SERVICE MANUAL

Valor™ 5000 Scales

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Valor ™ 5000 Scales

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1.1 INTRODUCTION

This service manual contains the information needed to perform routine maintenance and service on the Ohaus Valor 5000 Series scales. Familiarity with the scale's Instruction Manual is assumed. The contents of this manual are contained in five chapters:

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

Chapter 2 Troubleshooting – Contains a diagnostic guide and error code table.

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

Chapter 4 Testing – Contains a list of required test masses, an operational test, segment display test, performance tests and adjustments.

Chapter 5 Drawings and Parts Lists – Contains exploded views of Valor 3000 scales identifying all serviceable components.

Appendix A Standard Calibration – Explains procedures for Standard Calibration, performed prior to using a scale, and after service.

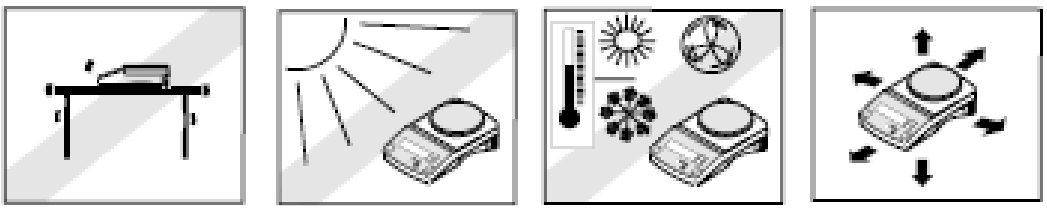
Appendix B Service Calibration – Describes the Service Menu and sub-menus, which allow authorized service personnel to perform factory Linearity and Span calibrations (no pre-set limits), take Ramp readings, adjust the GEO Factor, and use E.PAnd to set the readability to 1/10th of the standard readability.

Appendix C Geographical Adjustment Values – The chart of scale settings for every geographical latitude away from the equator (in degrees and minutes) and every elevation above sea level (in meters or feet).

1.2 SERVICE FACILITIES

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

- Should be temperature controlled and meet scale specifications for temperature environmental requirements.
- Must be free of vibrations such as fork lift trucks close by, large motors, air currents or drafts from air conditioning/heating ducts, open windows, people walking by, fans, etc.
- Area must be clean and free of excessive dust.
- Work surface must be stable and level.
- Scale must not be exposed to direct sunlight or radiating heat sources.
- Use an approved Electro-Static Device.



1.3 TOOLS AND TEST EQUIPMENT REQUIRED

The service shop should contain the following equipment:

1. Standard hand tools.
2. Digital Voltmeter (DVM).
3. Standard Electronics tool kit.
4. Grounding mat and clip.
5. Razor blades.

1.4 SERVICE STRATEGY

The repair method for the Valor 5000 Series Scales is direct substitution of major assemblies. The available repair parts are listed and illustrated in Chapter 5.

There are four major replaceable assemblies:

- Cover Assembly with Membrane Switch
- Load Cell Assembly with Frame
- Lead Acid Rechargeable Battery and
- Main PC Board with LCD.

The Load Cell, LCD and Membrane Switch 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.

1.5 SPECIFICATIONS

Complete specifications for the Ohaus Valor 5000 Scales are listed in Tables 1-1 and 1-2. When a scale has been serviced, it must meet the specifications listed in the table. Before servicing the scale, determine what specifications are not met.

TABLE 1-1. SPECIFICATIONS, STANDARD DENSITY MODELS

Model	**V51P3**	**V51P6**	**V51P15**	**V51P30**
Capacity x Readability Max x d (non-approved)	3 kg x 0.0005 kg 3000 g x 0.5 g 6 lb x 0.001 lb 96 oz x 0.02 oz 96 oz x 1/4 oz 6 lb 0 oz x 0.1 oz 6 lb 0 oz x 1/4 oz	6 kg x 0.001 kg 6000 g x 1 g 15 lb x 0.002 lb 240 oz x .05 oz 240 oz x 1/4 oz 15 lb x 0.1 oz 15 lb x 1/4 oz	15 kg x 0.002 kg 15000 g x 2 g 30 lb x 0.005 lb 480 oz x 0.1 oz 480 oz x 1/4 oz 30 lb 0 oz x 0.1 oz 30 lb 0 oz x 1/4 oz	30 kg x 0.005 kg 30000 g x 5 g 60 lb x 0.01 lb 960 oz x 0.2 oz 960 oz x 1/4 oz 60 lb 0 oz x 0.2 oz 60 lb 0 oz x 1/4 oz
Maximum Displayed Resolution	6000	7500	7500	6000
Capacity x Readability Max x d (approved)	3 kg x 0.001 kg 3000 g x 1 g 6 lb x 0.002 lb 96 oz x 0.05 oz 96 oz x 1/4 oz	6 kg x 0.002 kg 6000 g x 2 g 15 lb x 0.005 lb 240 oz x .1 oz 240 oz x 1/4 oz	15 kg x 0.005 kg 15000 g x 5 g 30 lb x 0.01 lb 480 oz x 0.2 oz 480 oz x 1/4 oz	30 kg x 0.01 kg 30000 g x 10 g 60 lb x 0.02 lb 960 oz x 0.5 oz 960 oz x 1/4 oz
Approved Resolution	3000	3000	3000	3000
Repeatability (kg)	0.001	0.002	0.005	0.01
Linearity (kg) (+/-)	0.001	0.002	0.005	0.01
Weighing Units	g, kg, lb, oz (decimal/fractional), lb:oz (decimal/fractional oz)			
Application Modes	Weighing, Checkweighing, Percentage			
Checkweigh Indication	3 LEDs (yellow, green, red) with configurable alert beeper			
Power	9-12 VDC 0.5A-0.8A AC adaptor; internal rechargeable sealed lead-acid battery			
Battery Operating Time	120 hours			
Tare range	To capacity by subtraction			
Stabilization Time	Within 2 seconds			
Auto zero tracking	Off, 0.5, 1 or 3 divisions			
Operating Temperature Range	–10° to 40°C / 14° to 104°F			
Storage Temperature Range	– 40° to 70°C / – 40° to 104°F			
Approved Temperature Range	0° to 40°C / 32° to 104°F			
Pan Size (D X W)	209 x 209 mm / 8.2 x 8.2 in			
Scale dimensions	300 x 223 x 71 mm / 9 x 12 x 2.8 in.			

1.4 SPECIFICATIONS

TABLE 1-2. SPECIFICATIONS, HIGH DENSITY MODELS

Model	**V51PH3**	**V51PH6**	**V51PH15**	**V51PH30**
Capacity x Readability Max x d (non-approved)	3 kg x 0.0001 kg 3000 g x 0.1 g 6 lb x 0.0002 lb 96 oz x 0.005 oz 96 oz x 1/4 oz 6 lb 0 oz x 0.1 oz 6 lb 0 oz x 1/4 oz	6 kg x 0.0002 kg 6000 g x 0.2 g 15 lb x 0.001 lb 240 oz x .01 oz 240 oz x 1/4 oz 15 lb x 0.1 oz 15 lb x 1/4 oz	15 kg x 0.001 kg 15000 g x 1 g 30 lb x 0.001 lb 480 oz x 0.02 oz 480 oz x 1/4 oz 30 lb 0 oz x 0.1 oz 30 lb 0 oz x 1/4 oz	30 kg x 0.001 kg 30000 g x 1 g 60 lb x 0.002 lb 960 oz x 0.05 oz 960 oz x 1/4 oz 60 lb 0 oz x 0.1 oz 60 lb 0 oz x 1/4 oz
Maximum Displayed Resolution	30000	30000	30000	30000
Repeatability (kg)	0.0002	0.0004	0.002	0.002
Linearity (kg) (+/-)	0.0002	0.0004	0.002	0.002
Weighing Units	g, kg, lb, oz (decimal/fractional), lb:oz (decimal/fractional oz)			
Application Modes	Weighing, Checkweighing, Percentage			
Checkweigh Indication	3 LEDs (yellow, green, red) with configurable alert beeper			
Power	9-12 VDC 0.5A-0.8A AC adaptor; internal rechargeable sealed lead-acid battery			
Battery Operating Time	120 hours			
Tare range	To capacity by subtraction			
Stabilization Time	Within 2 seconds			
Auto zero tracking	Off, 0.5, 1 or 3 divisions			
Operating Temperature Range	–10° to 40°C / 14° to 104°F			
Storage Temperature Range	– 40° to 70°C / – 40° to 104°F			
Approved Temperature Range	0° to 40°C / 32° to 104°F			
Pan Size (D X W)	209 x 209 mm / 8.2 x 8.2 in			
Scale dimensions	300 x 223 x 71 mm / 9 x 12 x 2.8 in.			

1.5 SCALE OPERATION

This section contains information on the basic operation of the scale.

1.5.1 OVERVIEW OF THE CONTROLS

Figure 1-1. Valor 5000 Display.

TABLE 1-3. FUNCTIONS OF DISPLAY CONTROLS

Button/ Function	ON/ZERO *Off* (Yes)	G/N/T *Units* (No)	TARGET *Menu* (Back)	TARE (Exit)
Primary Function (short press)	**ON / ZERO** If scale is off, turns scale on. If scale is on, sets zero.	**G/N/T** Momentarily Displays Gross Net and Tare values	**TARGET** Initiates target setting mode.	**TARE** Sets tare. Clears tare, if pan is empty.
Secondary Function (long press)	**Off** If scale is on, turns scale off.	**Units** Changes weighing unit	**Menu** Enters menu mode.	None
Menu Function	**Yes** Accepts current setting and advances to the next menu item	**No** Rejects current setting or menu item and advances to the next available item	**Back** Reverts back to previous menu item.	**Exit** • Immediately exits menu mode • Aborts calibration in progress
Target Setting Function	Shifts to next digit	Increments value of the active digit	Accepts current displayed value.	Changes sign (+ / –) of displayed value.

1.5.2 OVERVIEW OF THE DISPLAY INDICATORS

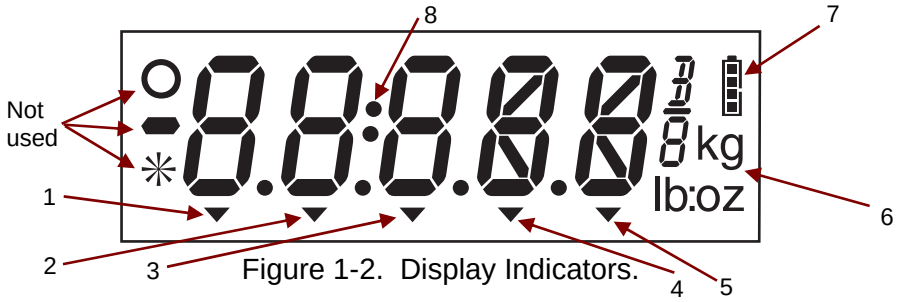


Figure 1-2. Display Indicators.

TABLE 1-4. DISPLAY INDICATORS

No.	Function
1	Indicates that the measured value has become stable
2	Center of Zero indicator
3	Checkweigher mode indicator
4	Net indicator
5	Tare indicator
6	Symbols for weighing modes: **kg** – Kilograms, **g** – grams, **lb:oz** – Pounds & Ounces, **lb** – Pounds, **oz** – Ounces, $^{3}/_{8}$ – Fractional ounces (P in % mode)
7	Battery charging indicator
8	Pound:Ounce separator

1.5.3 Power

Check that the AC adapter supports the voltage in use locally. Then plug the adapter into the receptacle marked “Power In” located on the underside of the scale.

The first time the scale is powered on, the internal rechargeable battery should be fully charged. The scale can be operated during the charging process. The battery is protected against over charging and the scale can remain connected to the AC power line. The display’s battery symbol will stay lit until the battery is fully charged, and then it will turn off.

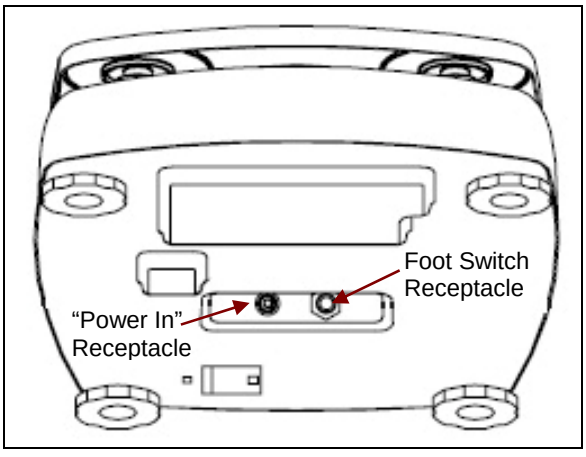


Figure 1-3. Scale Bottom

The scale will automatically switch to battery operation if the power cord is removed or there is a power failure. A fully charged battery can operate the scale for up to 120 hours (with the backlight off). During battery operation, the battery symbol will light to show the current status of the battery (1 segment = 25% capacity). A flashing symbol indicates that the battery requires recharging. The scale will automatically shut off when the battery is fully discharged.

1.5.4 Power ON

With power applied, press **ON/ZERO/*Off*.** Allow 20 minutes warm-up time. The scale should be calibrated before use. (See Appendix A.)

1.5.4 Power OFF

With the scale on, press and hold the **ON/ZERO Off** button until OFF is displayed.

1.5.5 Menu Setup

Programmable features of the Valor 5000 scales are contained in menus which are accessed by pressing **TARGET/*Menu*** on the Display Panel. The menu structure consists of three levels: Main, Sub-menu, and Menu item. The Main menu contains the Sub-menus and each Sub-menu contains several Menu items. Each Menu item contains two or more settings.

Use the four buttons marked with **Yes**, **No**, **Back** and **Exit** to navigate through the menus. (See Figure 1-4.) For more detail on using the menus, see the Instruction Manual.

- **Yes** Enters the displayed sub-menu or menu item and accepts the displayed setting.
- **No** Skips to the next sub-menu or menu item and changes the displayed setting.
- **Back** Goes back to the previous sub-menu or menu item.
- **Exit** Immediately exits the Menu mode.

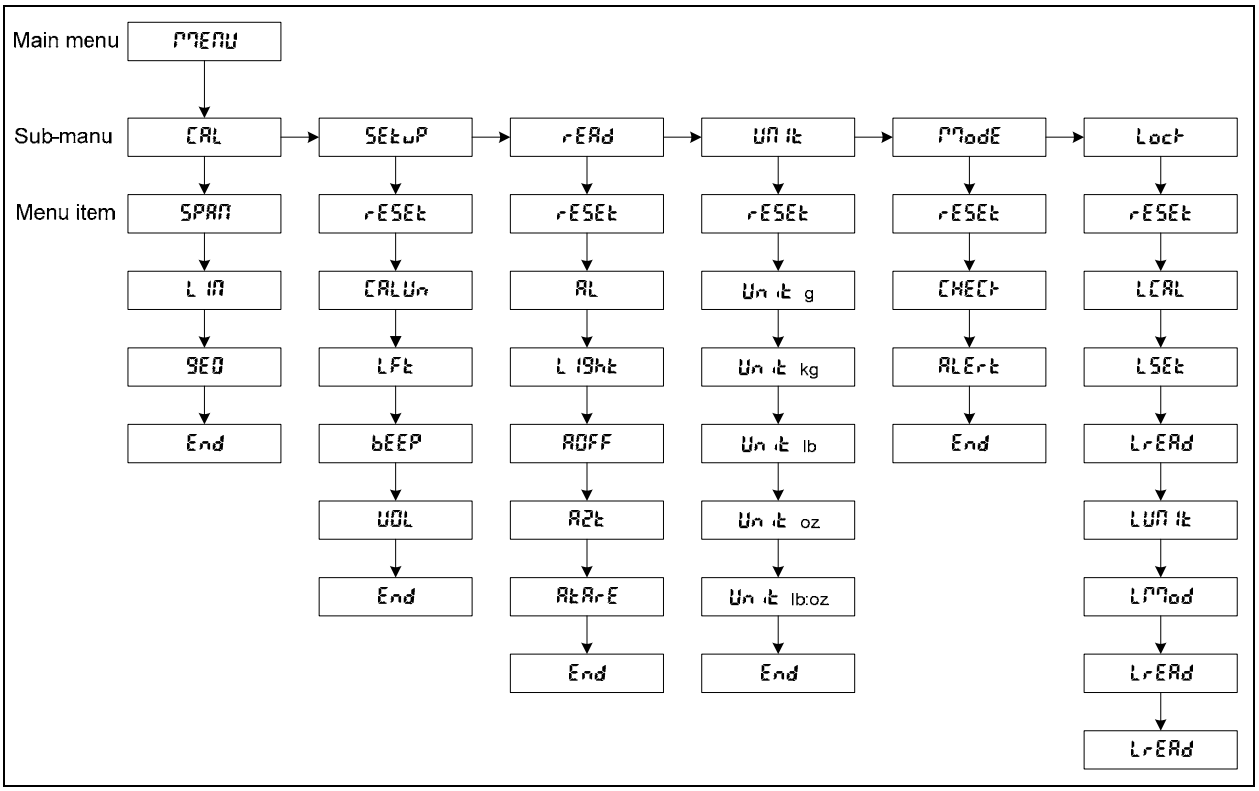


Figure 1-4. Valor 5000 Menu Structure

1.6 Legal for Trade Settings

Consult local weights and measures officials for regulations before placing the scale in Legal for Trade mode. When the LFT menu setting is On, the following conditions apply:

- The Calibration (**CAL**) sub-menu is hidden.
- The Calibration Lock (**LCAL**) menu item is hidden.
- The Auto Zero Tracking (**AZt**) menu item is set to 0.5 d.
- **lb:oz** and **P** units are disabled.

To regain access to the locked menu settings, break the seal holding the Security Slide on the bottom of the scale closed, and shift the slide open. (See Figure 1-6.) This turns LFT off by moving a menu-lock switch on the PCB to the Off position. (See Figure 1-5.)

After the LFT/CAL Lock setting has been turned off, the scale must be inspected and sealed in accordance with local weights and measures regulations before it can be used in LFT mode again.

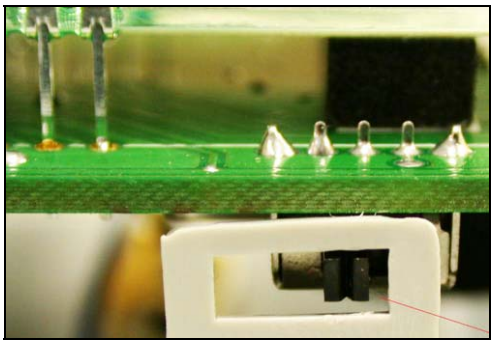


Figure 1-5. Menu-lock switch on PCB.

1.6.1 Sealing the Scale

When used in conjunction with the Lockout Menu and the Security Switch, the scale may be sealed to prevent or detect unauthorized changes to scale settings. For Legal for Trade applications, set the LFT menu item to ON, set the Security Slide to the On position by sliding the switch to cover the screw, and then seal the scale to prevent access to the metrological parameters. Seal the scale according to the local weights and measures regulations.

To regain access to the scale settings, break the seal and set the security slide to the OFF position.

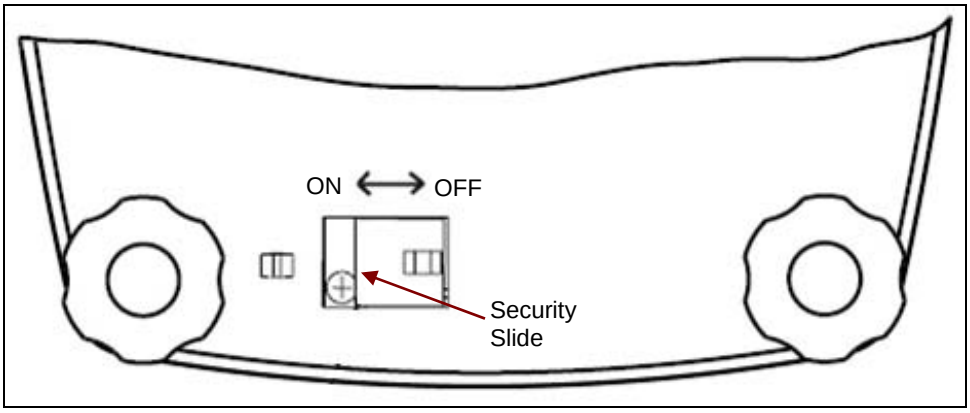


Figure 1-5. Security Switch Settings.

2.1 TROUBLESHOOTING

This section of the manual contains troubleshooting information. Information is contained to isolate specific problems using Table 2-1, Diagnostic Guide. Follow all directions step by step. Make certain that the work area is clean. Handle scale components with care. Use appropriate Electro-Static Device.

2.2 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 to repair the scale, read all chapters of this manual to be familiar with the scale components and operation.

2.2.1 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 section of the scale.

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

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

2.2.2 Testing the Membrane Switch

If the scale does not turn on, or menus cannot be accessed, the Membrane Switch may be defective. It can be tested after removing the Top Housing. (See Section 3.1.)

1. Using an Ohmmeter, measure the resistance between pin 5 and each other pin on the Membrane Switch Cable. (See Figure 2-2, next page.) The readings should be infinite resistance.
2. Press each button and check that the resistance is under 50 ohms for each button.
3. Check that the Membrane Switch is not shorted to the Top Housing case. Check pins 1 through 5 to the case, which should be infinite resistance.
4. If any test fails, the Membrane Switch is defective. Replace it. (See Section 3.5.)

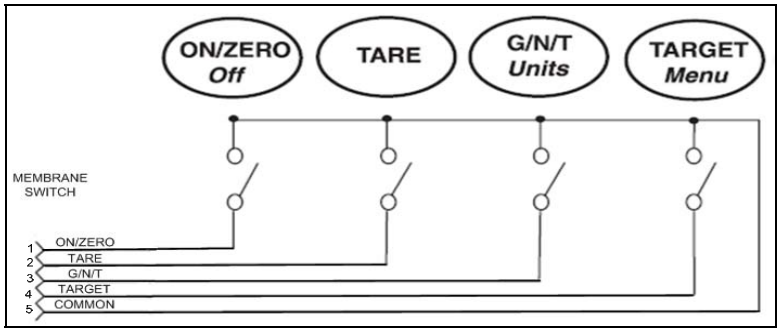


Figure 2-1. Membrane Switch Cable connections.

2.2.3 Checking Load Cells for Trouble

This section contains three methods of testing the Load cell.

1. Perform a **Ramp Test**. (See Appendix B.) If the Ramp Test passes, continue with the rest of this procedure.

2. Perform **a Resistance Test**, to determine if the Load Cell is severely damaged or a short circuit to the frame 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.

   Remove the Load Cell cable connector from the PC Board. Using an Ohmmeter, measure Load Cell Resistance Readings on the cable. (See Table 2-1.) If the resistance readings vary more than the table readings allow, replace the Load Cell. (See Chapter 3.)

TABLE 2-1. LOAD CELL RESISTANCE READINGS (in Ohms)

MEASUREMENT POINTS*	READING
Pins 1& 4 (Exe+ to Exe–)	408 ± 10
Pins 2& 3 (S+ to S–)	350 ± 4

*See Figure 2-2.

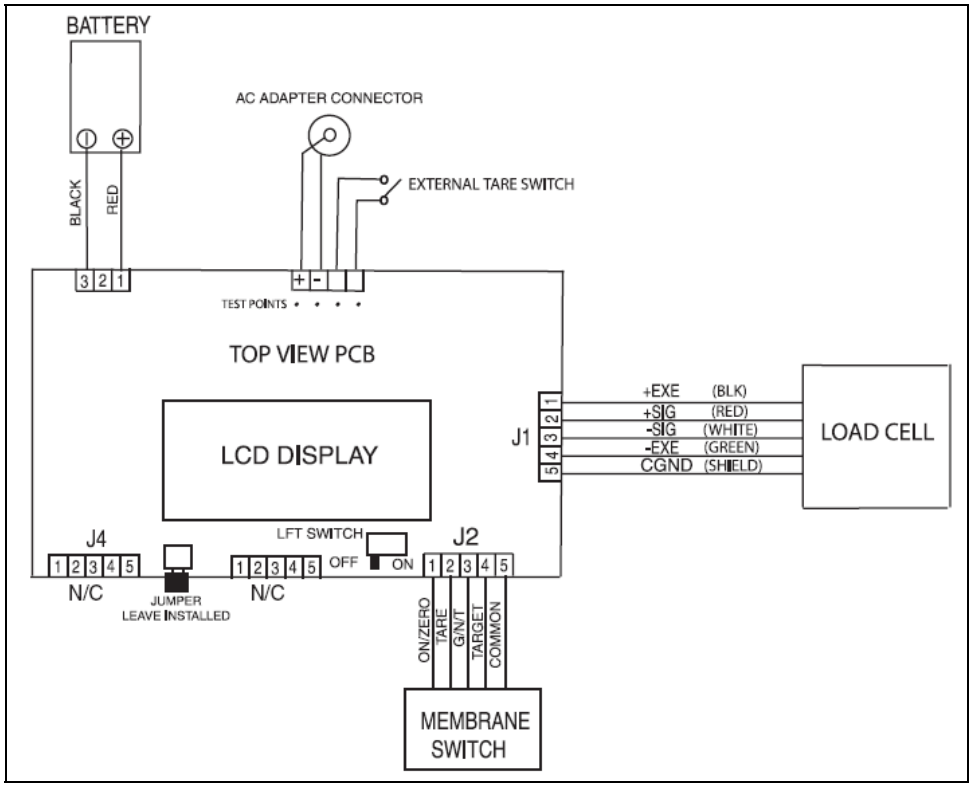


Figure 2-2. Main Printed Circuit Board Connections

2.2.2 Checking Load Cells for Trouble

2. **Perform an 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.)

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

BLACK	RED	GREEN	WHITE
EXE+	SIG+	EXE–	SIG–

*Color codes may vary.

– Insert the Pan Support Caps into the Load Cell Frame, place the Platform on top, and turn on power to the scale.

– Using a voltmeter, measure and record the excitation voltage supplied to the PCB: with no load on the Platform, measure the voltage across points 1 and 4 of the Load Cell connection on the PCB: +EXE and –EXE. (See Figure 2-2.) This voltage must be approximately 5.0 Volts dc with the Load cell connected. If the voltage is lower, disconnect the Load Cell cable from the PCB 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 PCB is defective and must be replaced.

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

– Measure the voltages on +SIG and –SIG wires, disconnected from the PCB (points 2 and 3 in Figure 2-2). 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 Load cell. (See Section 3.6.)

TABLE 2-3. LOAD CELL OUTPUT READINGS (in mV with 5V Excitation)

Capacity	Zero Load	50% Load	100% Load
3kg	1.2 ± 1.5	Zero + 2.2	Zero + 4.4
6kg	0.4 ± 1.5	Zero + 2.0	Zero + 4.0
15kg	0.2 ± 1.5	Zero ± 2.5	Zero ± 5.0
30kg	0.2 ± 1.5	Zero ± 3.0	Zero ± 6.0

2.2.3 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.

PCB Voltage Measurements

Note: Prior to the voltage measurements, the battery should be fully charged and tested.

1. Disconnect power from the scale, and remove the Top housing. (See Section 3.1.) Leave the Membrane Switch connected to the scale.

2. Disconnect the Battery from the PCB.

3. Connect the AC Adapter to the scale and turn the scale on.

4. Using a DVM, measure the excitation voltage across pins 1 and 4 of J1. (See Figure 2-2.) The reading should be 5 volts dc. This is the excitation voltage for the Load Cell and is regulated. If the voltage is lower, replace the PCB. (See Section 3.4.) Then perform Operational Tests. (See Chapter 4.)

5. Measure incoming power from the AC Adapter connector shown in Figure 2-2. The voltage should read between 9 and 14 volts dc with power off and above 9 Volts dc with power on.

6. With the battery disconnected from the PCB, measure voltage across pins 1 and 3 on the battery connector on the PCB. (See Figure 2-2.) The voltage should read 1 to 3 Volts dc.

7. Connect the battery to the PCB and measure the voltage across pins 1 and 3 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. Test the battery. (See Section 2.5.)

8. Perform simulator testing.

2.2.3 Testing the Printed Circuit Board (PCB)

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. 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 zero load, 50% and 100% load capacities.

1. Disconnect power from the scale, and remove the Top housing. (See Section 3.1.) Leave the Membrane Switch connected to the scale. Disconnect the battery.
2. Disconnect the Load Cell cable from connector J1 on the main PC Board. (See Figure 2-2.)
3. With the Simulator set to zero, connect it to connector J1 using Alligator clips.
4. Connect a known good AC Adapter to the scale and connect to a power source.
5. Turn on the scale. CLEAR PAN, ERROR 14 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 scale 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 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 the scale menu and perform a span calibration. (See Appendix A.)
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. (For example, when a span value of 6 kg for a 6 kg scale is shown, the simulator should be set to .8 mV/V.)
3. Upon completion of calibration, the PCB can be further checked using the Simulator to simulate various weight values. If simulator settings and weight reading 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.)

2.2.4 Testing the Battery

The Valor 5000 contains a rechargeable, 6.0 Volt, 4.5 Ampere rated, Lead-Acid Battery.

WARNING! DEATH OR SERIOUS INJURY CAN OCCUR

- Charge the battery only with the scale's charger. 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.
- Check the battery for any irregularities in appearance. If there is any damage to the case such as cracks, deformation or leakage, replace the battery.
- Do NOT charge the battery with the charger terminals reversed.

A new battery when installed in a Valor 5000 scale 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, and service life can be many years.

Valor 5000 Scales can be operated for up to 120 hours per charge. Battery life can be maximized by frequent charging.

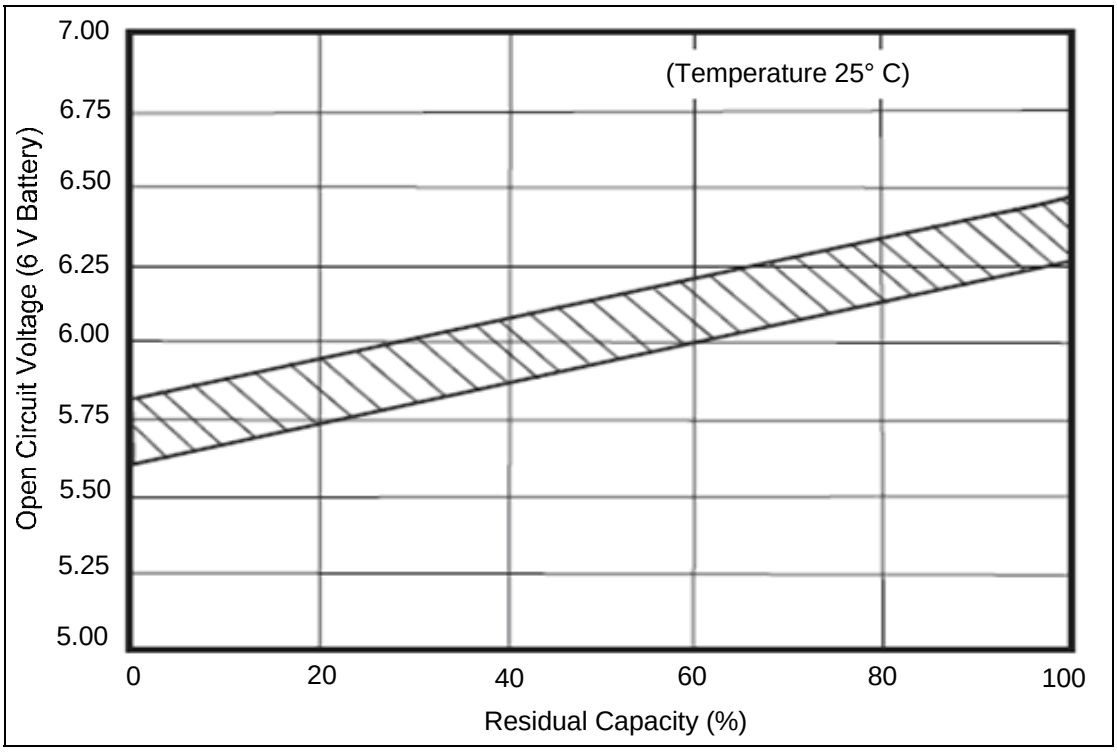
1. Upon receipt of the scale, plug in the AC Adapter to a power source and the scale. Allow the battery to charge. If the battery required a charge, the battery indicator on the front of the LCD display will indicate charging.
2. Remove the Top Housing. (See Section 3.1.) Leave the Membrane Switch on the cover connected to the scale.
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. It should be approximately **6.4 Volts dc** ten minutes after charging stops. The scale will operate until the battery voltage drops to approximately **5.6 Volts dc**.

NOTE: If the scale operates less than 120 hours, charge the battery and turn on the scale and test how long the scale operates. If the scale operates less than 60 hours with no backlight, the battery should be replaced. This is 50% capacity.

4. Table 2-4 indicates the capacity of the battery in percentage after a full charge. Allow a charged battery to stand overnight without being charged and then measure the terminal voltage to see capacity of the battery.
5. If the battery requires replacement, see Section 3.6. **←CHECK**

2.2.4 Testing the Battery

TABLE 2-4. BATTERY CAPACITY.



2.2.5 Diagnosis

TABLE 2-5. DIAGNOSTIC GUIDE

Symptom	Possible Cause	Remedy
Cannot turn on with AC adapter supplied.	No power to scale	Verify connections and voltage.
	DC input connector at the bottom of scale is defective.	Reconnect the ac adapter to the scale. Check dc voltage on the PCB or test points as shown in Figure 2-2. Voltage should read between 9 and 14 Volts (power off), and above 9 Volts dc (power on). If voltage is not present, check and replace the Harness.
	Membrane Switch defective.	Test the Membrane Switch. (See Section 2.2.) Replace if necessary. (See Chapter 3.)
	Main PC Board is defective.	If the scale fails to turn on with a new Membrane Switch, test the PCB. If defective it should be replaced. (See Section 3.4.)
Scale will not turn on using battery power.	Battery discharged or defective.	Test the battery. Replace if necessary.
	Wiring harness defective or battery clips connection broken.	Check voltage at battery contacts first. Check dc voltage at pins 1 and 3 of battery connector on the PCB. (See Figure 2-2.) 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 connector pins 1 and 3 on the PCB. Resistance should be 0 ohms for the red lead and 0 ohms for the black lead. If an open condition exists, replace wiring as necessary.
	Membrane Switch defective.	Test the Membrane Switch. Replace if necessary.
	PCB is defective.	If the scale fails to turn on with a new Membrane Switch, test the PCB. If defective it should be replaced. (See Sections 2.3 and 3.4.)

Symptom	Possible Cause	Remedy
Scale does not respond to front panel controls.	Membrane Switch is defective.	Test the Membrane switch. Replace if necessary. If Membrane Switch is OK, test the PCB. If defective, replace it.
Display is not on or partial characters are displayed.	Main PC Board is defective or LCD may be defective.	Test the PCB. Replace PCB or LCD. **NOTE**: If the LCD shows signs of damage (cracked, dim or partial characters), it should be replaced
Scale reads incorrectly. Scale reading unstable.	Needs calibration. Load Cell is damaged. Main PC Board defective.	Perform Service Calibration. (See Appendix B.) If calibration fails, see next symptom. Test the Load Cell. (See Section 2.2.3.) If defective replace. (See Section 3.3.) Test the PCB. (See Section 2.2.3.) If defective replace it. (See Section 3.4.)
Cannot calibrate	Incorrect weights. LFT lock switch is in locked position; software lock menu is set to ON. Load Cell is defective. PCB is defective.	Verify that proper weights are used. Set LFT lock switch to unlocked position and/or set the software lock menu to OFF. (See Section 1.6.) Test the Load Cell. (See Section 2.2.3.) If defective replace it. (See Section 3.3.) Test the PCB. (See Section 2.2.3.) If defective replace it. (See Section 3.4.)
Error 1	The load on the Pan exceeds the rated capacity of the scale (Overload condition). Needs calibration. Damaged Load Cell.	Remove excess load. Turn scale off then on. Perform service calibration. (See Appendix A.) Test the Load Cell. (See Section 2.2.3.) If defective replace it. (See Section 3.3.)
Error 2	Pan missing. (Underload) Needs calibration. Damaged load cell.	Replace the Pan. Perform Calibration. (Appendix A.) Test the Load Cell. (See Section 2.2.3.) If defective replace it. (See Section 3.3.)

Symptom	Possible Cause	Remedy
Error 9	Checksum error. (Configuration data.) Needs calibration. PCB defective.	Check capacity. (See Appendix B.) Perform Service Calibration. (See Appendix B.) Replace PCB.
Error 14	At power up, the load cell signal is outside the allowable limit. (Zero range error.)	**Remove load from pan. If problem persists, t**est the Load Cell. (See Section 2.2.3.) If defective replace it. (See Section 3.3.)
Error 21	Checksum error. (User data menu settings.) Corrupt checksum error (calibration).	Check menu settings. Perform Service Calibration. (See Appendix B.)
CAL E	Incorrect weight used (Calibration error). Load cell damaged. PC board damaged.	Calibrate using correct calibration weights and in the correct order. Test the Load Cell. (See Section 2.2.3.) If defective replace it. (See Section 3.3.) Test the PCB. (See Section 2.2.3.) If defective replace it. (See Section 3.4.)

3.1 PREVENTIVE MAINTENANCE

Ohaus scales are precision instruments and should be carefully handled, stored in a clean, dry, dust-free 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.

– Do not leave a mass on the scale when the scale is not in use.

– 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. Allow one hour for each 5°F (2.7°C) temperature change before using the scale. 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. Remove the Pan and Sub Pan to inspect and clean the area beneath the Pan.

2. Clean the outside of the scale 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 REMOVING THE TOP HOUSING

Common hand tools are sufficient to disassemble the Valor 5000 scales. Turn the scale off and unplug the power cord before you begin.

1. Carefully lift and remove the Pan from the scale.

2. Unscrew and remove the four Pan Support Caps from the top of the scale.

3. Turn the scale over and remove the five screws which hold the Top Housing. (See Figure 3-1.) Note that one of these is smaller, and is beneath the Security Slide.

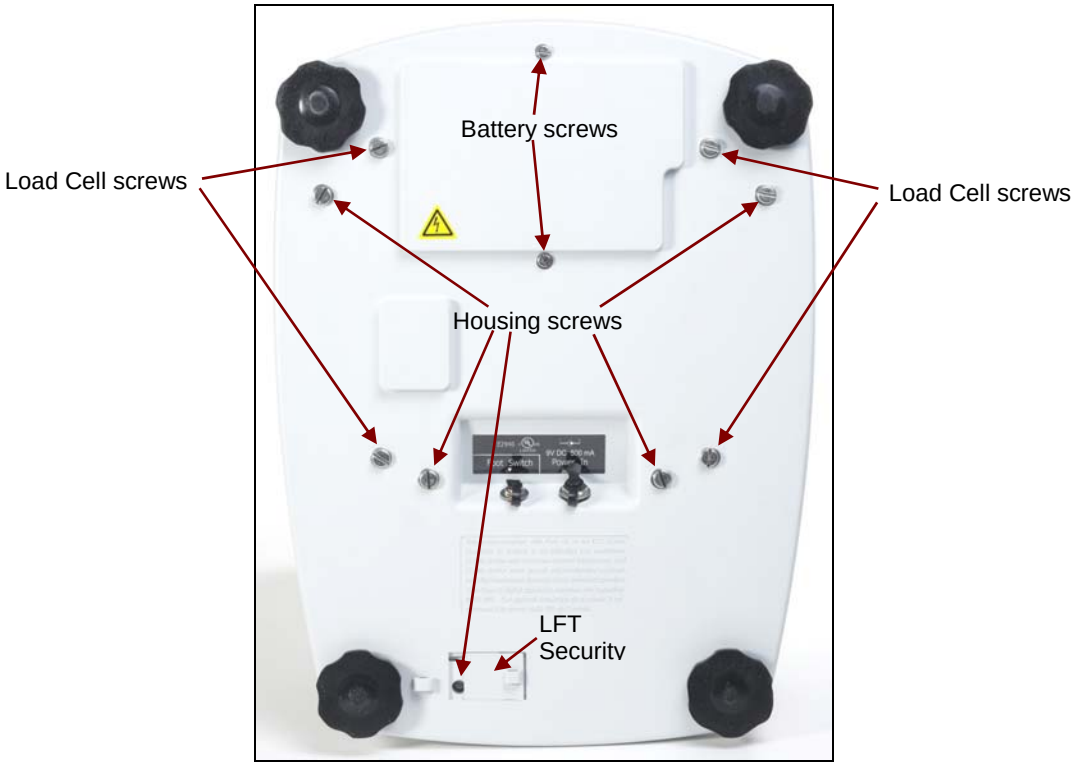


Figure 3-1. Scale Bottom.

CAUTION

Use care in the next step as the Membrane Switch wiring is attached to the PC Board.

4. Place the scale upright and carefully lift the Top Housing from the Base Housing slightly, and tilt forward. Reach under the Top Housing from the front and carefully disconnect the flexible Membrane Switch Cable from PC Board.

5. Set the Top Housing aside.

3.3 REPLACING THE LOAD CELL (Either as Assembly or as Component)

The Load Cell 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.

The entire Load Cell Assembly, with the Frame, can be replaced, or only the Load Cell itself, as an individual component. (See Chapter 5 for parts information.) If it is replaced as a component, the Overload Protection Stops must be adjusted. (See Section 3.3.2.)

3.3.1 Replacing the Load Cell Assembly (with Frame)

The Load Cell is factory assembled and the Overload Protection Stops are pre-adjusted. There are no adjustments to be made on this assembly after installation.

1. Remove the Top Housing, and disconnect the flexible Membrane Switch Cable from the PC Board. (See Section 3.2.)
2. Disconnect the Load Cell Cable from the PCB. (See Figure 3-2.)
3. Remove the four screws holding the Load Cell Assembly to the Bottom Housing. (See Figure 3-1.)
4. Lift the Load Cell Assembly out of the bottom housing and replace it with a new one. Install the screws in the Bottom Housing that were removed in Step 2.
5. Connect the Load Cell Cable to the PCB.
6. Replace the Top Housing and connect the Membrane Switch cable to the PCB.
7. Make sure the LFT Security Slide is in the OFF position.
8. Turn on the scale. The display may show an error code. This is normal.
9. Calibrate the scale according to the instructions in Appendix A.
10. Turn the scale off then on. It will go through all the self-testing.
11. Perform a Service Calibration. (See Appendix B.)
12. Run Performance Tests. (See Chapter 4.)

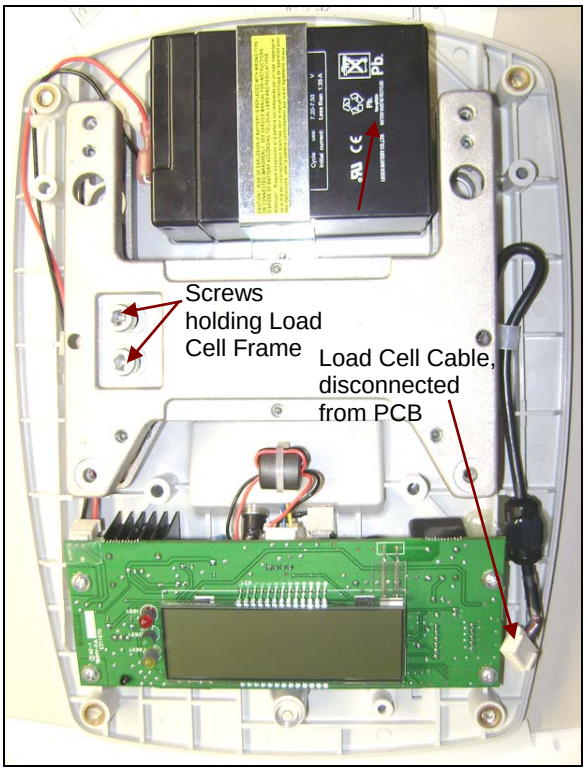


Figure 3-2. Valor 5000 with Top Housing off.

3.3.1 Replacing the Load Cell Component

Use this procedure to keep the existing Load Cell Frame and just replace the Load cell.

Note: When the new Load Cell is mounted to the existing Frame, the Overload Protection Stops must be adjusted.

1. Remove the Top Housing, and disconnect the flexible Membrane Switch Cable from the PC Board. (See Section 3.2.)
2. Disconnect the Load Cell Cable from the PCB. (See Figure 3-2.)
3. Remove the four screws holding the Load Cell Assembly to the Bottom Housing. (See Figure 3-1.)
4. Remove the screws holding the Load Cell Frame to the Load Cell, and lift it off.
5. Remove the cable clamp holding the Load Cell cable to the Frame.
6. On the *bottom* of the Load Cell Frame, remove the two screws holding the Load Cell.
7. Install the new Load Cell: insert the four screws that hold it to the Frame. Torque the screws as indicated in Table 4-1. Be sure the Load cell is properly aligned.

TABLE 3-1. LOAD CELL TORQUE SETTINGS

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

8. Re-attach the cable clamp holding the Load Cell Cable to the Frame assembly
9. Re-install the four screws holding the Load Cell Assembly to the Bottom Housing. (See Figure 3-1.)
10. Re-connect the Load Cell Cable to the PC Board.
11. Replace the Top Housing and connect the Membrane Switch cable to the PCB.
12. Make sure the LFT Security Slide is in the OFF position.
13. Turn on the scale. The display may indicate an error code. This is normal.
14. Perform a Service Calibration. (See Appendix B.)
15. Run Performance tests. (See Chapter 4.)

3.3.2 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 requires mm feeler gauges ranging from 0.35 mm to 2.1 mm or inch feeler gauges 0.013 in. to 0.082 in. (See Table 3-2.)

1. At each Overload Stop Protection location, insert the proper feeler gauge as specified in Table 3-2.

2. With the correct feeler gauge positioned in the first Overload Protection Stop, press down on the Frame and check for 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.

3. Repeat this procedure for all of the Overload Protection Stops, using the appropriate feeler gauges.

4. When the initial gap settings have been made, recheck all gap settings and adjust as required.

5. Use a thread locking solution to coat all down stop screws so they will not move.

TABLE 3-2. LOAD CELL OVERLOAD PROTECTION STOP GAP SETTINGS

CAPACITY	LONG ARM	MID	SHORT ARM
3 kg	0.7 mm / 0.028 in.	0.5 mm / 0.02 in.	0.5 mm / 0.019 in.
6 kg	1.0 mm / 0.039 in.	0.5 mm / 0.02 in.	0.75 mm / 0.029 in.
15 kg	1.4 mm / 0.055 in	0.7 mm / 0.028 in.	1.2 mm / 0.047 in.
30 kg	2.5 mm / 0.098 in	0.9 mm / 0.035 in	1.4 mm / 0.055 in

6. Reassemble the scale.

7. Perform a Service Calibration. (See Appendix B.)

8. Run Performance tests. (See Chapter 4.)

3.4 Replacing the Printed Circuit Board and LCD Display

The Printed Circuit Board (PCB) is located inside the scale towards the front. To replace the PCB it is necessary to disassemble the scale. The LCD Display may also be replaced as a separate item if it is cracked or partial displays are shown.

1. Remove the Top Housing, and disconnect the flexible Membrane Switch Cable from the PC Board. (See Section 3.2.)
2. Disconnect the Load Cell Cable from the PCB. (See Figure 3-2.)

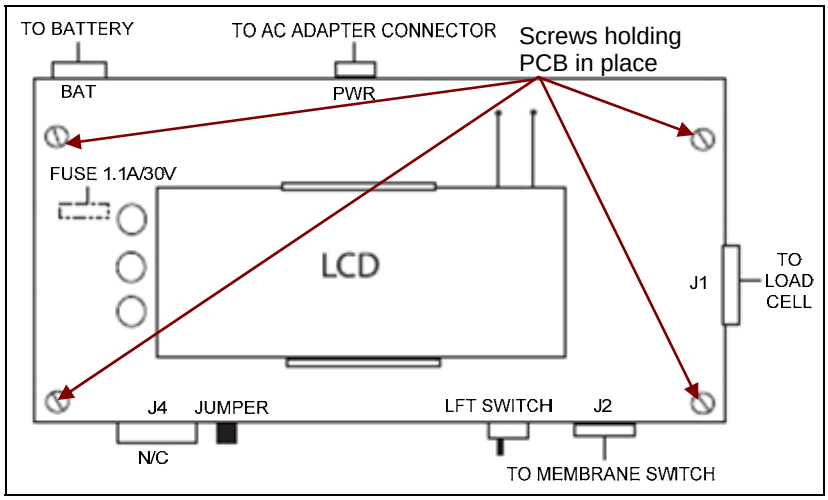


Figure 3-3. PCB Connector Locations

3. Remove the connector plugs from the Battery and AC Adapter. Remove the four screws holding the PCB. (See Figure 3-3.)
4. Lift the PCB up from the Housing. Insert the replacement PCB.
5. Follow these steps in reverse order to install the new PCB.
6. Replace the Top Housing and connect the Membrane Switch cable to the PCB.
7. Make sure the LFT Security Slide is in the OFF position.
8. Turn on the scale. When self-testing is completed, the display may indicate an error code. This is normal.
9. Configure the Scale. (See Appendix C.)
10. Perform a Service Calibration. (See Appendix B.)
11. Run Performance tests. (See Chapter 4.)

Note: The PCB and the LCD Display are supplied as a single unit. However, if only the LCD Display needs replacement, it can be separated from the PCB by removing the two screws in the bottom of the PCB, and unsoldering the 24 fine lead-wires connecting it to the PCB. When installing the new LCD Display, carefully feed the lead-wires through their holes, then insert the two screws, and finally solder the 24 lead-wires.

3.5 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. Remove Top Housing. (See Section 3.2.)

CAUTION

Use care in the next step as the Membrane Switch wiring is attached to the PC Board.

2. Place the scale upright and carefully lift the Top Housing from the Base Housing slightly. Reach under the Top Housing from the front and carefully disconnect the flexible Membrane Switch Cable from the PCB.

3. On the Top Housing, lift up the defective Membrane Switch (if necessary carefully pry it up with a knife) and gently peel it off the Upper Housing.

4. Carefully clean the Top Housing Membrane Switch area, removing all traces of adhesive. The best method is to use a flat razor blade.

5. 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.

6. 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.

CAUTION

DO NOT PRESS ON THE CLEAR WINDOW AREA OR ON THE SWITCHES.

7. Position the Top Housing over the Bottom Housing and connect the flexible Membrane Switch Cable to the PC Board.

8. Reassemble the scale.

9. Replace the Pan Support Caps and Pan on top of the scale.

10. Run Performance tests. (See Chapter 4.)

3.6 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 scale's charger. 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.
- Check the battery for any irregularities in appearance. If there is any damage to the case such as cracks, deformation or leakage, replace the battery.
- Do NOT charge the battery with the charger terminals reversed.

1. Remove the Top Housing. (See Section 3.2.)
2. Disconnect the wire Harness from the Battery.
3. Remove the two screws holding the Battery Holder on top of the Battery. These screws are reached from underneath the scale on the Bottom Housing.
4. Lift the Battery out of the Bottom Housing.
5. Position the new Battery in the Bottom Housing.
6. Reinstall the Battery holder using the two screws.
7. Place the Battery Holder over the Battery and secure it with the two screws previously removed.
8. Attach the two battery wires with quick-clips to the new Battery posts. Attach the Red wire to the positive terminal on the Battery and the Black wire to the negative terminal.

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.

4.1 TESTING

Before and after servicing a Valor 5000 scale, various performance tests should be made to confirm that the scale meets specifications. Turn the scale on and allow it to warm up for at least 20 minutes before performing these tests.

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

4.1.1 Test Masses Required

The masses required to test the Ohaus Valor 5000 scales must meet the requirements of ASTM Class 4 or OIML F2 Tolerance. The mass values are listed in Table 4-1.

TABLE 4-1. CALIBRATION MASS VALUES

MODEL	Span Cal Choices	Linearity Cal (fixed)	Service Cal.
V51P3	1, 2, 3 kg	1 or 2, 3 kg	1, 3 kg
V51P6	2, 4, 6 kg	2, 6 kg	2, 6 kg
V51P15	5 10, 15 kg	10, 15 kg	5, 15 kg
V51P30	10, 20, 30 kg	15, 30 kg	10, 30 kg

4.2 PERFORMANCE TESTS

Accurate performance of the Valor 5000 scales is determined by a series of performance tests. The displayed readings are compared with the tolerances listed in Tables 1-1 and 1-2. Tolerance values are expressed in counts. A one-count difference is shown in the last digit on the scale display.

NOTE:
The following performance tests are used to evaluate scale operation before and after repairs. The scale must meet the requirements specified in each test as well as the specifications listed in Tables 1-1 and 1-2. Before proceeding with the following tests, the scale should be calibrated. (See Appendix A.)

4.2.1 Segment Display Test

Turn the scale on, and ensure that all segments are enabled and displayed briefly. This is a Segment Display Test. (See Figure 4-1.)

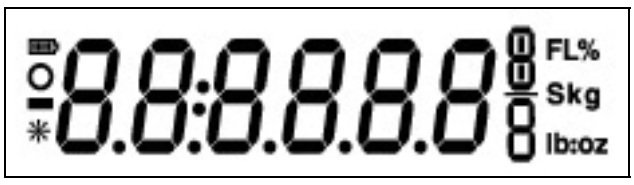


Figure 4-1. Segment Display

4.2.2 Load Cell Test Using RAMP

To test the Load Cell using RAMP, see Appendix B.

4.2.3 Precision Test

The Precision Test measures the Standard Deviation of a set of similar weight readings, which should match the specification for each model, listed in Tables 1-1 and 1-2.

1. Power on the balance. The reading on the display should be 0g.

2. Select a mass weighing near the maximum capacity of the balance, and place it on the center of the Pan. Observe and record the reading.

3. Remove the mass. The reading should return to 0g ±1 count.

4. Repeat this test three times. The reading should be within ±1 count of the reading recorded. If so, the balance passes the Precision Test.

5. If the deviation for any set of readings (using the same mass placed on the center of the Pan) is greater than the tolerance listed in Tables 1-1 and 1-2, the balance does not meet the precision specification. Inspect and correct the following areas:

   – Check for mechanical obstructions. Any foreign object touching any part of the moving assemblies will cause a balance to fail the Precision Test. Inspect and correct as necessary.

   – 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, perform a service calibration, and try again. (See Appendix B for Service Calibration.)

4.2.4 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 ½ of the capacity of the instrument.
- Wear gloves when handling the mass.

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

Set Up:

Enter the menu and adjust and record the following settings:

A. Set the Stability setting to its lowest setting.
B. Set the Filter level to medium or the center of its range.
C. Set the AZT (Auto Zero Tracking) to .5d or its lowest setting. Do not turn it off.
D. Set the instrument to display the same units as the performance specifications. (Usually kg, g, or mg)

Record Settings:

Stability Setting = _____

Filter Level Setting = _____

Auto Zero Tracking Setting = _____

Displayed Units = _____

Mass Used = _____

TEST PROCEDURE:

1. Zero the instrument, if it does not read zero.
2. Using a test mass approximately half the capacity of the instrument, 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 4-2) with the ten (10) readings.

4.2.4 Repeatability Test

TABLE 4-2. 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 =_____

10. **Note:** If the balance 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, perform a service calibration, and try again. (See Appendix B for Service Calibration.) If the Scale continues failing to meet specifications, the Load Cell may need to be replaced.

4.2.5 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 Precision and Repeatability Tests, and be calibrated before the Linearity Test may be performed.

TABLE 4-4. LINEARITY TEST MASSES

Capacity:	**3 kg**	**6 kg**	**15 kg**	**30 kg**
Test Mass:	1 kg	1 kg	1 kg	1 kg
Load 1:	0.5 kg	2 kg	5 kg	10 kg
Load 2:	1 kg	3 kg	10 kg	15 kg
Load 3:	2 kg	5 kg	14 kg	25 kg

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

1. Place the test mass on the Scale, record the weight and remove.
2. Place Load 1 on the Scale and press TARE.
3. Place the test mass on the Scale, record the weight and remove.
4. Place Load 2 on the Scale and press TARE.
5. Place the test mass on the Scale, record the weight and remove.
6. Place Load 3 on the Scale and press TARE.
7. Place the test mass on the Scale and record the weight.
8. The difference in the weights of the test mass should be within the tolerance in Tables 1-1 and 1-2. If not, calibrate (see Appendix A.1) and repeat the test.
9. If the Scale remains out of tolerance, the Load Cell may need to be replaced.

4.2.6 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 Specifications Tables (Chapter 1). If this maximum is exceeded, follow procedures in Section 4.2.7, Adjusting Off Center Load.

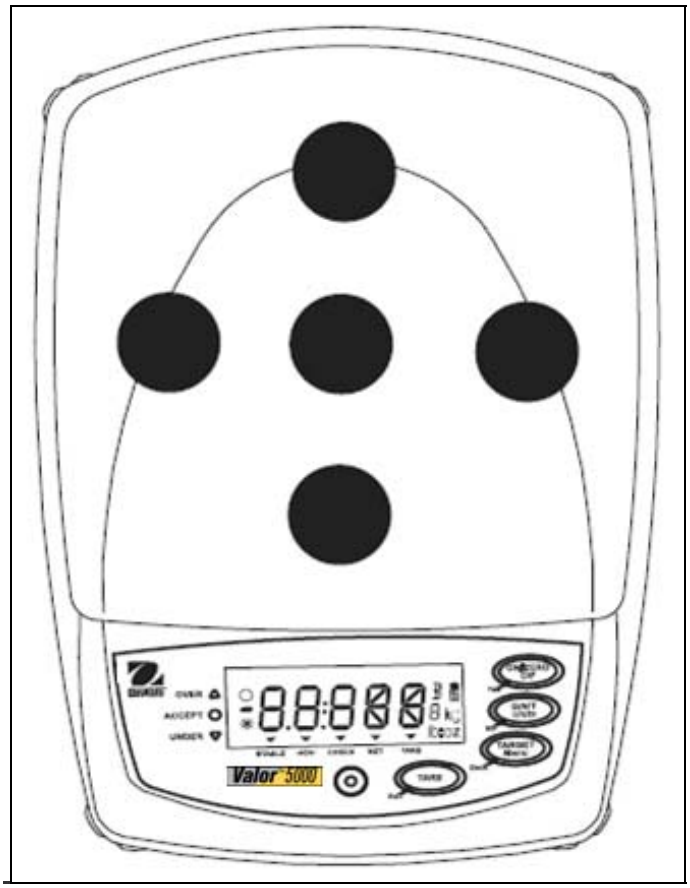


Figure 4-2. Off-Center Load Test Weight Locations.

4.2.7 Adjusting Off Center Load

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

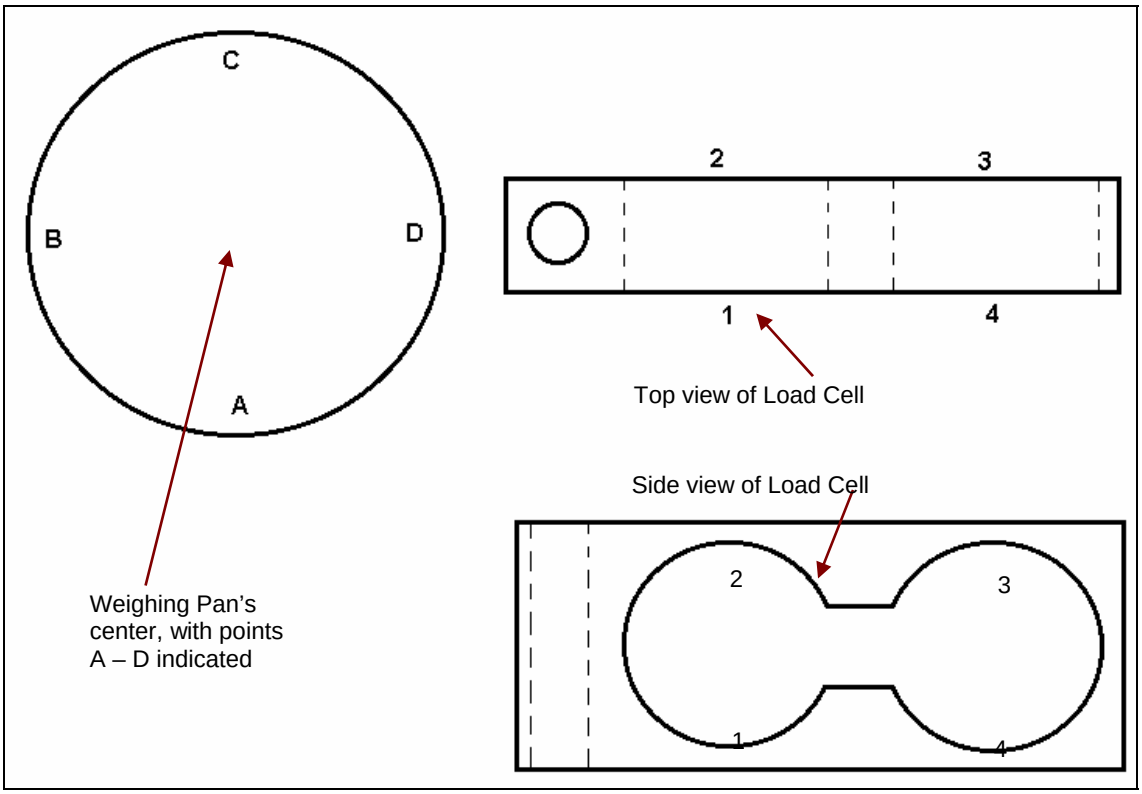


Figure 4-3. Scale drawing of Valor 5000 Load Cell and Weighing Pan.

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

This section of the manual contains exploded views for the Valor 5000 Series scales. The exploded view drawings are designed to identify the parts which can be serviced on the scale 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 distributor, or:

Ohaus Corporation, www.ohaus.com
19A Chapin Road
P.O. Box 2033
Pine Brook, NJ 07058-2033 USA

Tel: 973-377-9000
Fax: 973-593-0359

In the United States call toll free, 800-526-0659 between 8:00 a.m. and 6:00 p.m. EST.

5.1 VALOR 5000 SERIES SCALES: HOUSING & INTERNAL PARTS

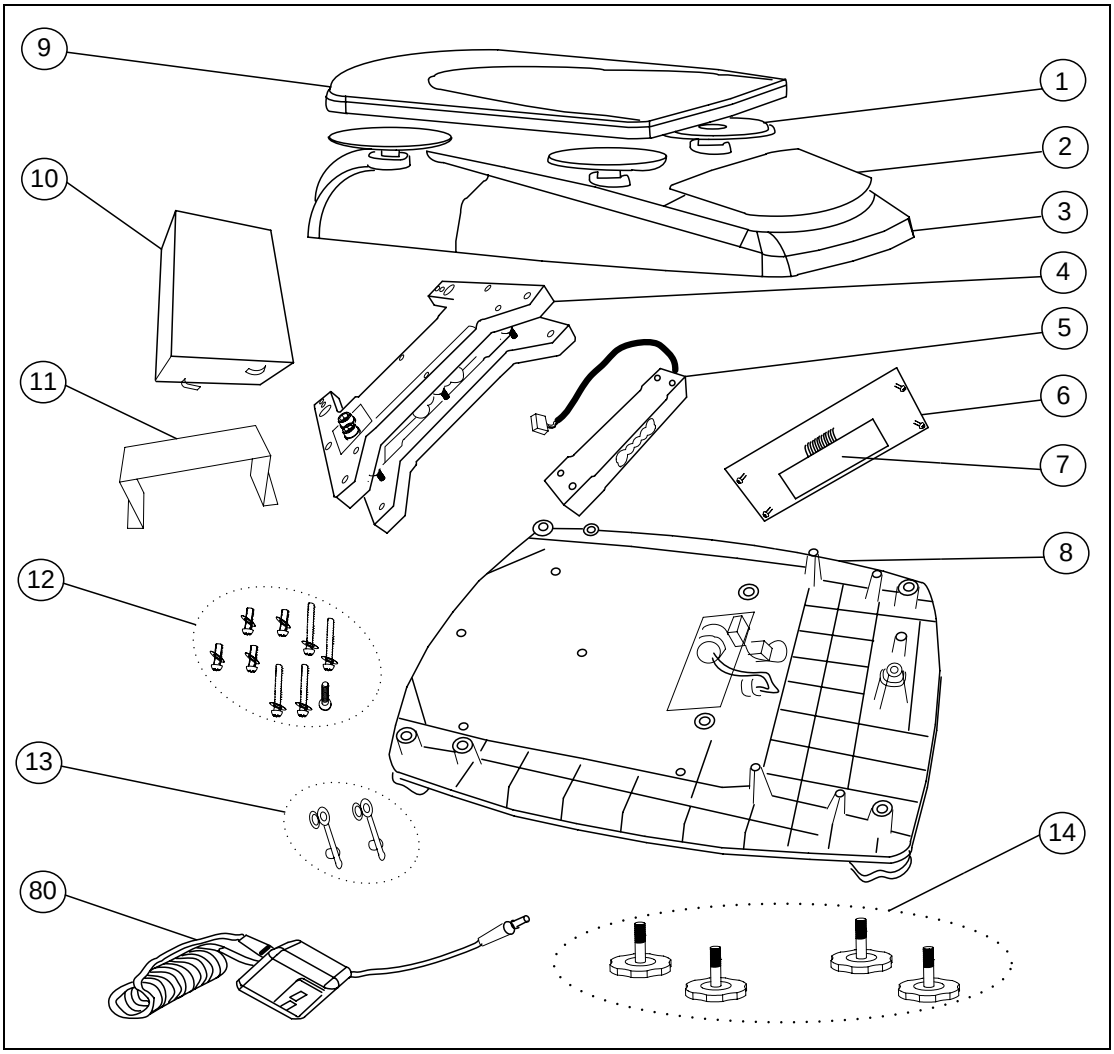


Figure 5-1. Valor 5000 Series Scales: Housing & Internal Parts.

5.1 VALOR 5000 SERIES SCALES: HOUSING & INTERNAL PARTS

TABLE 5-1. VALOR 5000 SERIES SCALES: HOUSING & INTERNAL PARTS

Drawing Item	Description
1	Pan Support Caps (4)
2	Membrane Switch
3	Top Housing
4	Load Cell Assembly (includes Frame)
5	Load Cell
6	Main Printed Circuit Board, with LCD
7	LCD Display
8	Bottom Housing
9	Pan
10	Rechargeable Battery Pack
11	Harness for Rechargeable Battery
12	Hardware Kit
13	Seal, Adapter & Foot Switch Socket
14	Adjustable Feet, Set of 4
80	Adapter

APPENDIX A. STANDARD CALIBRATION

A.1 CALIBRATION

Standard calibration should be performed prior to using a scale, and after service. Calibration can be adjusted in two ways: Span and Linearity. Span calibration uses two calibration points to adjust the sensitivity of the scale. Linearity calibration uses three calibration points to correct for non-linear weighing results. See Section 4.2 for Calibration Masses required for each model.

Calibration is not available when the scale has been set to Legal for Trade operation. To disable LFT, and then restore it if necessary, see Section 1.6.

Note:
Be careful not to touch the scale or the table while calibration is in progress, as it will cause the process to fail.

Span Calibration Procedure

Press **TARGET/*Menu*** until **CAL** appears. Press **Yes.**

Span appears. Press **Yes** to begin Span calibration. **Clear Pan** flashes.

Clear the pan, then press **Yes**.

--C-- appears, followed by the span calibration weight value.

Press **No** to change to an alternate span calibration weight value, or place the indicated calibration weight on the scale and press **Yes**.

--C-- appears then **done**, and then the scale reverts to weighing mode. Remove the calibration weight.

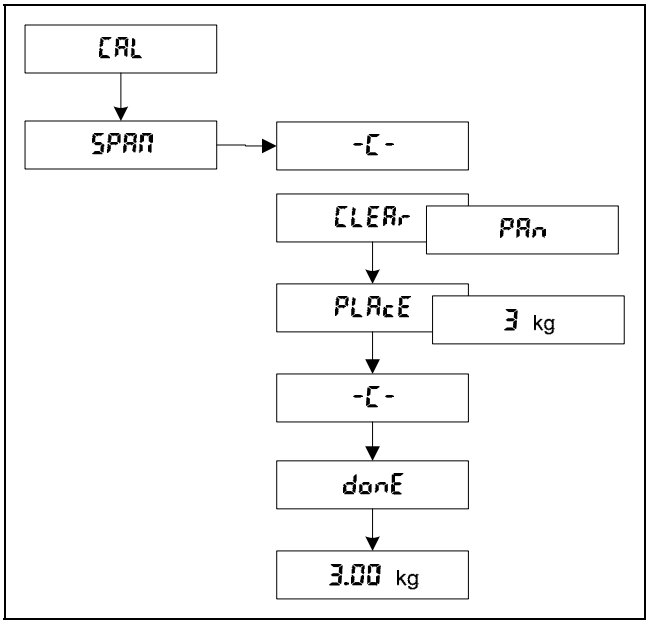


Figure A-1. Span Calibration Menu readings.

Note: The calibration procedure can be canceled at any time by pressing **Exit** or turning the scale off.

A.1 CALIBRATION

Linearity Calibration Procedure

Press **TARGET/*Menu*** until **CAL** appears. Press **Yes. Span** appears. Press **No**.

Lin appears. Press **Yes** to begin Linear calibration. **Clear Pan** flashes.

Clear the pan if necessary, then press **Yes**.

--C-- appears, followed by the first calibration weight value. Press **No** to change to an alternate first calibration weight value, or• place the indicated calibration weight on the scale and press **Yes**.

--C-- appears, followed by the second calibration weight value. Place the indicated calibration weight on the scale and press **Yes**.

--C-- appears, then “done,” and then the scale reverts to weighing mode. Remove the calibration weight.

Note: The calibration procedure can be canceled at any time by pressing **Exit** or turning the scale off.

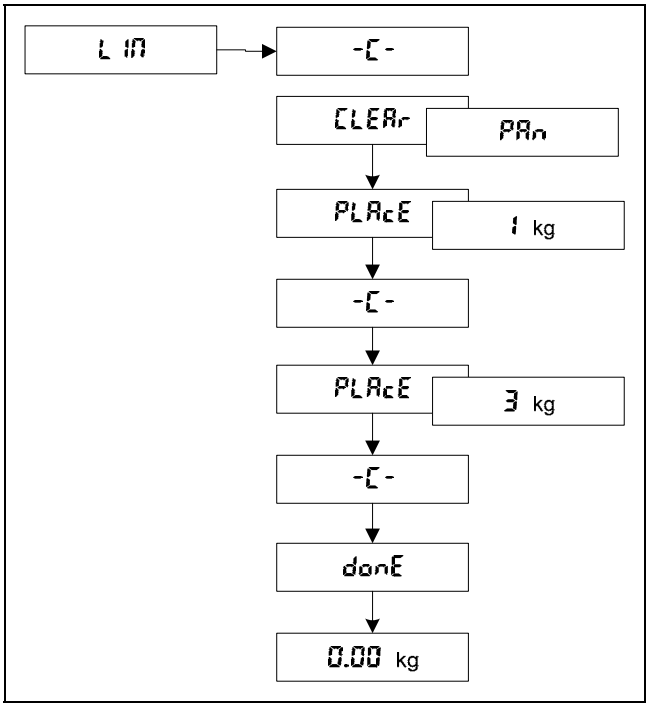


Figure A-2. Linear Calibration Menu readings.

APPENDIX B. THE SERVICE MENU

This section describes the Service menu and sub-menus, which allow authorized service personnel to perform factory settings and calibration (no pre-set limits), as well as setting the Geo code. There is also a Ramp display used to indicate the condition of the load cell. Please refer to the Service Menu diagram

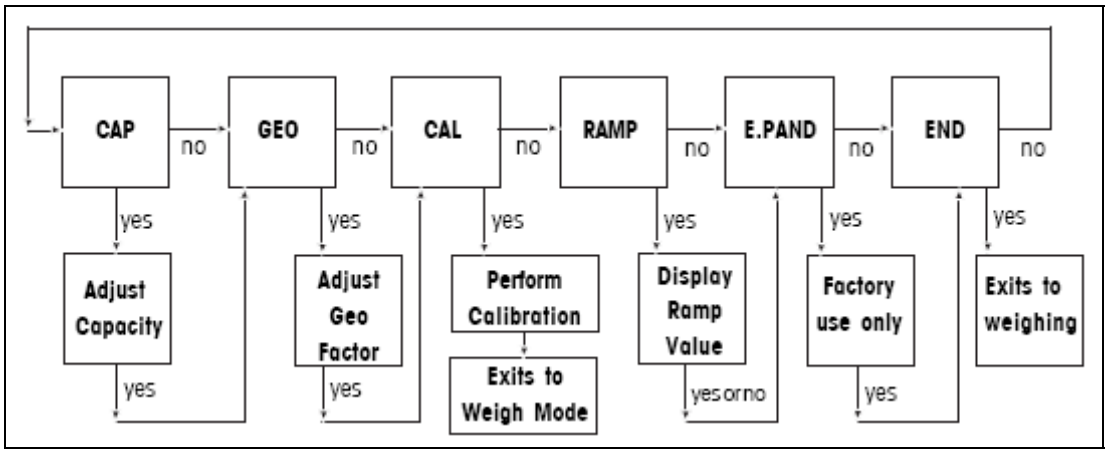


Figure A-1. Service Menu Flow Chart

B.1 ENTERING THE SERVICE MENU

1. The following conditions must be met before entering the Service menu.

   – The Security Slide on the bottom of the scale must be in the OFF position. (See Figure 1-5, page 1-8)

   – In the **Setup** menu **LFT** must be turned **OFF**. (See note.)

   – In the **Lock** menu **Calibration Lock** must be set to **OFF**. (See note.).

   NOTE: This requirement is waived when there is an EEPROM checksum error.

2. Turn the scale on.

3. To enter the Service Menu, press and hold **TARE** and **G/N/T** together for at least ten seconds, until **SERVE** appears briefly, followed by **CAP**.

B.2 NAVIGATION

A blinking item on the display indicates a choice to make:

Press **Yes** to accept the displayed choice.

Press **No** to advance to the next choice or the next menu.

Press **Exit** to exit the service menu and return to displaying the weight.

Press **Back** to back up one step in the menu.

B.3 CAPACITY

The capacity function allows you to set the capacity to match the installed Load Cell.

1. Press and hold **TARE** and **G/N/T** together for at least 10 seconds. **SERVE** appears. SErUE
2. When you release the buttons, **CAP** appears. CAP
3. To check the scale's capacity, press **ON/ZERO Off**. 3 kg flashes. 3 kg
4. To accept the displayed capacity, press **Yes**.
   To change the capacity to match the Load Cell, press **No** until the correct capacity appears, then press **Yes** to accept. Then **GEO** appears. GEO

B.4 GEOGRAPHICAL ADJUSTMENT FACTOR

This menu item is used to compensate for slight variations in gravity at different geographical locations around the world. It allows entry of values from 0 to 31. (Complete Geographical Adjustment Factors are listed in Appendix C.) The default Geo factor is 19 for Europe and 16 for the USA.

This feature allows authorized personnel to accurately calibrate the scale at a location other than the location where the scale is to be used. Prior to calibration, set the Geo factor to correspond to the geographical location where the calibration is being performed. Following calibration, change the Geo factor to match the location where the scale is to be used. If required, the scale may also be sealed according to the required approval regulations.

5. With **GEO** displayed, press **Yes**. The code for the current Geographical location flashes, for example, **GEO 19**. GEO 19
6. Locate the Geographical Factor in Appendix C. Select a number from 0 to 31.
7. To change the Geographical factor, press **No** until the desired GEO Factor appears, then press **Yes**. GEO 16

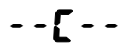
CAL is now displayed. CAL

B.5 SERVICE CALIBRATION

Service calibration is used when span or linearity calibration fails or whenever a Load Cell or PC Board has been changed. Using this procedure establishes a new set of parameters for the scale and new calibration data.

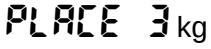
1. When **CAL** appears, press **Yes**. **CLEAR PAN** flashes.

2. Remove any material from the Pan and press **Yes**. **- - C- -** appears.



3. After a few seconds, **PLACE (n) kg** flashes, where **(n)** is the first calibration weight.

4. Place the requested weight on the Pan and press **Yes**. **- - C- -** appears briefly, followed by **PLACE (n) kg** where **(n)** is the second calibration weight.



5. Place the requested weights on the Pan and press **Yes**. **- - C- -** appears briefly, followed by **DONE**.

Within a few seconds, the scale returns to weighing mode and displays the current weight on the Pan.

6. Remove the weights from the Pan.

Note:
Be careful not to touch the scale or the table while calibration is in progress, as it will cause the process to fail.

B.6 Ramp

Ramp is used primarily to determine if the Load Cell is damaged from causes including abuse, heavy weights dropped on the Pan, or dropping the scale. The ramp function displays the duty cycle of the A/D converter output to within one tenth of a percent.

When in the Ramp Menu, placing a small weight on the Pan will cause the reading to increment slightly. Placing additional weights of the same value will also increment to a greater displayed value. This is normal operation. A Load Cell that is damaged will be non-linear as additional weights are added and might also have rapidly changing numbers. In this case, the Load Cell must be replaced.

1. When RAMP appears, press **Yes** to display the scale's ramp values.

2. With an empty Pan, record the no load ramp value.

3. Place half load on the pan and record the ramp value.

4. Place a full load on the Pan and record the ramp value.

5. Subtract the no load ramp value from the half load ramp value.

6. Subtract the half load ramp value from the full load ramp value.
   The two calculated values should be equal.
   The ramp value should be between 20% to 60% throughout testing.
   Values outside of this range indicate the load cell should be replaced.

7. At the end of the testing, press **Yes**.
   E.PAND appears. Disregard this display. It is not used.

8. Press **No**. **END** appears.

9. Press **Yes** to exit and return to the weighing mode.

APPENDIX C. GEOGRAPHICAL ADJUSTMENT VALUES

TABLE D-1. GEOGRAPHICAL ADJUSTMENT VALUES.

Geographical latitude away from the equator (North or South), in degrees and minutes.	Elevation above sea level in meters										
	0 325	325 650	650 975	975 1300	1300 1625	1625 1950	1950 2275	2275 2600	2600 2925	2925 3250	3250 3575
	Elevation above sea level in feet										
	0 1060	1060 2130	2130 3200	3200 4260	4260 5330	5330 6400	6400 7460	7460 8530	8530 9600	9600 10660	10660 11730
0°00′ - 5°46′	5	4	4	3	3	2	2	1	1	0	0
5°46′ - 9°52′	5	5	4	4	3	3	2	2	1	1	0
9°52′ - 12°44′	6	5	5	4	4	3	3	2	2	1	1
12°44′ - 15°06	6	6	5	5	4	4	3	3	2	2	1
15°06′ - 17°10′	7	6	6	5	5	4	4	3	3	2	2
17°10′ - 19°02′	7	7	6	6	5	5	4	4	3	3	2
19°02′ - 20°45′	8	7	7	6	6	5	5	4	4	3	3
20°45′ - 22°22′	8	8	7	7	6	6	5	5	4	4	3
22°22′ - 23°54′	9	8	8	7	7	6	6	5	5	4	4
23°54′ - 25°21′	9	9	8	8	7	7	6	6	5	5	4
25°21′ - 26°45′	10	9	9	8	8	7	7	6	6	5	5
26°45′ - 28°06′	10	10	9	9	8	8	7	7	6	6	5
28°06′ - 29°25′	11	10	10	9	9	8	8	7	7	6	6
29°25′ - 30°41′	11	11	10	10	9	9	8	8	7	7	6
30°41′ - 31°56′	12	11	11	10	10	9	9	8	8	7	7
31°56′ - 33°09′	12	12	11	11	10	10	9	9	8	8	7
33°09′ - 34°21′	13	12	12	11	11	10	10	9	9	8	8
34°21′ - 35°31′	13	13	12	12	11	11	10	10	9	9	8
35°31′ - 36°41′	14	13	13	12	12	11	11	10	10	9	9
36°41′ - 37°50′	14	14	13	13	12	12	11	11	10	10	9
37°50′ - 38°58′	15	14	14	13	13	12	12	11	11	10	10
38°58′ - 40°05′	15	15	14	14	13	13	12	12	11	11	10
40°05′ - 41°12′	16	15	15	14	14	13	13	12	12	11	11
41°12′ - 42°19′	16	16	15	15	14	14	13	13	12	12	11
42°19′ - 43°26′	17	16	16	15	15	14	14	13	13	12	12
43°26′ - 44°32′	17	17	16	16	15	15	14	14	13	13	12
44°32′ - 45°38′	18	17	17	16	16	15	15	14	14	13	13
45°38′ - 46°45′	18	18	17	17	16	16	15	15	14	14	13
46°45′ - 47°51′	19	18	18	17	17	16	16	15	15	14	14
47°51′ - 48°58′	19	19	18	18	17	17	16	16	15	15	14
48°58′ - 50°06′	20	19	19	18	18	17	17	16	16	15	15
50°06′ - 51°13′	20	20	19	19	18	18	17	17	16	16	15
51°13′ - 52°22′	21	20	20	19	19	18	18	17	17	16	16
52°22′ - 53°31′	21	21	20	20	19	19	18	18	17	17	16
53°31′ - 54°41′	22	21	21	20	20	19	19	18	18	17	17
54°41′ - 55°52′	22	22	21	21	20	20	19	19	18	18	17

TABLE D-1. GEOGRAPHICAL ADJUSTMENT VALUES.

	Elevation above sea level in meters										
Geographical latitude away from the equator (North or South), in degrees and minutes.	0 325	325 650	650 975	975 1300	1300 1625	1625 1950	1950 2275	2275 2600	2600 2925	2925 3250	3250 3575
	Elevation above sea level in feet										
	0 1060	1060 2130	2130 3200	3200 4260	4260 5330	5330 6400	6400 7460	7460 8530	8530 9600	9600 10660	10660 11730
55°52′ - 57°04′	23	22	22	21	21	20	20	19	19	18	18
57°04′ - 58°17′	23	23	22	22	21	21	20	20	19	19	18
58°17′ - 59°32′	24	23	23	22	22	21	21	20	20	19	19
59°32′ - 60°49′	24	24	23	23	22	22	21	21	20	20	19
60°49′ - 62°09′	25	24	24	23	23	22	22	21	21	20	20
62°09′ - 63°30′	25	25	24	24	23	23	22	22	21	21	20
63°30′ - 64°55′	26	25	25	24	24	23	23	22	22	21	21
64°55′ - 66°24′	26	26	25	25	24	24	23	23	22	22	21
66°24′ - 67°57′	27	26	26	25	25	24	24	23	23	22	22
67°57′ - 69°35′	27	27	26	26	25	25	24	24	23	23	22
69°35′ - 71°21′	28	27	27	26	26	25	25	24	24	23	23
71°21′ - 73°16′	28	28	27	27	26	26	25	25	24	24	23
73°16′ - 75°24′	29	28	28	27	27	26	26	25	25	24	24
75°24′ - 77°52′	29	29	28	28	27	27	26	26	25	25	24
77°52′ - 80°56′	30	29	29	28	28	27	27	26	26	25	25
80°56′ - 85°45′	30	30	29	29	28	28	27	27	26	26	25
85°45′ - 90°00′	31	30	30	29	29	28	28	27	27	26	26

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