjust and record the following setting.

- A. Set the Filter level to 1.
- B. Set the AZT (Auto Zero Tracking) to 1d.
- C. Set the scale to display the same units as the performance specifications.
- D. Set the Zero return to 0.

Record Settings:

Filter Level Setting = _____

Auto Zero Tracking Setting = _____

Displayed Units = _____

Zero Return = _____

Mass Used = _____

3.6.2 Repeatability Test (Cont.)

Test Procedure:

1. Zero the scale.
2. Using a test mass approximately 1/2 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 this worksheet with the ten (10) readings.

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 = The Square root of (the sum of the (Delta x Delta) / 9)

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

$$\text{Mean} = \frac{(\text{Reading 1} + \text{Reading 2} + \text{Reading 3} + \text{Reading 4} + \text{Reading 5} + \text{Reading 6} + \text{Reading 7} + \text{Reading 8} + \text{Reading 9} + \text{Reading 10})}{10}$$

Mean = _____

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

$$\text{Delta} = \text{Reading} - \text{Mean}$$

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 = _____

CHAPTER 3 SCALE TESTING AND CALIBRATION

3.6.3 Off-Center Load Test

The Off-Center Load Test is used to determine whether displayed weight values will be affected by moving the sample to different areas of the weighing surface. See Figure 3-4.

This test must be performed using a single mass or the masses must be stacked.

1. Zero the scale.
2. Place a mass equal to 1/3 of the full-scale capacity in the center of the weighing surface. Press the **ZERO** button to return the reading to zero.
3. Slide the mass halfway between the center and the rear edge of the platform, and record the reading.
4. Slide the mass to the center of the weighing surface and press the **ZERO** button to return the reading to zero.
5. Slide the mass halfway between the center and the left edge of the platform, and record the reading.
6. Slide the mass to the center of the weighing surface and press the **ZERO** button to return the reading to zero.
7. Slide the mass halfway between the center and the right edge of the platform, and record the reading.
8. Slide the mass to the center of the weighing surface and press the **ZERO** button to return the reading to zero.
9. Move the mass halfway between the center and the front edge of the platform, and record the reading.
10. Maximum reading should be less than or equal to the OCL specifications for the scale.

Reading toward Rear	_____
Reading toward Left	_____
Reading toward Right	_____
Reading toward Front	_____
Maximum Reading	_____

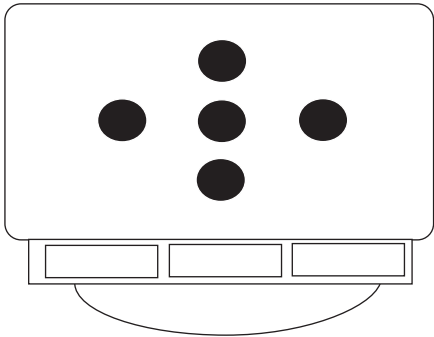


Figure 3-4. Off-Center Load Test Weight Locations.

3.6.4 Linearity Test

The linearity test is used to determine the linearity of the scale throughout its operating range. The results should be in accordance with the specifications shown above. The reference mass should be approximately 1/8 of the full-capacity of the scale.

NOTE: The scale must pass the Off-Center Load test and Repeatability Test **before** the Linearity Test is performed.

BE CERTAIN TO USE THE SAME REFERENCE MASS THROUGHOUT THE LINEARITY TEST.

1. Press **ZERO** to zero the display.
2. Place the reference mass on the center of the platform and record the exact value (all decimal places) displayed.
3. Remove the reference mass and verify that the display returns to zero. If it does not, disregard the reading, press **ZERO** to rezero the display, and take the reading again.
4. Place a mass equal to 1/4 of the full scale capacity on the platform and press **ZERO**.
5. Add the reference mass to the center of the platform and record the exact value displayed.
6. Remove the reference mass and verify that the display returns to zero. If it does not, disregard the reading, press **ZERO** to rezero the display, and take the reading again.
7. Place a mass equal to 1/2 of the full-scale capacity on the platform and press **ZERO**.
8. Add the reference mass to the center of the platform and record the exact value displayed.
9. Remove the reference mass and verify that the display returns to zero. If it does not, disregard the reading, press **ZERO** to rezero the display, and take the reading again.
10. Place a mass equal to 3/4 of the full scale capacity on the platform and press **ZERO**.
11. Add the reference mass to the center of the platform and record the exact value displayed.
12. Remove the reference mass and verify that the display returns to zero. If it does not, disregard the reading, press **ZERO** to rezero the display, and take the reading again.
13. Calculate the weight differences between the reading as shown in the recorded readings.
14. The Maximum difference should be less than or equal to the Linearity specification for the scale.

CHAPTER 3 SCALE TESTING AND CALIBRATION

3.6.4 Linearity Test (cont.)

Record Readings

Reading 1 reference weight added to zero _____

Reading 2 reference weight added at 1/4 full-scale capacity _____

Reading 3 reference weight added at 1/2 full-scale capacity _____

Reading 4 reference weight added at 3/4 full-scale capacity _____

Calculate Differences

Reading 1 – [(Reading 1 + Reading 2) / 2] = _____

Reading 2 – [(Reading 2 + Reading 3) / 2] = _____

Reading 3 – [(Reading 3 + Reading 4) / 2] = _____

Maximum Difference _____

3.7 SPECIFICATIONS

TABLE 3-4. EC SCALE SPECIFICATIONS.

Model	EC3	EC6	EC15	EC30
Capacity x Readability	3000 g x 0.1 g 6 lb x 0.0002 lb	6000 g x 0.2 g 15 lb x 0.0005 lb	15000 g x 0.5 g 30 lb x 0.001 lb	30000 g x 1 g 60 lb x 0.002 lb
Repeatability (Std. dev) (g)	±0.2g	±0.4g	±1g	+2g
Linearity (g)	±0.2g	±0.4g	±1g	+2g
Off Center Load	±0.2g	±0.4g	±1g	+2g
Maximum Displayed Resolution	1:30000	1:30000	1:30000	1:30000
Min Recommended Sample Weight	1 g / 0.002 lb	2 g / 0.005 lb	5 g / 0.01	10 g / 0.02 lb
Min Recommended APW	0.01 g / 0.00002 lb	0.02 g / 0.00005 lb	0.05 g / 0.0001 lb	0.1 g / 0.0002 lb
Construction	Stainless steel pan, plastic housing			
Weighing Units	g, lb			
Application Modes	Weighing, Counting, Accumulation			
Display	3-Window, 19 mm / 0.75" High, 6-digit, 7-segment backlit LCD display			
Display Indicators	Stability, Center of Zero, Tare, Low Sample Weight, Low APW, Accumulation, Battery status			
Memories	10 locations for APW			
Keyboard	7 function, 11 numeric x Membrane switch: Tare, Sample, APW, Zero, Pre-set Tare, M+, Cancel			
Zero Range	4% of Full Scale Capacity			
Tare Range	Full Capacity by Subtraction (except EC15, up to 10kg only)			
Stabilization Time	≤ 2 seconds			
Operating Temperature	0° to 40°C			
Humidity Range	≤90% relative humidity, non-condensing			
Power	AC Adapter 12V DC / 800mA Internal rechargeable lead acid battery			
Battery Life	80 hours continuous use with 12 hour recharge time			
Calibration	Automatic external with kg or lb mass			
Shipping Protection	Shipping screw to avoid damage to sensitive components			
Safe Overload Capacity	120% of capacity			
Pan Size	294 x 226 mm / 11.6 x 8.9 in.			
Scale Dimensions W x H x D	325 x 114 x 330.5 mm / 12.8 x 4.5 x 13 in.			
Shipping Dimensions W x H x D	440 x 160 x 360 mm / 17.3 x 6.3 x 14.2 in.			
Net Weight	4.2 kg / 9.2 lb			
Shipping Weight	5.3 kg / 11.7 lb			
Other Features	Auto-Zero Tracking, Filtering Level, Auto-Optimization of APW			

CHAPTER 3 SCALE TESTING AND CALIBRATION

3.8 CALIBRATION

Calibration – The EC Series' calibration can be calibrated using full scale capacity as the best method for the most accurate results, this is referred to as span calibration.

Calibration Weights – Before beginning calibration, make sure that the required calibration weights are available. The model-specific calibration points are listed in the Table 3-5.

3.8.1 Calibration Points

TABLE 3-5. CALIBRATION POINTS.

Model	Calibration Unit	Span Calibration
EC3	kg	3 kg
	lb	6 lb
EC6	Kg	6 kg
	lb	15 lb
EC15	Kg	15 kg
	lb	30 lb
EC30	kg	30 kg
	lb	60 lb

NOTES: 1. Calibration Units kg or lb are selected in the (Setup mode) sub-menu.

2. ASTM Class 4 or OIML Class F2 weights are required for calibration.

3.8.2 Span Calibration

1. Enter calibration by holding down the **Zero** button until CAL is displayed in the Count window.
2. The required calibration weight is displayed (ex. 3000g for a 3kg model). At this time, a different calibration weight value can be entered via the numeric keypad.
3. Place the corresponding calibration weight on the Pan. the display flashes until the actual weight is registered and the calibration process ends (the scale momentarily beeps before exiting to normal weighing mode).

NOTE: 1. Different values of calibration masses can be used on the EC scale, however, it is recommended that the calibration mass used is close to or matches the maximum capacity of the scale for best accuracy.

2. The calibration procedure can be canceled at any time by pressing the **Zero** button.

3.9 SCALE SETTINGS

The EC scale contains eight user-selectable scale settings (Setup mode). These are as follows: Auto-Off, Zero Tracking Range, Zero Display Range, Filtering, Zero Return Range, Backlight, Unit selection and APW Re-computing. A description of each setting is explained below.

1. To enter the setup mode, press **Tare** until A.OFF is displayed.
2. Press **Sample** to step through settings and press **Tare** to accept the displayed setting and proceed to the next setup parameter.
3. Press **C** at any time to exit from the setup mode.
4. Restart the scale after changing settings in the setup mode.

A.OFF	Zero	Zero	Filter	Zero	BL	Unit	APW
0=Off 2 Min. 5 Min. 8 Min.	0=Off 1=0.5d 2=1d 3=2d 4=3d (d=scale division)	0=Off 1=0.5d 2=1d 3=2d 4=3d (d=scale division)	0 1 2 3 4 5 (Level)	0 1 2 3 4 5 (Level)	0=Auto On 1=Manual	0=Grams (g) 1=Pounds (lb)	0=Off 1=On

A.OFF **Auto-Off** - Sets the period of inactivity before the scale automatically turns off.

Zero **Zero Tracking Range** - Sets the range in which the zero reading is maintained.

Zero **Zero Display Range** - Sets the range in which the Zero indication turns on.

Filter **Filtering** - Sets the level in which the stable indication turns on; the higher the setting, the faster the stabilization time.

Zero **Zero Return Range** - Sets the level in which the zero point is stable; the higher the setting, the more stable.

BL **Backlight** - Sets the activation mode of the backlight.

Unit **Unit Selection** - Sets the active weighing unit.

APW **APW Re-computing** - Sets the APW re-computing mode. Optimizes piece weight accuracy by automatically re-computing the existing APW as further pieces (less than the original quantity on the pan) are added (a beep will sound in this event).

CHAPTER 3 SCALE TESTING AND CALIBRATION

4. REPAIR PROCEDURES

This section describes how to change individual components of the EC Series Scales. When doing this, please refer to the drawings and parts lists in Section 5.

Important: After replacing components, an operational test of the scale must always be carried out, (see Section 3.6).

4.1 REMOVING TOP HOUSING

To gain access to the components in the scale, perform the following procedures.

1. Remove power from the scale by disconnecting the AC adapter. Make sure the scale is off.
2. Carefully lift and remove the Pan and Pan Support from the scale.
3. Turn the scale over and remove the five screws, which hold the Top Housing. Refer to Figure 4-1.

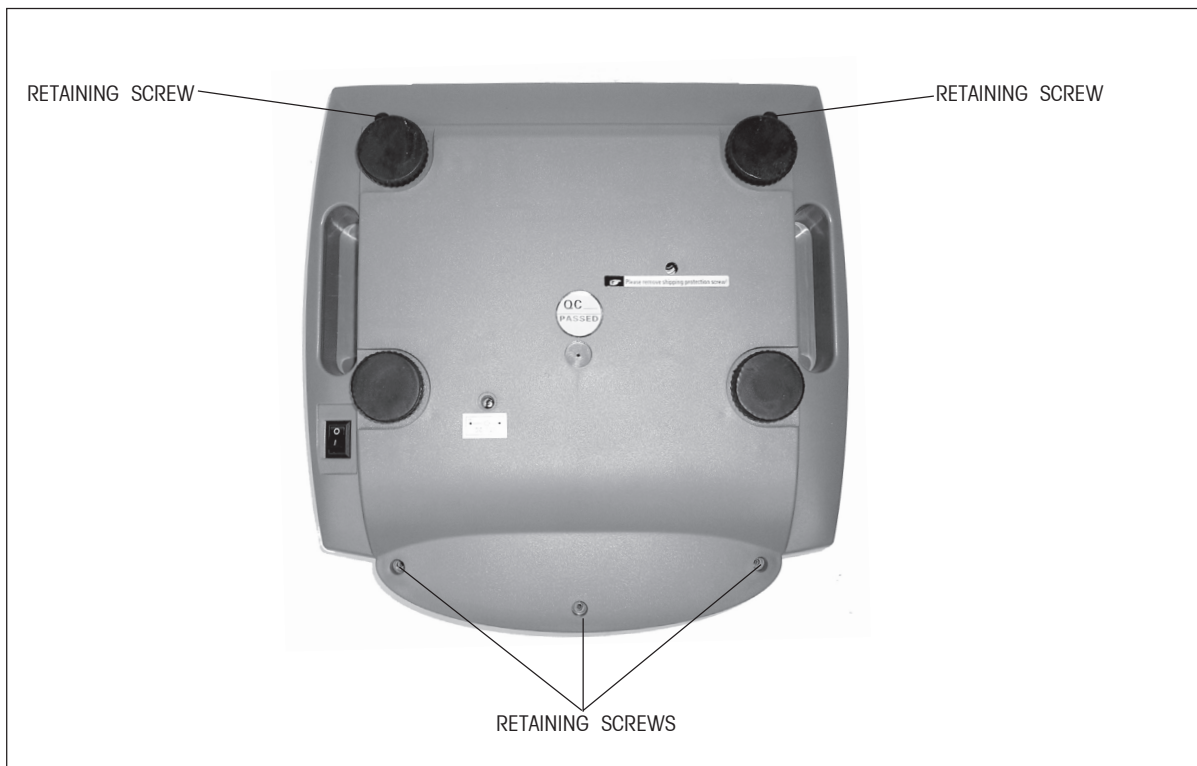


Figure 4-1. Top Housing Retaining Screws Location.

CAUTION

Use care in the next step as the Display PCB wiring is attached to the Main PC board.

4. Place the scale in the upright position and carefully lift the Top Housing from the Base and tilt forward. Reach under the Top Housing from the front and carefully disconnect the flexible cable from connector on the Display PC board.
5. Set the Top Housing aside.

CHAPTER 4 REPAIR PROCEDURES

4.2 REPLACING THE MEMBRANE SWITCH

The membrane switch is affixed to the Top Housing of the scale. To replace the Membrane Switch, the scale must be disassembled to gain access to the switch connections.

1. Refer to Section 4.1 and remove Top Housing.

CAUTION

Use care in the next step as the Display PCB wiring is attached to the PC board.

2. Place the scale in the upright position and carefully lift the Top Housing from the Base Housing.

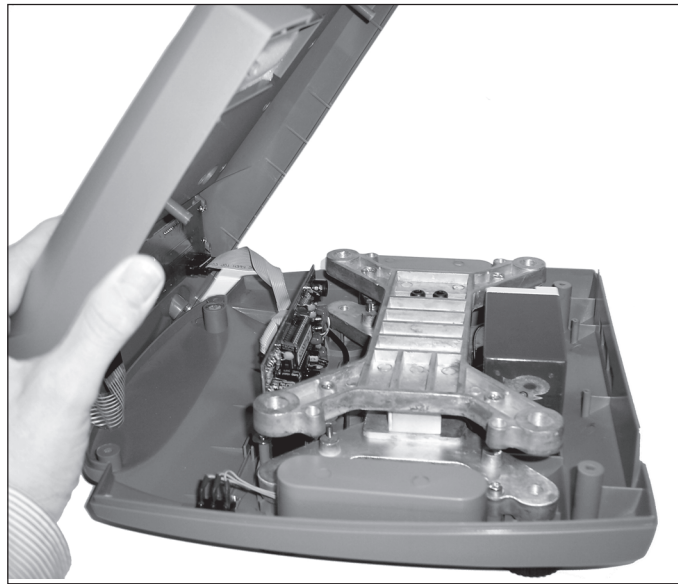


Figure 4-2. Removing the Top Housing.

3. Carefully disconnect the ribbon cable from connector on the Display PC board. See Figure 4-3.

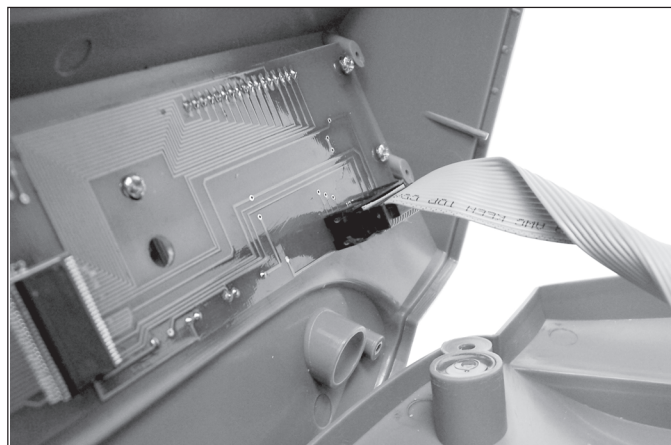


Figure 4-3. Disconnecting the Ribbon Cable.

4.2 REPLACING THE MEMBRANE SWITCH (Cont.)

4. Disconnect the Membrane Switch Cable from the Display PCB as shown in Figure 4-4.

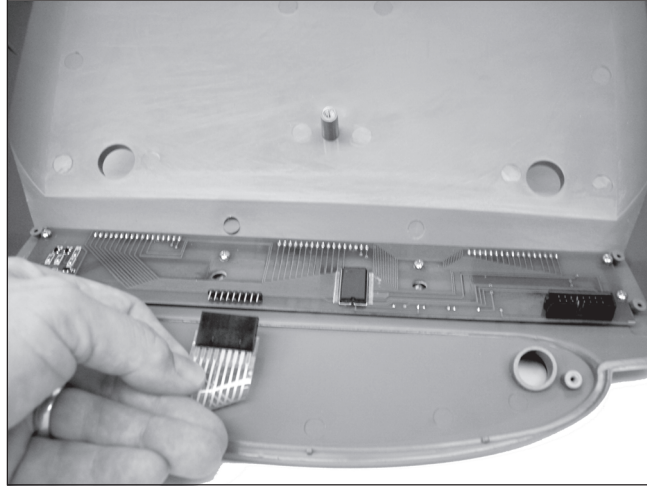


Figure 4-4. Disconnecting the Membrane Switch Cable.

5. On the Top Housing, lift up the defective Membrane Switch (if necessary carefully prying it up with a knife) and gently peel it off the Top Housing.
6. Carefully clean the Top Housing membrane switch area (removing all traces of adhesive). The best method is to use a flat razor blade.
7. Insert the cable from the new Membrane Switch through the hole in the Top Housing. Peel off the protective film from the new Membrane Switch and carefully align and affix to the Top Housing.
8. Press the Membrane Switch down uniformly. Using your fingers with a cloth, roll from the center of the Membrane Switch outward towards the edges to remove any air bubbles that may be trapped.
9. Position the Top Housing in place over the Bottom Housing and connect the flexible cable from the Main PC Board to Display PC Board.
10. Reassemble the scale by replacing the five screws at the bottom of the scale which secure the Top housing.
11. Replace the Pan Support and Pan on top of the scale.

CHAPTER 4 REPAIR PROCEDURES

4.3 MAIN PC BOARD

The Main PC Board is located in the Bottom Housing. To replace the Main PC Board, it is necessary to disassemble the scale.

4.3.1 Main PC Board Replacement

1. Refer to Section 4.1 and remove the Top Housing.
2. At the rear of the Bottom Housing, disconnect the Red battery lead from the Battery. See Figure 4-5 for location. This is necessary to prevent damage to the circuitry and the Battery if the wiring is accidentally shorted during servicing.



Figure 4-5. Battery Terminal Connector.

Note the positioning of the cable for reassembly.

3. Remove the screws and washers holding the Main PC Board in place. See Figure 4-6.
4. Disconnect the Display Cable coming from the Display PC Board on the Main PC Board.

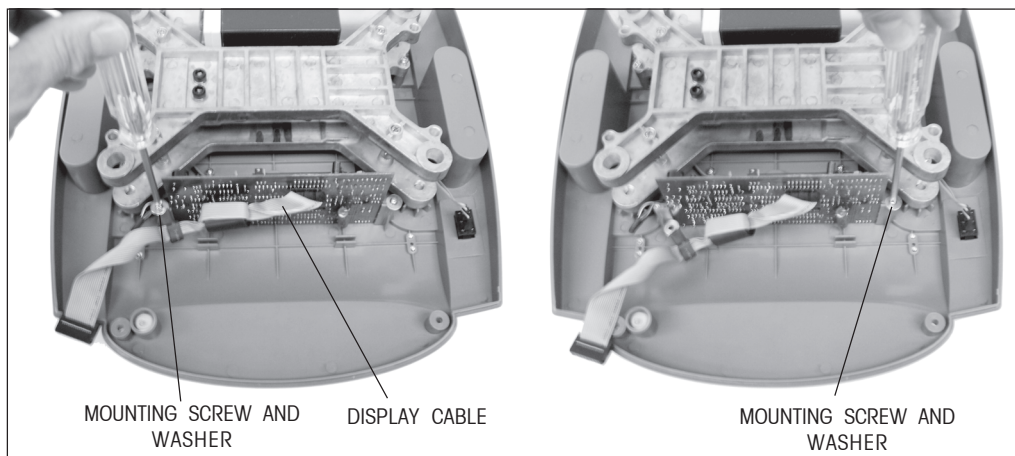


Figure 4-6. Main PC Board Screws and Washers Removal.

5. Carefully lift the Main PC Board up and out of the slots in the supporting posts. You may have to rock the Main PC Board from left to right to lift the board out.

4.3.1 Main PC Board Replacement (Cont.)

6. Remove the Battery connector plug from the Main PC Board and the connector that connects to the On/Off Switch. See Figure 4-7.

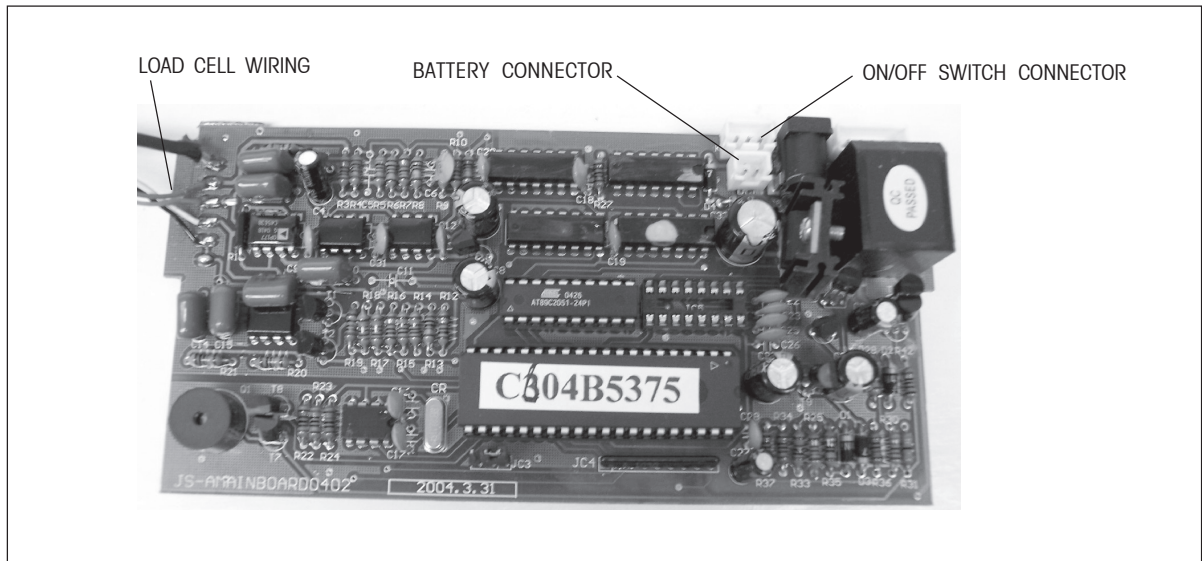


Figure 4-7. Disconnecting Battery and On/Off Switch Connectors from Main PC Board.

7. Unsolder the Load Cell wiring from the Main PC Board. Note the position and color coding of the wires on the main PC Board. These will have to be soldered on the new PC Board in the same positions.
8. On the replacement Main PC Board, install the Battery and Switch connectors.
9. Refer to Figure 3-2 and solder the Load Cell wiring to the replacement Main PC Board. Make sure that the color coded wiring is installed in the correct locations.
10. Connect the Display Cable to the Main PC Board connector. See Figure 4-8.

CAUTION: THE DISPLAY CABLE CONNECTOR MUST BE CORRECTLY INSTALLED WITH THE TAB FACING UP.

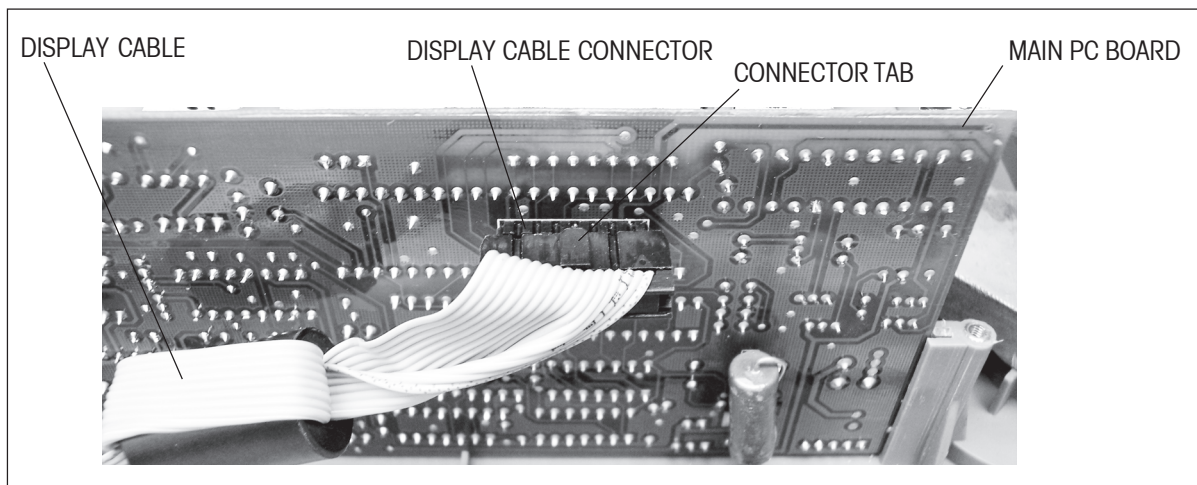


Figure 4-8. Installing Display Cable to Main PC Board.

CHAPTER 4 REPAIR PROCEDURES

4.3.1 Main PC Board Replacement (Cont.)

11. Install the Main PC Board into position in the slots on the Bottom Housing and secure with the screws and washers previously removed.

12. Connect the Battery connector to the Battery.

NOTE: When a replacement Main PC Board is installed, the scale must be put into a service mode first to enter parameters such as capacity and readability. Calibration must also be performed, see Appendix A and Appendix B.

13. Refer to Figure 4-9 and move the Main PC Board Jumper from normal to service position.

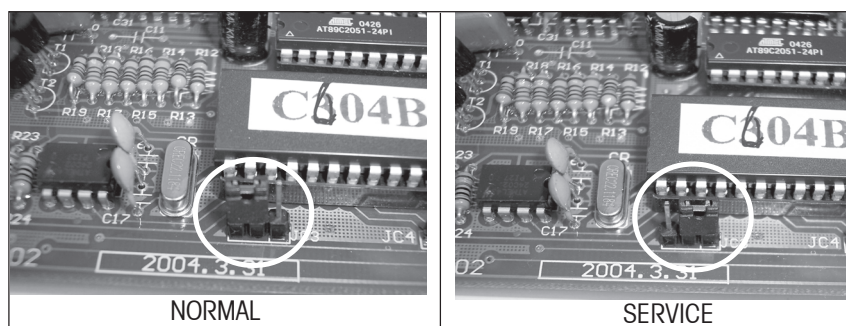


Figure 4-9. Main PC Board Jumper Positions.

14. Position the Top Housing in place over the scale temporarily and install the Pan Support and Pan in place.

15. Set the capacity and readability, see Appendix A.

16. Calibrate the scale according to the Instructions in Appendix B. After calibration, turn off the scale and replace the jumper into the normal position.

17. Reassemble the scale and replace the Pan Support and Pan on top of the scale.

18. Turn the scale on. It will go through all the self-testing and operate normally.

19. After repair, initiate Performance Tests, see Section 3.6.

4.3.2 Display PC Board Replacement

1. Refer to Section 4.1 and remove the Top Housing.
2. Disconnect the Ribbon Cable from the Display PC board. See Figure 4-10.

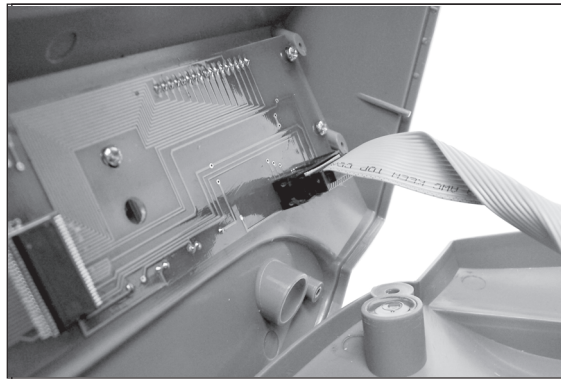


Figure 4-10. Disconnecting the Ribbon Cable.

3. Disconnect the Membrane Switch Cable from the Display PC Board. See Figure 4-11.

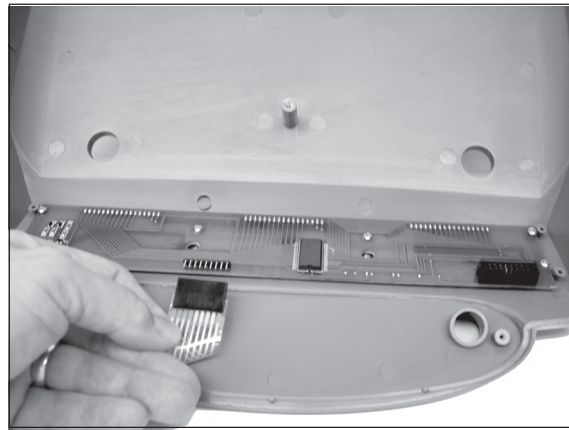


Figure 4-11. Disconnecting the Membrane Switch Cable from the Display PC Board.

4. Remove the six screws that hold the Display PC Board to the Top Housing. See Figure 4-12.

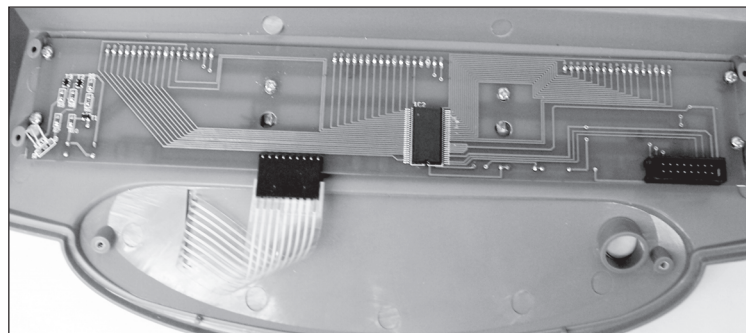


Figure 4-12. Removing Screws from the Display PC Board.

5. Examine the replacement Display PC board and remove all protective plastic film that may be covering the LCD displays.

CHAPTER 4 REPAIR PROCEDURES

4.3.2 Display PC Board Replacement (Cont.)

6. Install the replacement Display PC board with the six screws previously removed.
7. Connect the Membrane Switch Cable from the Top Housing to the Display PC Board and the Ribbon Cable from the Main PC Board to the Display PC Board.
8. Reassemble and test the scale according to Performance Tests in section 3.6.

4.3.3 LCD Replacement

This procedure is performed when an LCD shows signs of visible damage such as a cracked glass or partial display and the scale operates normally in all other functions.

NOTE: This procedure is very difficult and should not be attempted unless you have the proper tools.

1. Perform steps 1 through 4 of Section 4.3.2.
2. Carefully unsolder all contacts of the defective LCD and remove the LCD. All solder holes on the Display PC board must clean and open to accept the pins of the LCD.
3. Solder all connections, check the Display PC Board and make sure that solder has not spilled over to other connections. Remove any protective film from the LCD and replace the LCD.
4. Continue with steps 6 through 8 of Section 4.3.2.

4.4 REPLACING THE LOAD CELL ASSEMBLY (WITH FRAME)

The Load Cell Assembly is centrally located inside the scale. The Load Cell is factory assembled and the overload protection stops are installed. The overload protection stops should be checked before installation.

1. Refer to Section 4.1 and remove Top Housing.
2. Turn the scale over and remove the four feet by unscrewing them counter-clockwise. The feet are actually screwed into the Load Cell Frame.



Figure 4-13. Bottom of Scale Feet.

3. Refer to Section 4.3.1 and perform steps 1 through 7 to gain access to the Load Cell wiring on the Main PC Board and unsolder the connections.
4. Remove the four screws holding the Load Cell Assembly to the bottom housing. See Figure 4-14 for screw locations.

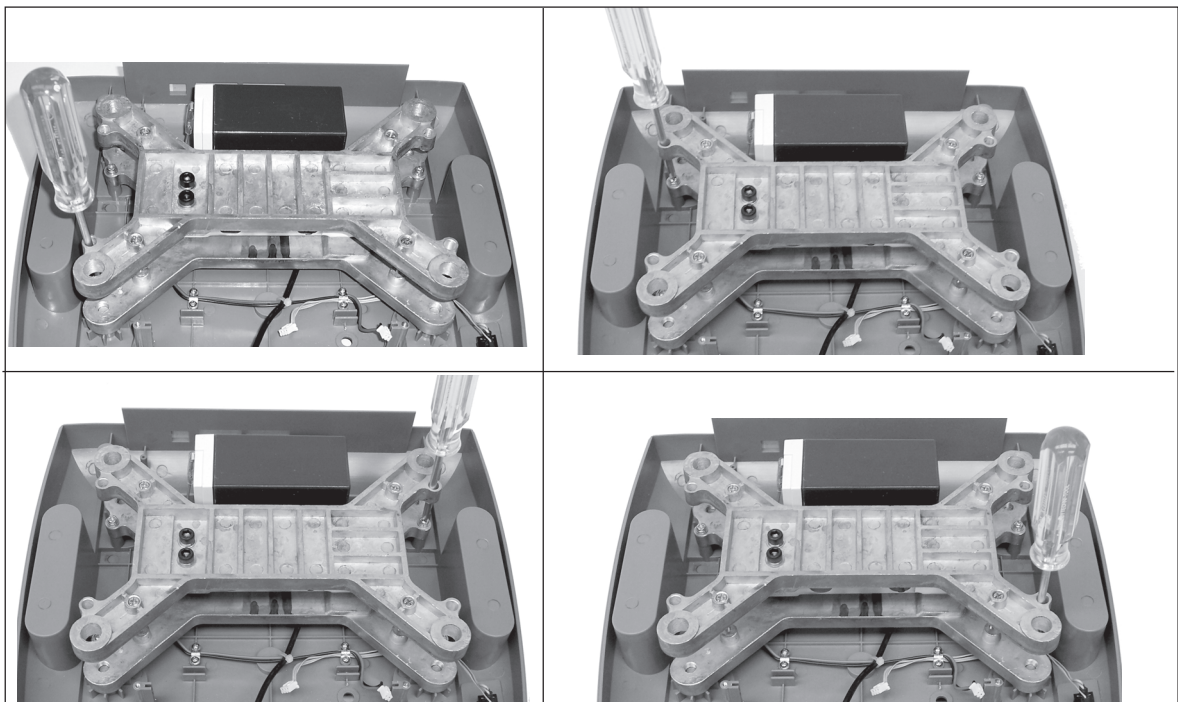


Figure 4-14. Load Cell Retaining Screw Locations.

CHAPTER 4 REPAIR PROCEDURES

4.4 REPLACING THE LOAD CELL ASSEMBLY (WITH FRAME) (Cont.)

5. Refer to Section 4.5.1 and check overload stops on the new assembly.
6. Lift the Load Cell Assembly out of the Bottom Housing and replace with the new one. Install screws.
7. Refer to Figure 3-2 and the label on the replacement Load Cell.
8. Solder the Load Cell wiring to the Main PC Board. Make sure that the color coded wiring is installed in the correct locations.
9. Reconnect the battery and power connectors to the Main PC Board and connect the battery terminal wiring to the battery.
10. Connect the Display Cable from the Display PC Board to the Main PC Board.
11. Install the Main PC Board into position in the slots on the Bottom Housing and secure with the screws and washers previously removed.
12. Refer to Figure 4-15 and move the Main PC Board Jumper from normal to service position.

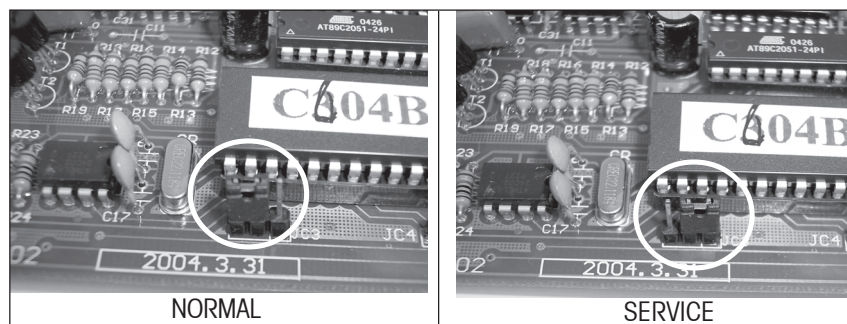


Figure 4-15. Main PC Board Jumper Positions.

13. Position the Top Housing in place over the scale temporarily and install the Pan Support and Pan in place.
14. Calibrate the scale according to the Instructions in Appendix B. After calibration, replace the jumper into the normal position.
15. Reassemble the scale and replace the Pan Support and Pan on top of the scale.
16. Turn the scale off then on. It will go through all the self-testing. When self-testing is completed, the scale should work normally.
17. After repair, perform Performance Tests, see Section 3.6.

4.5 REPLACING THE LOAD CELL COMPONENT

This procedure is used when it is desired to keep the existing Load Cell Frame and replace only the Load Cell. The Load Cell Assembly is centrally located inside the scale. When the new Load Cell is mounted to the existing Frame, the Overload Protection Stops must be adjusted.

1. Refer to Section 4.1 and remove Top Housing.
2. Refer to Section 4.4 and perform steps 1 through 4. The Load Cell and Frame can now be removed. Make sure the Load Cell Cable in the Bottom Housing can be removed by cutting the tie wrap holding the battery wires together with the Load Cell cable.
3. Remove the Load Cell, by unscrewing two bolts on the top of the Load Cell and two bolts on the bottom of the Load Cell. See Figure 4-16.

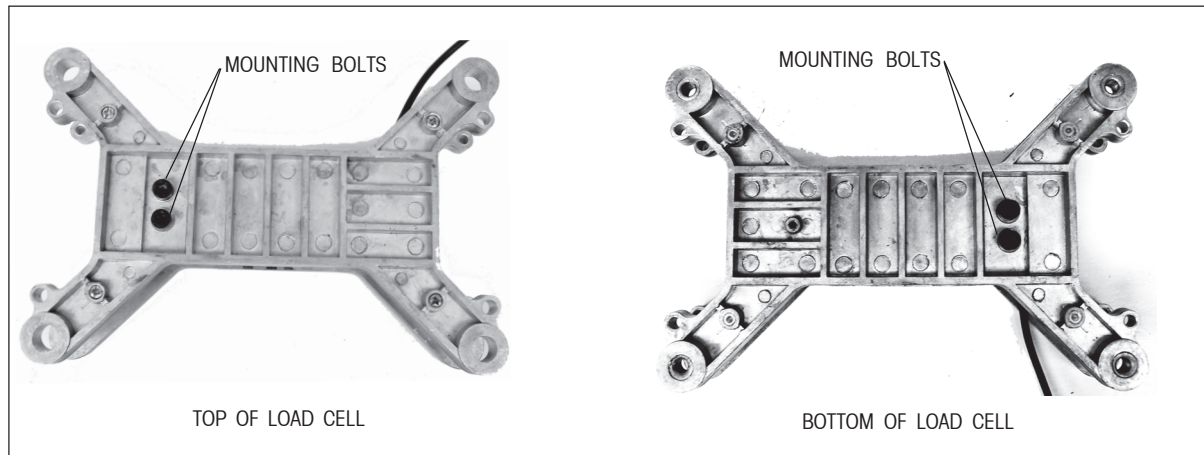


Figure 4-16. Load Cell Mounting Bolt Locations.

4. Place the replacement Load Cell on the Bottom Load Cell Frame into position and install the two bolts previously removed. **DO NOT TIGHTEN.**
5. Position the Top load Cell Frame on top of the Load Cell and install the two bolts previously removed. **DO NOT TIGHTEN.**

TABLE 4-1. LOAD CELL SCREW TORQUE INFORMATION.

CAPACITY	TORQUE
3 kg	7 N.m / 62 in. lb
6 kg	10 N.m / 88 in. lb
15 kg	10 N.m / 88 in. lb
30kg	10 N.m / 88 in. lb

6. Align Top and Bottom Frames and tighten screws as indicated. Recheck alignment.

CHAPTER 4 REPAIR PROCEDURES

4.5 REPLACING THE LOAD CELL COMPONENT (Cont.)

7. Position the Load Cell and Frame in the Bottom Housing and install the four retaining screws through the Frame into the Bottom Housing. See Figure 4-17.

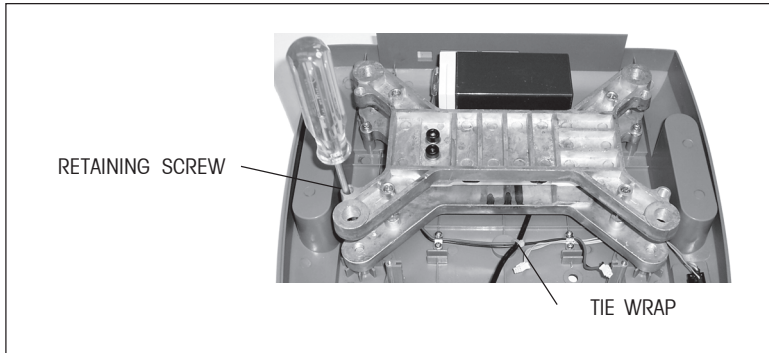


Figure 4-17. Load Cell Frame Mounting Bolt Locations.

8. Install a cable clamp holding the Load Cell cable on the bottom of the Frame assembly to the other wires in the Housing.
9. Proceed to section 4.5.1 and set the overload stops.

4.5.1 Overload Protection Stop Adjustment

When a Load Cell has been replaced in the existing Load Cell frame, the Overload Protection Stops must be set before calibrating or testing the scale. This will require the use of mm feeler gauges ranging from 0.6 to 1.6 mm and masses. See Table 4-2.

1. At each Overload Stop Protection location, insert the proper feeler gauge as specified in Table 4-2.
2. With the correct feeler gauge positioned in the first Overload Protection Stop, press down on the Frame and see if there is movement of the frame. Adjust the Overload Protection Stop until there is no movement with the feeler gauge inserted. The resulting gap should be the thickness of the feeler gauge. Do all four stops and recheck until settings are correct.

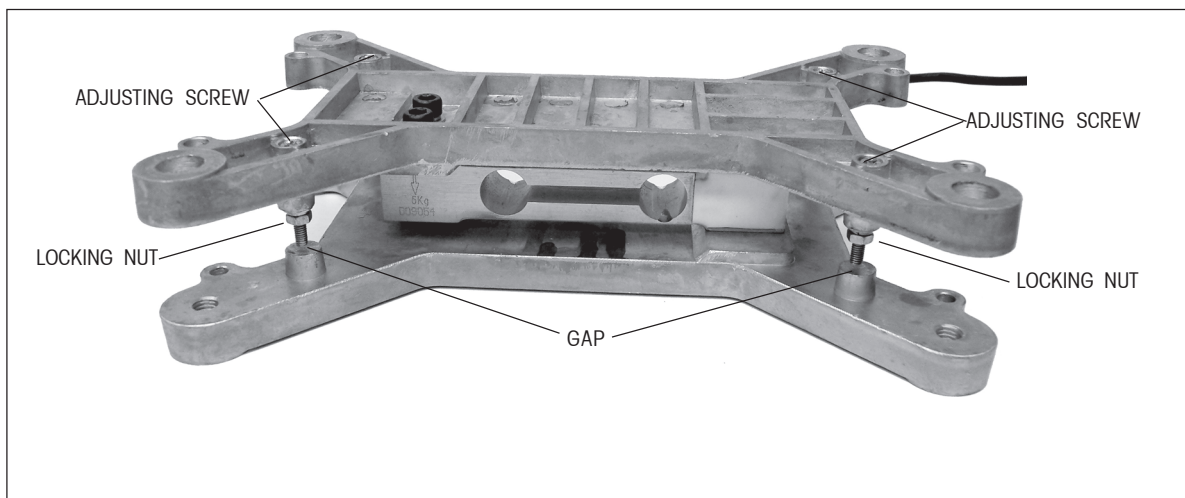


Figure 4-18. Overload Stop Locations.

4.5.1 Overload Protection Stop Adjustment (Cont.)

3. Add the mass specified in Table 4-2. The mass should be placed on the center of the Pan. With the specified mass on the Pan, all of the overload (down) stops should hit the bottom Load Cell Frame.
4. Tighten the nut on the down stop screws so they will not move and recheck.

TABLE 4-2. LOAD CELL OVERLOAD PROTECTION STOP GAP SETTINGS

SCALE CAPACITY	OVERLOAD GAP SETTING	MASS
3 kg	0.6mm	4.5kg
6 kg	0.8mm	9kg
15 kg	1.0mm	22.5kg
30kg	1.6mm	45kg

5. Reassemble the scale.
6. Calibrate the scale using Appendix B instructions. Check all operations.

4.6 REPLACING THE BATTERY

This procedure is used when it is required to change the Battery.

WARNING: DEATH OR SERIOUS INJURY CAN OCCUR



- Charge the battery only with the charger in the scale. Charging the battery under any other conditions may cause the battery to overheat, emit hydrogen gas, leak, ignite or burst.
- Operate the battery at normal temperature range as specified for the scale.
- Do NOT short the battery terminals under any conditions.
- Do NOT dispose of the battery in incinerators, or crush or try to open. Dispose of the defective battery in accordance with local regulations for lead-acid type batteries.

CAUTION



- Check the battery for any sign of irregularities in appearance. If there is any damage to the case such as cracks, deformation or leakage, replace the battery with a new one.
- Do NOT charge the battery with the charger terminals reversed.

1. Refer to section 4.1 and remove the Top housing.

CHAPTER 4 REPAIR PROCEDURES

4.6 REPLACING THE BATTERY (Cont.)

2. Disconnect the two wires from the battery. See Figure 4-19 which is a close-up view of the battery.

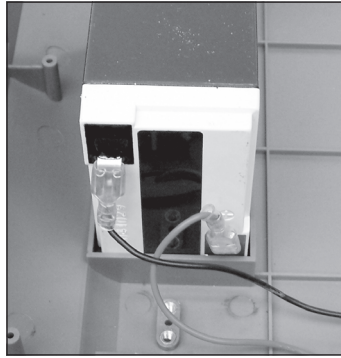


Figure 4-19. Battery Connections.

3. Remove the Battery from the Bottom Housing.
4. Install a replacement Battery into the same position as the original Battery. The positive terminal (Red) should be facing up.
5. Connect the wires to the Battery. Make sure the Red wire is attached to the positive terminal on the Battery and the Black wire is attached to the negative terminal on the Battery.

Note: The Battery is held in place by the Top Housing that has a cutout and foam backing. When the Top Housing is installed, the Battery is held in place.



CAUTION: Dispose of the Battery according to local regulations for hazardous materials. Do not incinerate, crush or throw out in regular garbage containers. Battery contains an acid solution.

6. Reassemble the scale and connect the ac adapter to the scale and plug into a power source. Allow the battery to charge for at least 12 hours with the scale off. A new battery requires a long charge period to obtain maximum service when operating the scale for the first time.

5. PARTS LISTS

This section of the manual contains exploded views, and parts lists for the EC Series Scales. The exploded view drawings identify the replaceable parts.

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, in the United States call toll-free 1-800-526-0659 between 8.00 a.m. and 4.00 p.m. EST. An Ohaus factory service technician will be available to provide assistance. Outside the U.S.A., please visit our site www.Ohaus.com to locate the nearest Ohaus office.

Ohaus Corporation
19A Chapin Road
P.O. Box 2033
Pine Brook, NJ 07058, USA
Tel: (973) 377-9000
Fax: (973) 944-7177

CHAPTER 5 PARTS LISTS

5.1 EC Series Scales Components

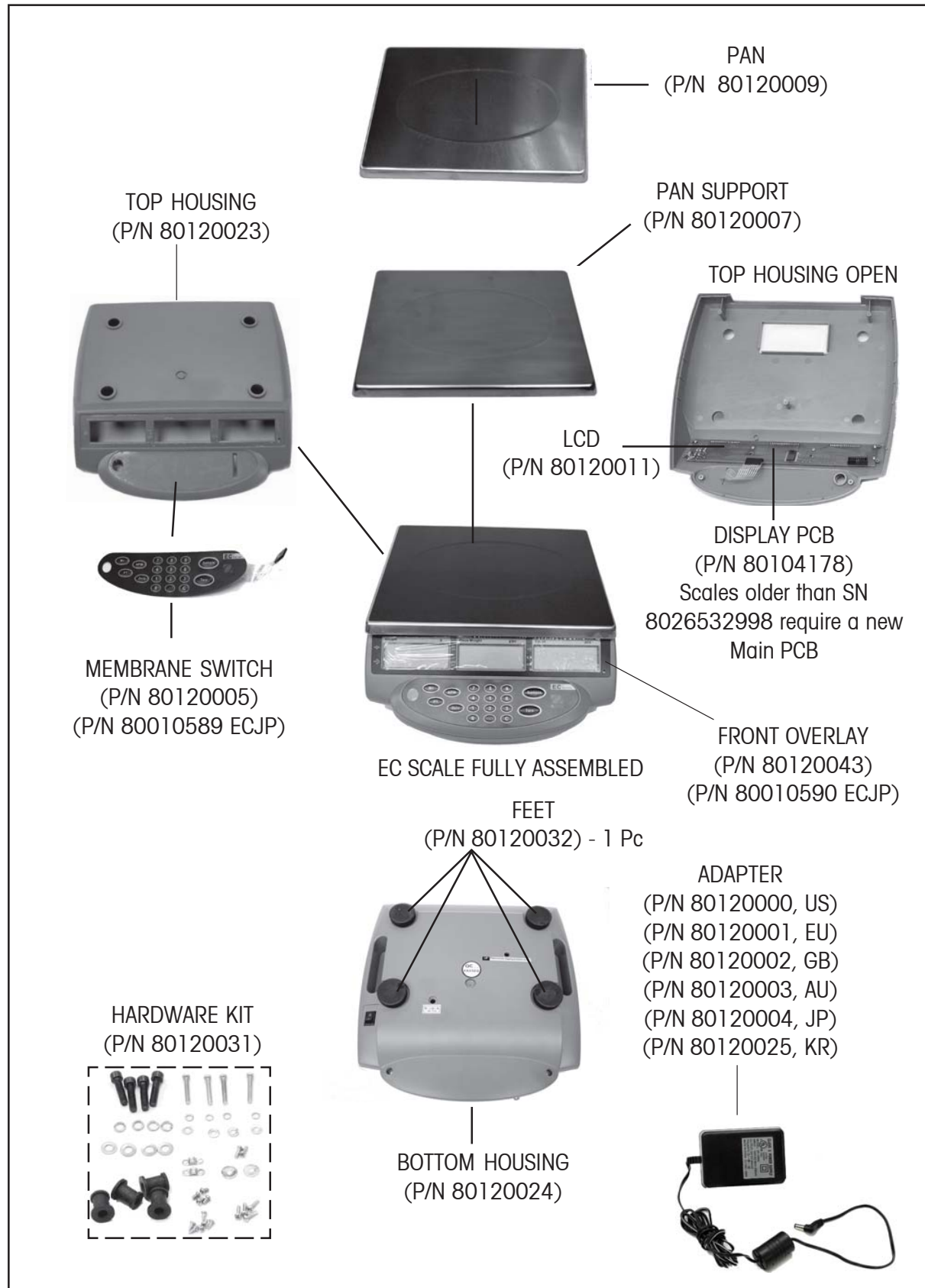


Figure 5-1. Major Components of EC Series Scales.

5.1 EC Series Scales Components (Cont.)

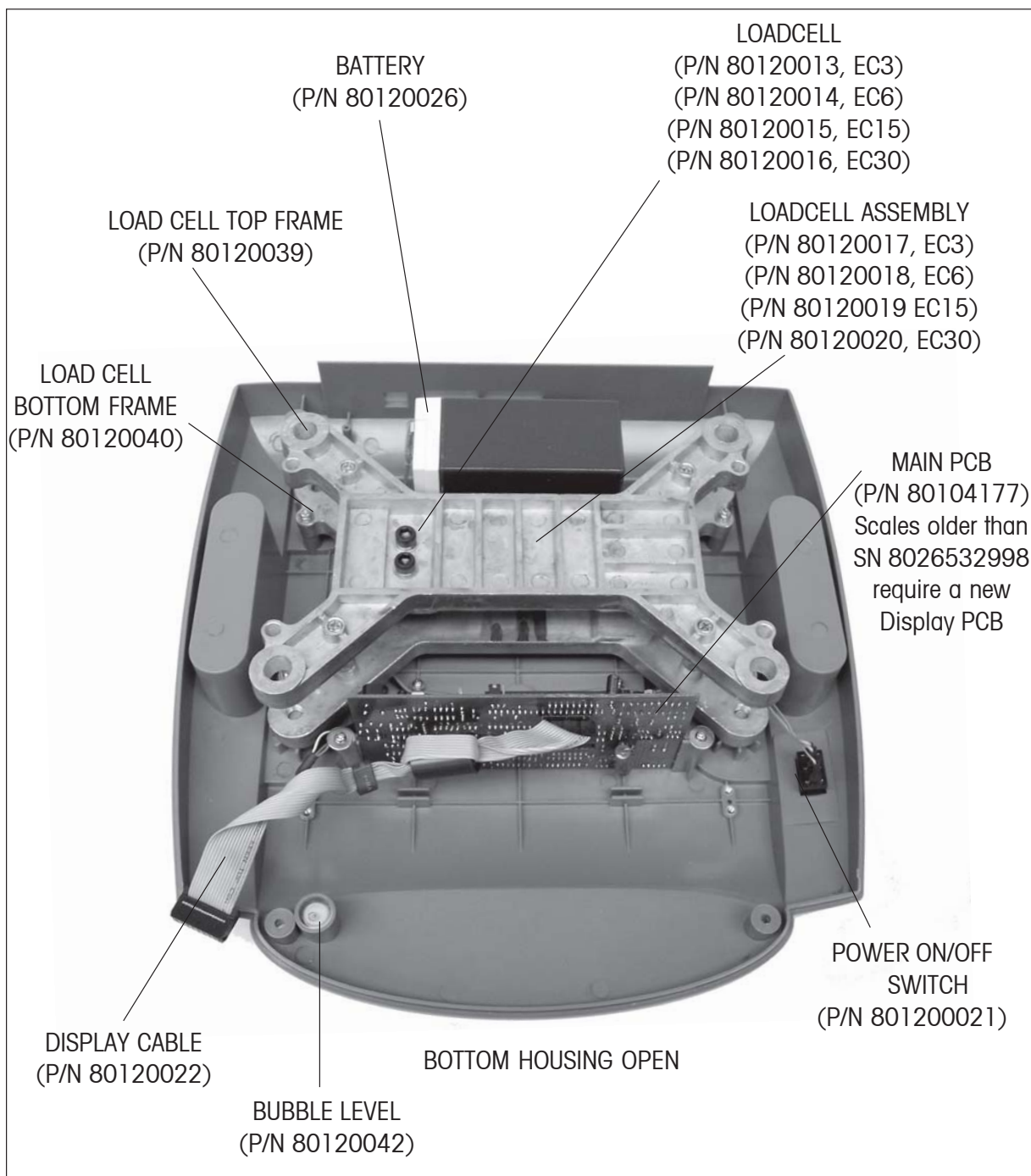


Figure 5-2. Components in Bottom Housing of EC Series Scales.

CHAPTER 5 PARTS LISTS

TABLE 5-1. EC SERIES SCALES PARTS LIST.

PART NO.	DESCRIPTION
80120000	Adapter, US, 120V,
80120001	Adapter, EU, 230V,
80120002	Adapter, GB, 230V,
80120003	Adapter, AU, 240V,
80120004	Adapter, JP, 100V,
80120005	Switch, Membrane
80010589	Switch, Membrane, ECJP
80120007	Pan support
80120009	Pan, Stainless Steel
80120010	Overlay, Back
80120011	LCD, 1pc.
80104176	Backlight, 1pc. Not compatible with scales older than SN8026532998
80120013	Loadcell, EC3
80120014	Loadcell, EC6
80120015	Loadcell, EC15
80120016	Loadcell, EC30
80120017	Loadcell assembly, EC3
80120018	Loadcell assembly, EC6
80120019	Loadcell assembly, EC15
80120020	Loadcell assembly, EC30
80120021	Power switch assembly
80120022	Cable, Display PCB
80120023	Housing, Top
80120024	Housing, Bottom
80120025	Adapter, KR, 230V
80120026	Battery
80120027	Battery wire harness
80120028	Cover, In-use
80104177	PCB, Main. Scales older than SN 8026532998 require a new PCB, Display
80104178	PCB, Display. Scales older than SN 8026532998 require a new PCB, Main
80120031	Kit, hardware
80120032	Foot
80120039	Frame, Loadcell, Top
80120040	Frame, Loadcell, Bottom
80120042	Level, Bubble
80120043	Overlay, Front
80010590	Overlay, Front, ECJP

A. INTRODUCTION

This Appendix describes the Service menu and sub-menus, which allow authorized service personnel to configure the scale. Configuration settings include selecting a weighing unit either grams (g) or kilograms (kg), setting the display increment, setting the capacity and resolution and setting the decimal point position. Please refer to the Service Menu diagram. The menu shown below represents the center window of the display. The actual numerical data entries are shown only in the left window of the scale.

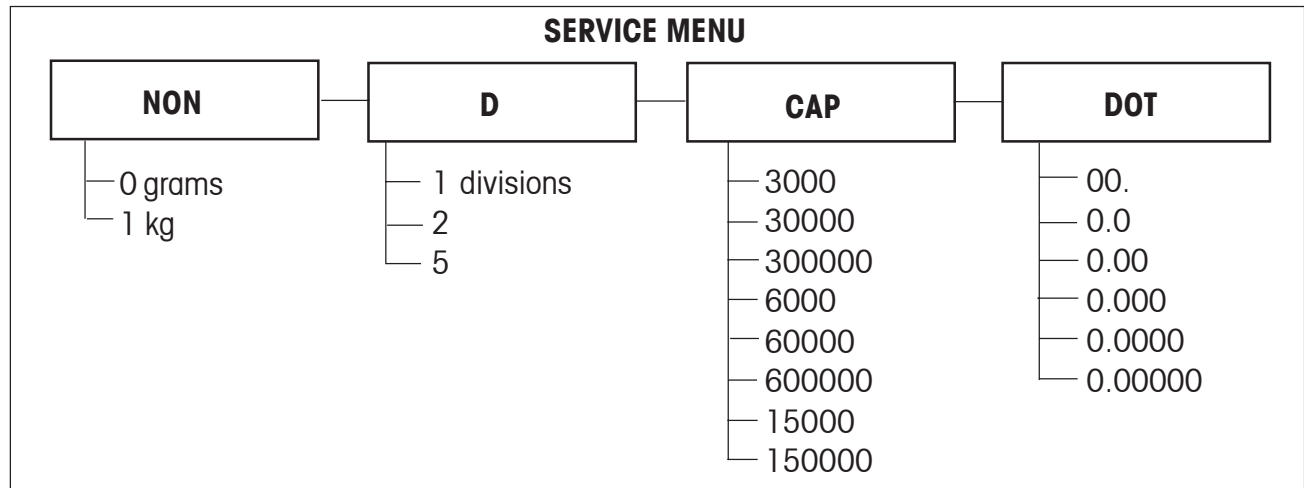


Figure A-1. Service Menu Diagram.

A.1 ENTERING THE SERVICE MENU

1. Turn the scale on.

Note: The password must be entered during the scale self test in the next step.

2. The Service menu is accessed by entering the password **113388** while the scale is in a self-test.
3. The displays on the scale will count down until the first configuration display is shown. See Figure A-2.



Figure A-2. First Configuration Display.

A.2 SELECT WEIGHT UNITS

See Table A-1.

1. The center display shows non.
2. First display shows 1 for kg, 0 for grams.
3. Press **Sample** to change or **Tare** to accept and advance to next menu. See Figure A-3.



Figure A-3. Weight Units Display.

APPENDIX A SERVICE MODES

TABLE A-1. MODEL CONFIGURATION SETTING.

MODEL	NON	D	CAP	DOT
EC3	0	1	30000	3000.0
EC6	0	2	60000	6000.0
EC15	0	5	150000	15000.0
EC30	0	1	30000	30000.

A.3 SELECT DISPLAY INCREMENT

See Table A-1. The last digit of the weigh display (left window) will increment by the number of divisions 1, 2 or 5 as selected.

1. The center display shows d. (d= divisions).
2. The left display shows choices of 1, 2, or 5.
3. Press **Sample** to change or **Tare** to accept and advance to next menu. See Figure A-4.



Figure A-4. Display Increment Display.

A.4 SELECT CAP VALUE

See Table A-1.

1. The center display shows CAP.
2. The left display indicates the capacity.
3. Repeated press **Sample** to select the CAP value per Table A-1. See Figure A-5.



Figure A-5. Capacity and Resolution Display.

4. Press **Tare** to accept setting and advance.

A.5 SELECT DECIMAL POINT POSITION

See Table A-1.

1. The center display shows dot.
2. Press **Sample** repeatedly to select decimal point position. Refer to figure A-1 for values.
3. Press **Tare** to accept setting and advance. Figure A-6 illustrates two samples.

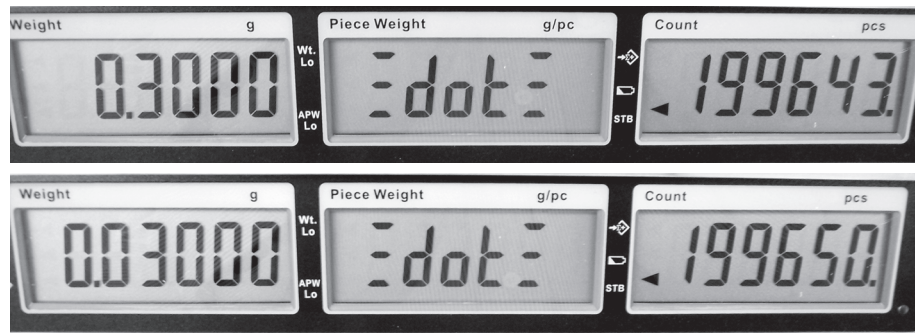


Figure A-6. Selecting Decimal Point Displays.

APPENDIX A SERVICE MODES

B. INTRODUCTION

This Appendix describes the Service calibration for the EC scale and allows authorized service personnel to calibrate the scale. Service calibration is used when normal calibration fails or a Load Cell or Main PC Board has been changed. Using this procedure establishes a new calibration setting. Configuration settings must be made to the scale before service calibration can be made. Refer to Appendix A and configure the scale before proceeding. A password is required in order to perform service calibration.

B.1 CALIBRATION

The scale will prompt you for the correct weights to be used based on it's capacity.

NOTE: The following displays illustrate the weights to be used with a 3kg scale.

1. Turn the scale on.
2. Enter password **123456** while the scale is in a self-test.
3. The displays on the scale will count down until the first calibration display is shown. See Figure B-1.



Figure B-1. Initial Calibration Display.

4. The center display shows 00, press on the Pan and release then wait.
5. Add the first weight as indicated on the scale (1000g shown), then wait. See Figure B-2.



Figure B-2. First Calibration Weight Display.

6. The center display shows 02.
7. Add the second weight to the total indicated on the scale (2000g shown), then wait. See Figure B-3.



Figure B-3. Second Calibration Weight Display.

8. The center display shows 03.

APPENDIX B SERVICE CALIBRATION

B.1 CALIBRATION (Cont.)

9. Add the third weight to the total indicated on the scale (3000g shown), then wait. See Figure B-4.



Figure B-4. Third Calibration Weight Display.

10. When calibration is complete, the weight is indicated in the first window, center and right windows indicate 0. See Figure B-5.



Figure B-5. Final Calibration Weight Display.

11. Remove all calibration weights from the scale



PN 80010584 B SERVICE MANUAL - EC SERIES SCALES