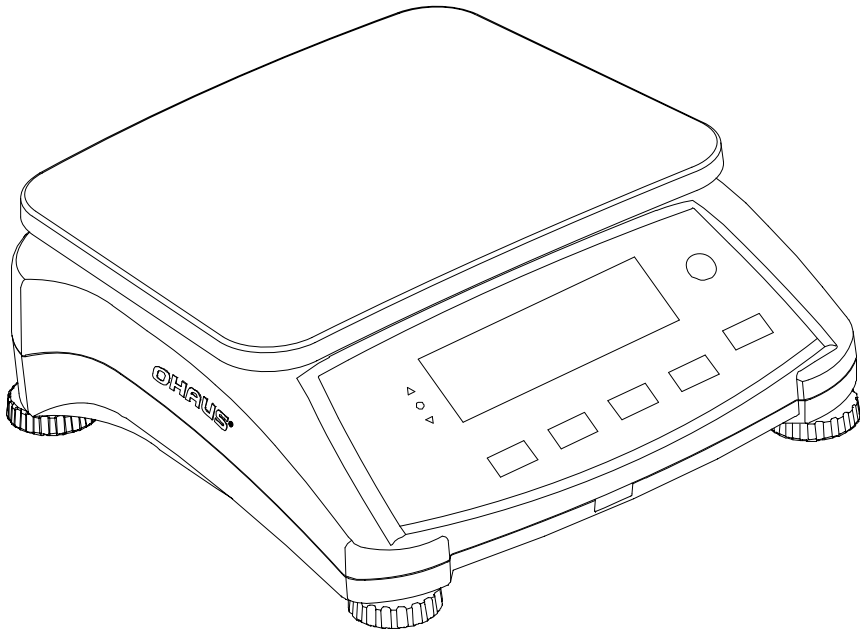
SERVICE MANUAL
VALOR™ 7000



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SERVICE MANUAL

VALOR ™ *7000*

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1.1 INTRODUCTION

This service manual contains the information needed to perform routine maintenance and service on the Ohaus Valor 7000 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 7000 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, and to set the service menu units.

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. Strain Gauge Simulator.

1.4 SPECIFICATIONS

Complete specifications for the Ohaus Valor 7000 scales are listed in Table 1-1. 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

Model	V71P1502T	V71P3T	V71P6T	V71P15T	V71P30T
Capacity	1.5 kg 3 lb	3 kg 6 lb	6 kg 15 lb	15 kg 30 lb	30 kg 60 lb
Min (20e)	0.01kg	0.02kg	0.04kg	0.1kg	0.2kg
	0.02lb	0.04lb	0.1lb	0.2lb	0.4lb
Standard readability d=	0.00005 kg 0.0001 lb	0.0001 kg 0.0002 lb	0.0002 kg 0.0005 lb	0.0005 kg 0.001 lb	0.001 kg 0.002 lb
LFT ON readability e=10d=	0.0005 kg 0.001 lb	0.001 kg 0.002 lb	0.002 kg 0.005 lb	0.005 kg 0.01 lb	0.01 kg 0.02 lb
Standard Resolution	1:30000	1:30000	1:30000	1:30000	1:30000
LFT ON Resolution (nMax)	1:3000	1:3000	1:3000	1:3000	1:3000
Linearity 2d	±0.0001 kg	±0.0002 kg	±0.0005 kg	±0.001 kg	±0.002 kg
Repeatability 2d	±0.0001 kg	±0.0002 kg	±0.0005 kg	±0.001 kg	±0.002 kg
Hysteresis 2d	±0.0001 kg	±0.0002 kg	±0.0005 kg	±0.001 kg	±0.002 kg
Off Center Load 2d	±0.0001 kg	±0.0002 kg	±0.0005 kg	±0.001 kg	±0.002kg
Creep (60s, 2d)	±0.0001 kg	±0.0002 kg	±0.0005 kg	±0.001 kg	±0.002 kg
Creep (30 min. 0.5e) MPE	±0.0002 kg	±0.0005 kg	±0.001 kg	±0.002 kg	±0.005 kg
Stabilization Time	1 sec.	1 sec.	1 sec.	1 sec.	1 sec.
Combined effect (Increasing / Decreasing Load)	MPE	MPE	MPE	MPE	MPE
Zero Drift vs. Temp 2d/°C	±0.0001 kg / °C	±0.0002 kg / °C	±0.0005 kg / °C	±0.001 kg / °C	±0.002 kg / °C
Span Drift vs. Temp 1d/°C, Less or equal than MPE	±16.7ppm / °C	±16.7ppm / °C	±16.7ppm / °C	±16.7ppm / °C	±16.7ppm / °C
Operating Conditions	-10°C to 40°C	-10°C to 40°C	-10°C to 40°C	-10°C to 40°C	-10°C to 40°C
Storage Temperature	-40°C to 60°C	-40°C to 60°C	-40°C to 60°C	-40°C to 60°C	-40°C to 60°C
Pan Size	225 x 300 mm	225 x 300 mm	225 x 300 mm	225 x 300 mm	225 x 300 mm

1.5 SCALE OPERATION – VALOR 7000

This section contains information on the basic operation of the Valor 7000 scale.

1.5.1 OVERVIEW OF THE CONTROLS

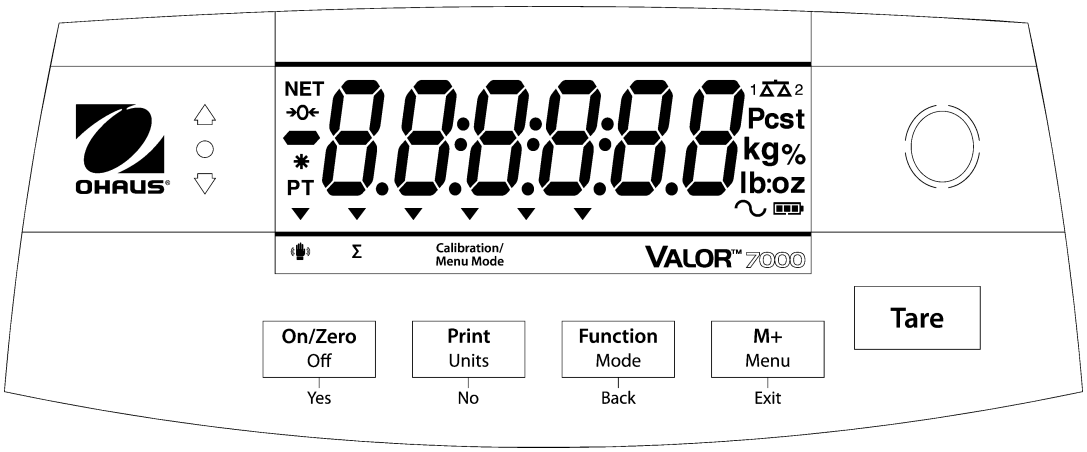


Figure 1-1. Valor 7000 Front Display with controls.

TABLE 1-2. Control functions Valor 7000

Button	Functions
On/Zero	Short Press[1] (when on): Sets display to zero (when off): Turns scale on
Off[3]	Long Press[2] (when on): Turns the scale off
Yes	Short Press (in Menu): Selects/accepts displayed setting
Print **Units**	Short Press: See Interface Manual for operation description. Long Press: Toggles through active weighing units
No	Short Press (in Menu): Toggles through available settings
Function **Mode**	Short Press: Selects function setting Long Press: Selects active Mode
Back	Short Press (in Menu): returns to previous settings
M+	Short Press: Accumulates the weight and displays the accumulated information at 0 load.
Menu	Long Press: Enters User Menu
Exit	Short Press (in Menu): Quickly exit User Menu
Tare	Short Press: Enter/clear a tare value. Clears the accumulation when the accumulation information is displayed.
	The IR Sensor can be programmed to act as “touchless” buttons. See section 4.3 for the available settings.

Notes: [1] Short Press: Press less than 1 seconds.
[2] Long Press: Press and hold for more than 2 seconds.
[3] Press and hold the **Off** button until OFF is displayed, then release the button.

Figure 1-2. Valor 7000 Back Display.

1.5.2 Power ON/OFF

To turn the scale on, press and hold the **On/Zero Off** button for 1 second. The scale performs a display test, momentarily displays the software version, and then enters the active weighing mode.

To turn the scale off, press and hold the **On/Zero Off** button until OFF is displayed.

The scale can be used on AC power immediately. Allow the battery to charge for 12 hours before using the scale on battery power. The Scale will automatically switch to battery operation if there is a power failure or the power cord is removed. With AC power, the scale is constantly charging, so the battery charge indicator (see item 11 in figure 3-2) will remain lit. The scale can be operated during charging, and the battery is protected against overcharging.

For maximum operating time, the battery should be charged at room temperature.

During battery operation, the battery symbol indicates the battery charge level remaining. The indicator will automatically turn off when the batteries are fully charged.

TABLE 1-3

Symbol	Charge level
	0 to 10 % Remaining
	11 to 40 % Remaining
	41 to 70 % Remaining
	71 to 100 % Remaining

Notes:
When battery symbol blinks fast, approximately 30 minutes working time is left.
When [Lo.bAt] is displayed, the scale will shut off.
Charging the scale must be performed in a dry environment.

CAUTION: Battery is to be replaced only by an authorized Ohaus service dealer. Risk of explosion can occur if the rechargeable battery is replaced with the wrong type or if it is not properly connected. Dispose of the lead acid battery according to local laws and regulations.

1.5.3 Menu Setup

Programmable features of the Valor 7000 scales are contained in menus which are accessed through the Display Panel's control switches. See the Instruction Manual for a full description of the menus and how to access them.

TABLE 1-4. Valor 7000 MENU STRUCTURE

Menu:	***C.A.L***	***S.E.t.U.P***	***r.E.A.d***	***M.O.d.E***	⇨
Menu Items:	Span Lin GEO End	Reset Pwr.Un Zero A. Tare Bp.Sig Bp.Key IR Func IR Adj Accum End	Reset Stable Filter AZT Light A.Off End	Reset Weigh Percnt Check End	

⇨	***U.n.i.t***	***P.r.i.n.t***	***C.O.M***	***L.O.C.k***	***E.n.d***
Menu Items:	Reset kg g lb oz lb:oz End	Reset Stable A.Print Contnt Layout Data.Tr End	Reset Baud Parity Stop Handsh Alt.Cm End	L.Cal L.Setup L.Read L.Mode L.Unit L.Print L.COM End	

1.5.4 Menu Navigation

Press and hold Menu until [MENU] (Menu) is displayed. When released the first sub-menu [CAL] (Cal) will be shown.
Summary of button navigation functions in menu mode:

-- **Yes** Allows entry into the displayed menu.
- Accepts the displayed setting and advances to the next item.

-- **No** Skips by the displayed menu.
- Rejects the displayed setting or menu item and advances to the next available item.

-- **Back** Moves backwards through the upper and middle level menus.
- Backs out of a list of selectable items to the previous middle level menu.

-- **Exit** Exits from menu directly to the active weighing mode.

1.6 LEGAL FOR TRADE

When the scale is used in trade or a legally controlled application it must be set up, verified and sealed in accordance with local weights and measures regulations. It is the responsibility of the purchaser to ensure that all pertinent legal requirements are met.
The Menu Lock switch limits changes to the Cal, Setup, Readout, Unit and Print menus. The switch in type approved models may set some scale settings as required by the approval agency. The switch may be secured using paper or wire seals.

Note: When LEGAL FOR TRADE is set to ON (LFT Switch in locked position), the menu settings are affected as follows:

Calibration (CAL) menu is not accessible
Zero Range is locked at 2%
Stable Range setting is locked at 1d
Auto-Zero Tracking setting is locked at 0.5d
Units are locked at their current settings
Filter is locked at current setting
Stable Only is locked On
Auto Print/ Continuous is disabled
Lb:oz is locked Off.

1.6.1 Settings

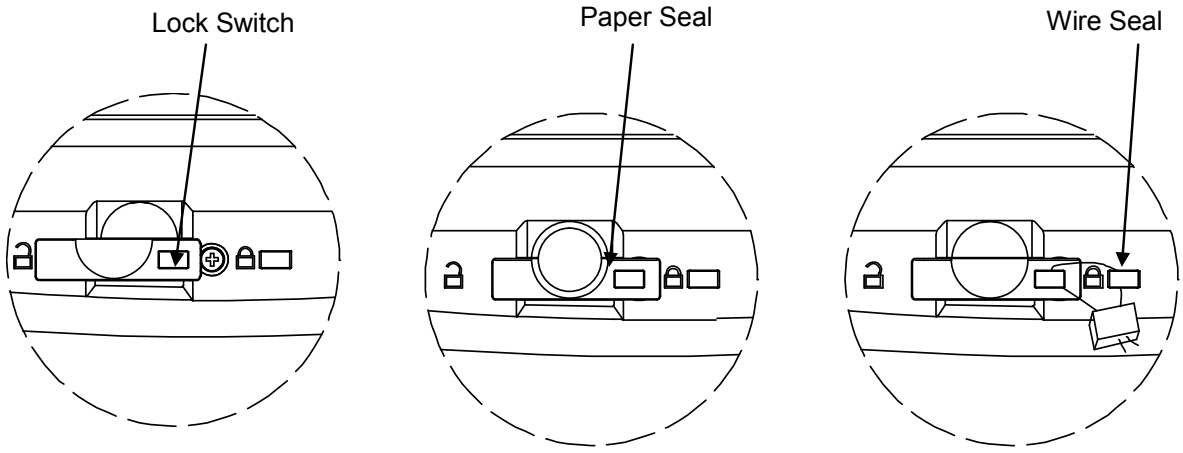
Before verification and sealing, perform the following steps:
1. Verify that the menu settings meet the local weights and measures regulations.
2. Perform a calibration, see instruction manual.
3. Set the switch to Locked. See figure 1-3.

1.6.2 Verification

The local weights and measures official or authorized service agent must perform the verification procedure.

1.6.3 Sealing

The local weights and measures official or authorized service agent must apply a security seal to prevent tampering with the settings. Refer to the illustration below for sealing methods.



Unlocked | Locked with Paper Seal | Locked with Wire Seal

Figure 1-3. Sealing

2.1 TROUBLESHOOTING

This section of the manual contains troubleshooting information. Information is contained to isolate specific problems using Table 2-4, Diagnostic Guide. Follow all directions step by step. Make certain that the work area is clean. Handle balance components with care. Use appropriate Electro-Static Device.

2.2 DIAGNOSTIC GUIDE

Table 2-4 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 balance, read all chapters of this manual to be familiar with the balance components and operation.

2.2.1 Diagnosis

1 Isolate and identify the symptom.

2 Refer to Table 2-4, 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 balance.

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

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

2.2.2 Checking Load Cells for Trouble

1. **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.

   Using an ohm meter, measure and record resistance between each pair of wires from the Load Cell, as specified in Table 2-1. Compare the measured readings with the specified values in Table 2-1.

   If the resistance readings are in the range specified, skip to the next section. If they are outside the expected range, open circuit or short-circuit across any two wires, the Load Cell is defective: replace it. (See Chapter 3.)

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

Model	Ex+ to Ex–	S+ to S–	Ex+ to S–	Ex+ to S+	Ex– to S+	Ex– to S–
All models	404 ± 10	350 ± 4	289 ± 10	289 ± 10	289 ± 10	289 ± 10

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 2-1.

   The EXE+ and EXE– wires should be connected to the PCB, and the SIG+ and SIG– wires must be disconnected. Record the colors for each wire connection before disconnecting. (See Table 2-2 for typical color code for Valor 7000.)

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

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

*Color codes may vary.

   – Insert the Platform Support 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 4 and 1 of Load Cell connection on the PCB (+EXE and –EXE). This voltage must be approximately 3.1 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 3.1 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 PCB.
Note: Measurements must be made with these wires disconnected from the PCB. These measurements represent the output of the Load Cell. Record measurements at Zero Load, 50% and full scale capacities. See Table 2-3 for typical readings.

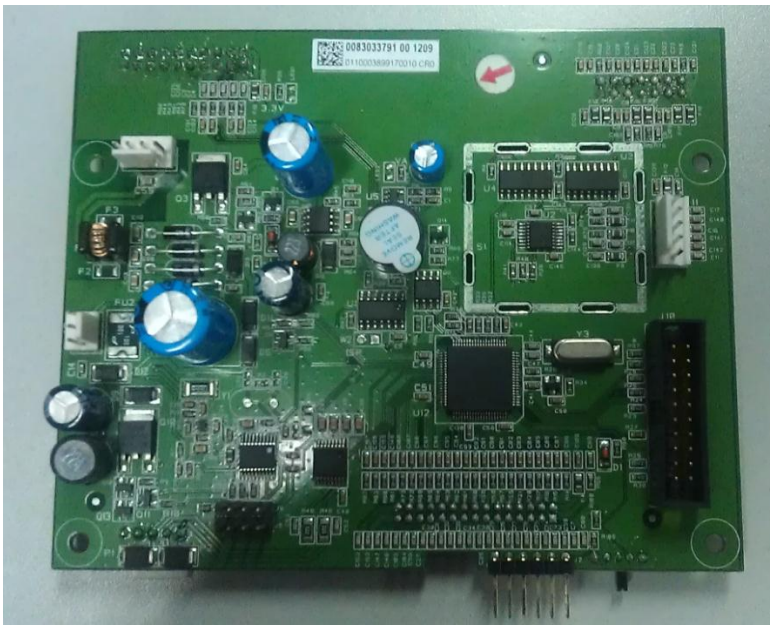


Figure 2-1. Top view of main PCB.

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/V with 3.1V Excitation)

Model/Capacity	Zero Load	50% Load	100% Load
V71P1502T / 1.5kg	**0.492666667**	**0.992666667**	**1.49266667**
V71P3T / 3kg	**0.2956**	**0.8956**	**1.4956**
V71P6T / 6kg	**0.1478**	**0.7478**	**1.3478**
V71P15T / 15kg	**0.0739**	**0.8239**	**1.5739**
V71P30T / 30 kg	**0.03695**	**0.78695**	**1.53695**

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 3.3.1.)

CAUTION: Disconnect the power from the scale before opening the housing.

2. Connect the AC Adapter to the scale and turn the scale on.
3. Using a DVM, measure the excitation voltage (EXE+ and EXE– in Figure 2-1.) The reading should be 3.1 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.)
4. Measure incoming power from the transformer connector shown in Figure 2-1. The voltage should read 0 volts with power off and above 12 Volts dc with power on.
5. Perform simulator testing.

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 3.1 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.

Disconnect power from the scale, and remove the Top housing. (See Section 3.3.1.) Leave the Mechanical Switch connected to the scale. Disconnect the battery.

1. Disconnect the Load Cell cable from the main PC Board.
2. With the Simulator set to zero, solder its cable leads to their counterparts on the PCB, using the Load Cell Cable solder points on the PCB. (See Figure 2-1.).
3. Connect a known good AC Adapter to the scale and connect to a power source.
4. Turn on the scale. An under load error may appear. This is normal.
5. Set the scale to indicate weight in kilograms (kg) and set the calibration value to maximum span value.
6. 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.
7. 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, 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.
3. Upon completion of calibration, the PCB can be further checked using the Simulator to simulate various weight values. If simulator settings and weight readings on the scale agree, the PCB is functional. If the scale readings vary, or do not agree with readings in Table 2-3, the Main PC Board is defective and should be replaced. (See Chapter 3.)

2.2.4 Diagnostic Guide

TABLE 2-4. DIAGNOSTIC GUIDE

Symptom	Possible Cause	Remedy
Cannot turn on	No power to scale	Verify connections and voltage
Poor accuracy	Improper calibration Unstable environment	Perform calibration Move scale to suitable location
Cannot calibrate	LFT locked	See chapter 5 for more information
Cannot access mode	Mode not enabled	Enter menu and enable mode
Cannot access unit	Unit not enabled	Enter menu and enable unit
Battery icon flashing	Low Battery error	Connect the scale to AC power and charge the battery
Err 8.1	Power On Error	Weight reading exceeds Power On Zero limit
Err 8.2	Power On Error	Weight reading below Power On Zero limit
Err 8.3	Over Range Error	Weight reading exceeds Overload limit
Err 8.4	Under Range Error	Weight reading below Underload limit
Err 8.5	Tare out of range	Adjust tare value to be within range
Err 8.6	Display overflow	Weight exceeds 6 digits.
Err 9.5	Calibration data error	Calibration data not present
-------	Busy	Displayed during tare setting, zero setting, printing
--NO--	Action not allowed	Function not executed
CAL E	Calibration error Unstable environment Incorrect calibration weight	Calibration value outside allowed limits Move the scale to suitable location Use correct calibration weight
Lo.rEF	Low reference weight warning	Increase reference weight
rEF.Err	Unacceptable reference weight	Reference weight too small. Weight on the pan is too small to define a valid reference weight. Increase reference weight
Battery fails to charge fully	Battery is defective	Have battery replaced by Ohaus authorized service dealer.

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 another 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. If using the rechargeable battery and the scale malfunctions, first recharge the battery to see if this resolves the problem.
5. Make a visual inspection for faulty connectors, wiring, and loose hardware.

3.2 SERVICE STRATEGY

All parts of the Valor 7000 are designed to be replaced rather than repaired. This includes the Main Printed Circuit Board (PCB) and Switches PCB, the Load Cell, and the cables. For an illustrated list of replaceable parts, see Chapter 5.

3.3 OPENING THE SCALE

Use these procedures in order to replace the Load Cell, any of the Printed Circuit Boards and/or LCD Displays.

3.3.1 Separating the Top and Bottom Housings

Common hand tools are sufficient to disassemble the Valor 7000 scales. Turn the scale off and unplug the power cord before you begin.

1. Lift off the Weighing Pan.
2. Turn the scale over. Remove the eight screws holding the Housing in place. (See Figure 3-1.)
3. Move the top housing a little bit backward and then raise and remove the top housing.
4. Separate Top Housing from Bottom Housing. Avoid straining the cables that connect the Main PCB to the parts in the Bottom Housing. (Lay the two housings close to each other, so cable is not strained.)

Figure 3-1. Screws (marked with white circles) that secure the housing.

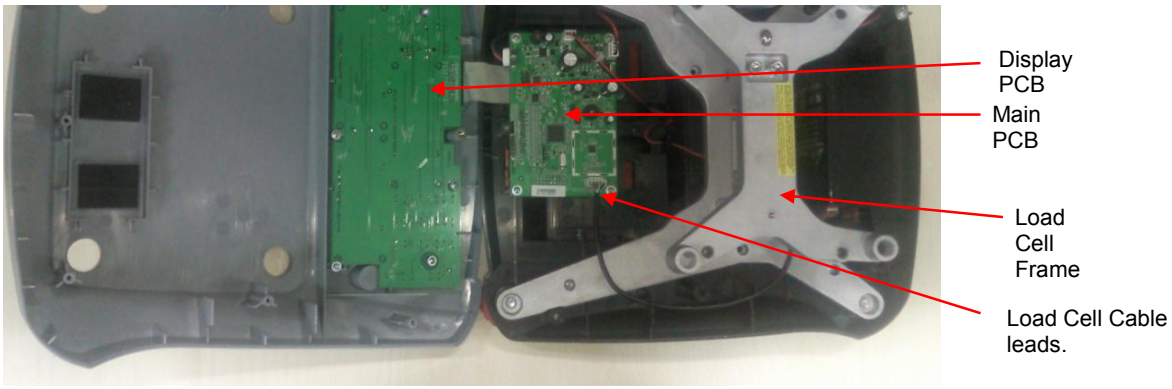


Figure 3-2. Top and Bottom Housings

3.4 Removing/Replacing the Main PCB and Display PCB

If the PCBs are suspected of being faulty, they should be replaced, as follows:

1. Disconnect the Cable connecting the Main PCB to the scale's power system. (See Figure 3-2.)
2. Remove the four screws that secure the PCB to the bottom housing.
3. If either the Main PCB or the Load Cell is to be replaced, note the order of the wire colors and then disconnect the Load Cell Cable from the Main PCB.

   (See Figure 3-2.)
4. Position the replacement PCB as in Figure 3-2, insert and tighten the screws.
5. Re-connect the Load Cell Cables to the PCB, in the same position as originally installed.
6. Re-connect the Cable connecting the Main PCB to the scale's power system.

   (See Figure 3-2.)
7. Insert and tighten the screws that secure the PCB to the bottom housing.

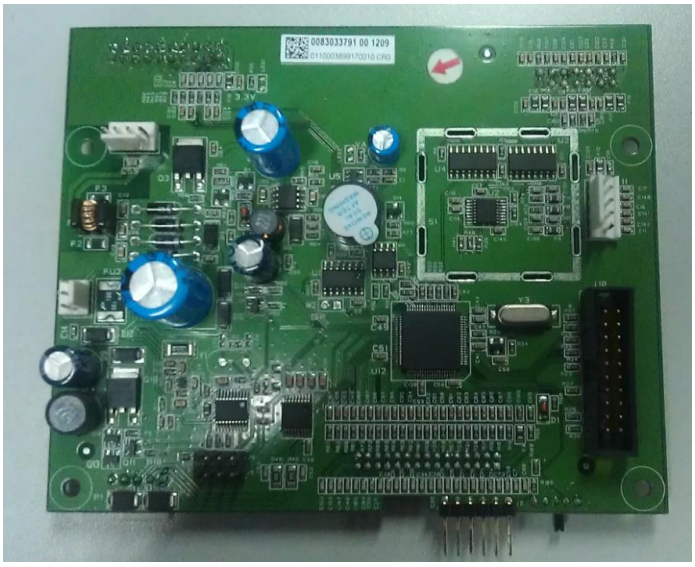


Figure 3-3. Main Printed Circuit Board.

3.5 Removing/Replacing the Load Cell

A Load Cell that is even slightly bent or corroded should be replaced. The Load Cell may also need to be replaced because of instability, or because the scale does not calibrate or repeat.

Note: The Load Cell is sold separately. (See Chapter 5.)

1. Unplug the cable leads connecting the Load Cell to the PCB. (See Figure 3-2.)

2. Turn the scale over and remove the bolts and washers that hold the Load Cell assembly (frame and load cell) to the Bottom Housing.

Remove the bolts and their washer pairs that hold the Load Cell Frame to the Load Cell. Use a high-leverage Allen wrench.

3. Lift the Load Cell away from the frame.

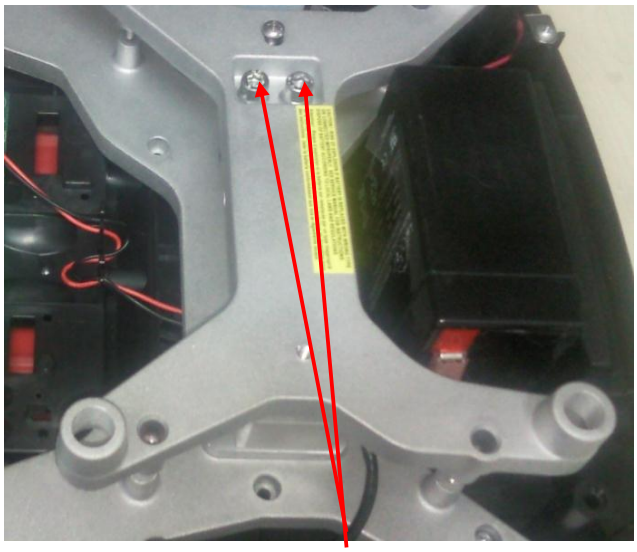


Figure 3-4. Remove the bolts holding Frame to the Load Cell.

4. When installing the replacement Load Cell, first secure the bottom frame to the load cell with the screws and then secure the top frame to the load cell. Adjust the down/up stop gaps (see table 3-2). Install the load cell assembly to the bottom housing. Insert the bolts and their washers, and tighten the bolts. (See Table 3-1 for torque settings.)

5. Connect the Load Cell cables to the PCB. (See Figure 3-2.)

TABLE 3-1. MOUNTING BOLT TORQUE SETTINGS

MODEL	TORQUE SETTING
V71P1501T	6N to 8N
V71P3T	6N to 8N
V71P6T	6N to 8N
V71P15T	6N to 8N
V71P30T	6N to 8N

6. Set Overload Stops as shown in Section 3.6.

3.6 Setting the Overload Stops

The Overload Stop gaps must be checked and reset if the Load Cell is replaced. This procedure requires test masses equal to the scale's capacity. (See Table 3-2.)

There are four Overload Stop Bolts. (See Figure 3-5.)

Adjust the Overload Stops, per Table 3-2:

1. Adjust the Overload Stop Bolt so that the gap between the Load Cell Frame and the Overload Stop Nut is equal to the specification in Table 3-2. (The gap can be tested by applying 100% load, one corner at a time, at each corner stop. If the gap is right, the Load Cell Frame will just touch the Overload Stop Nut.)

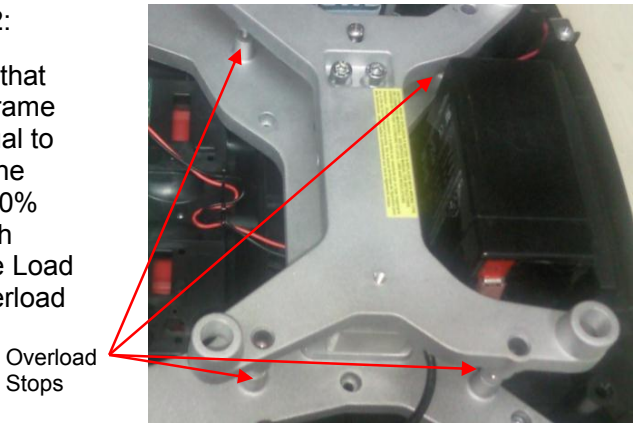


Figure 3-5. Overload Stops.

Note: Be careful not to overload the Load Cell, which would damage it.

2. Repeat this for all four corners.

3. Test the scale to see if full capacity can be achieved.

TABLE 3-2. VALOR 7000 OVERLOAD STOP GAP SETTINGS

Model	Max. Capacity		Overload Stop Gap	
	V7000 Scale	Load Cell	A/B mm	C/D mm
V71P1501T	1.5kg	3kg	0.6	0.5
V71P3T	3kg	5kg	0.8	0.7
V71P6T	6kg	10kg	1.5	1.1
V71P15T	15kg	20kg	2.4	1.7
V71P30T	30kg	40kg	2.4	1.7

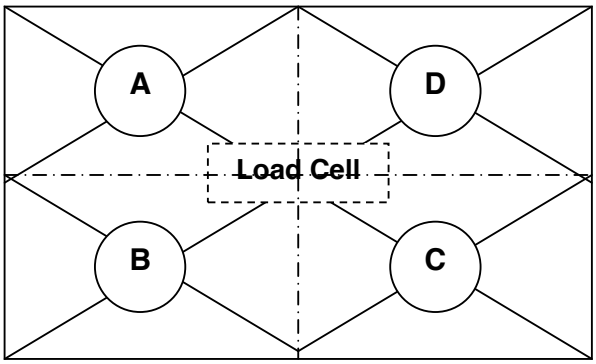


Figure 3-6. Gap position of corners A, B, C, D. (A & B represent the front of the scale.)

3.7 Removing/Replacing the Rechargeable Battery

The Valor 7000 has a rechargeable battery.
If it fails to recharge, replace it as follows:

1. Lift the battery's front end enough to access the quick-connect tabs holding the wire leads.

Note: Be careful not to short-circuit the battery leads.

2. Pull the quick-connect tabs free of the battery posts, and lift out the battery.

Figure 3-7. Rechargeable battery.

3. Position the replacement battery in the compartment on an angle sufficient to access the battery posts.

4. Insert the quick-connect tabs on their respective posts, and place the battery fully in the battery compartment.

3.8 Replacing the Function Label

The Function Label may need to be replaced. (See Chapter 5 for parts information.)
Use a broad knife to remove the label. Clean the glue residue from the Housing surface.
Then carefully place the new label where the old one was.

4.1 TESTING

Before and after servicing a Valor 7000 scale, an operational test and 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 one hour 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 7000 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. TEST MASS VALUES

Model	Weight (g)
V71P1502T	1kg,500g,200g
V71P3T	1kg,500g
V71P6T	2kg,1kg,500g
V71P15T	10kg,5kg,2kg
V71P30T	10kg,5kg

4.2 Operational Test

1. Connect a functioning Power cord to the back of the scale.
2. Plug the Power Cord into a suitable power source, or power the scale on using battery power. (Assure that the battery is charged beforehand.)

4.3 Segment Display Test

Turn the scale on, and ensure that all segments are enabled and displayed briefly and followed by a software revision number.

4.4 Performance Tests

Accurate performance of the Valor 7000 scale is determined by a series of four performance tests. The displayed readings are compared with the tolerances listed for each test in Table 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 other specifications listed in Table 1-1. Before proceeding with the following tests, the scale should be calibrated. (See Appendix A and B.)

4.4.1 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 Table 1-1.

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 ±2 count.

4. Repeat this test three times. The reading should be within ±2 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 ±2 d, 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.)

4.4.2 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 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:

Follow the steps in Appendix A, Section A-2, Setup and Calibration.

Record Settings:

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.

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 =_____

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

4.4.3 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 4-3. LINEARITY TEST MASSES

Capacity (g)	1500 x 0.05 g	3000 x 0.1g	6000 x 0.2g	15000 x 0.5g	30000 x 1g
Reference Wt.	500g	500g	1kg	2kg	5kg
Load 1	200g	1000g	2kg	5kg	10kg
Load 2	500g	1000g	1kg	5kg	10kg
Load 3	200g	500g	2kg	2kg	5kg

NOTE:
All masses are nominal values. 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 **ON/ Zero - Off**.
3. Place the test mass on the Scale, record the weight and remove.
4. Place Load 2 on the Scale and press **ON/ Zero - Off**.
5. Place the test mass on the Scale, record the weight and remove.
6. Place Load 3 on the Scale and press **ON/ Zero - Off**.
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 ±2 d, as specified in the 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.

4.4.4 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 Tables 1-1 (Specifications, page 1-2).
   If this maximum is exceeded, follow procedures in Section 4.4.5, Adjusting Off Center Load.

4.4.5 Adjusting Off Center Load

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

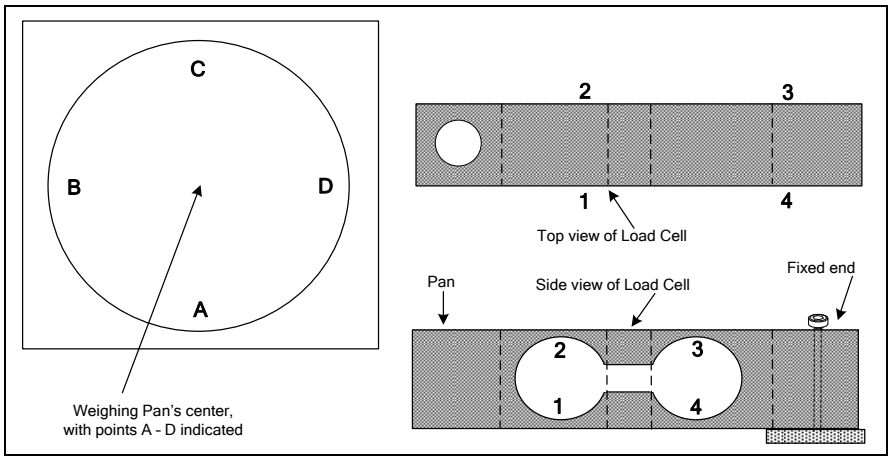


Figure 4-1. Scale drawing of Valor 7000 Load Cell and Weighing Pan.

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.

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 of the Valor 7000 scale. 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:

www.ohaus.com

Ohaus Corporation,
7 Campus Drive
Suite 310
Parsippany, NJ 07054 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 7000 SCALES: PARTS

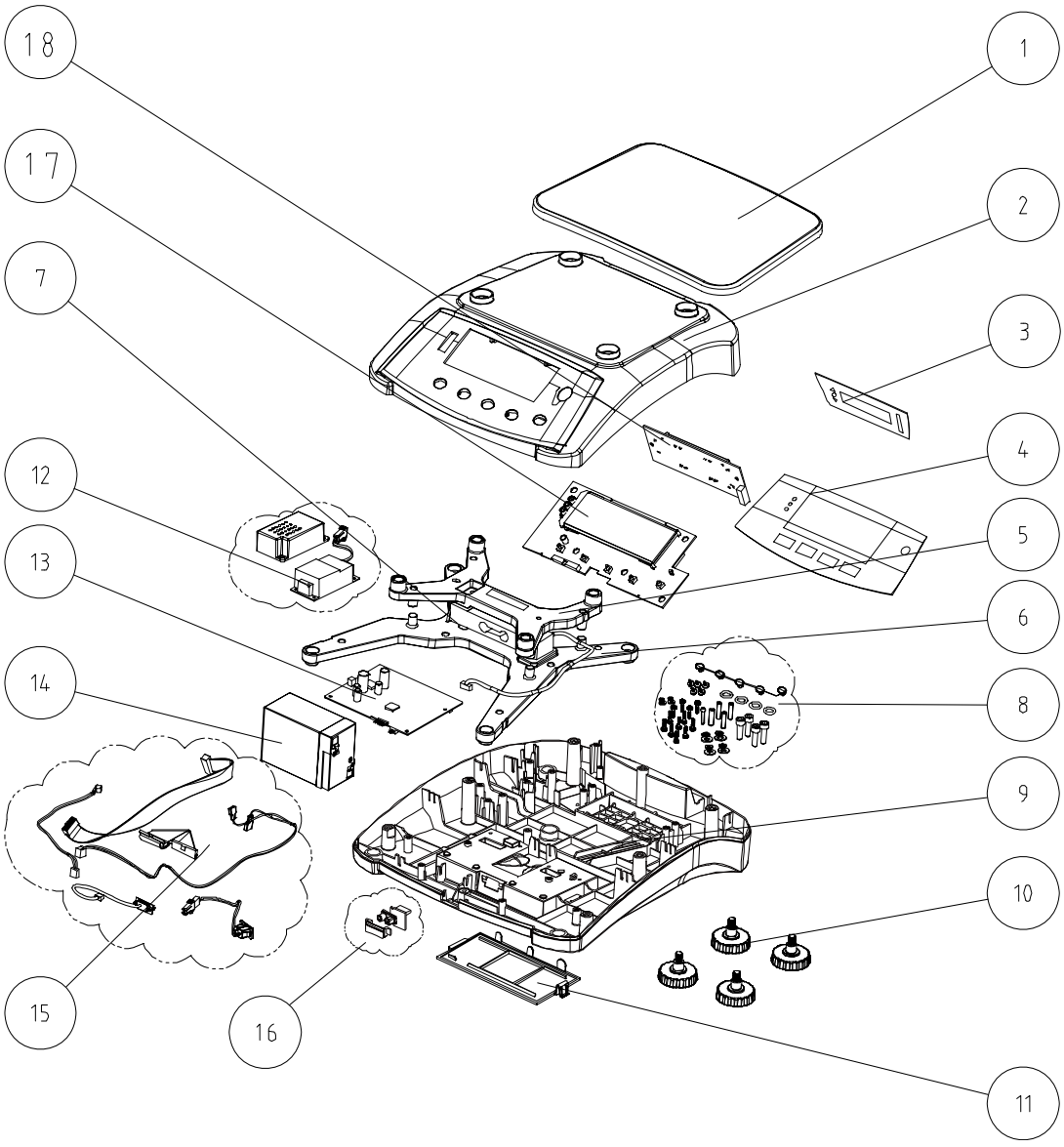


Figure 5-1. Valor 7000 Scales: Parts.

TABLE 5-1. Valor 7000 SCALES: PARTS

Drawing Item	Part Number	Description
1	30037417	Pan,Plastic,R31,RC31,V71
2	30037395	Housing,Top,V71
3	30025998	Function Label,Rear,EN,V71
	30060923	Function Label,Rear,JP,V71
	30037467	Function Label,Rear,KR,V71
4	30025997	Function Label, Front,EN,V71
	30060922	Function Label, Front,JP,V71
	30037466	Function Label, Front,KR,V71
5	30037434	Spider,Upper, R31,R21,RC31,RC21,V71
6	30037401	LoadCell AMI C3 3kg,V71P1502T
	30037402	LoadCell AMI C3 5kg ,V71P3T
	30037403	LoadCell AMI C3 11kg ,V71P6T
	30037404	LoadCell AMI C3 22kg ,V71P15T
	30037405	LoadCell AMI C3 40kg,V71P30T
7	30037435	Spider,Down, R31,R21,RC31,RC21,V71
8	30037420	Hardware Kit,R31,R21,RC31,RC21,V71
9	30037400	Housing,Bottom,V71
10	30037421	Feet,R31,R21,RC31,RC21,V71
11	30037422	Cover,Option, R31,R21,RC31,RC21,V71
12	30037392	Switch Power, R31,RC31,V71
13	30037428	PCBA,Main,R31,RC31,V71
14	71168359	Battery,Lead Acid,R31,R21,RC31,RC21,V71
15	30037419	Harness,R31,R21,RC31,RC21,V71
16	30037438	PCBA,IR sensor with a IR cover,V71P
17	30037430	PCBA,Display,LCD,R31,R21,V71
18	30037433	PCBA,Display,LCD,rear,V71
NA	30037383	Packaging Box carton,R31,R21,RC31,RC21,V71
NA	30037384	Packaging Box,complete,R31,R21,RC31,RC21,V71
NA	30037457	Manual, Instr.,JP,V71
NA	30060919	Manual, Instr.,KR,V71
NA	72200232	Line Cord , US
NA	72200229	Line Cord, EU
NA	72200228	Line Cord, AU
NA	72200231	Line Cord, GB
NA	72200230	Line Cord, JP
NA	30031898	Manual,CD, EN ES FR DE IT, V71

Note: For parts numbers, see your local Ohaus distributor, or visit www.ohaus.com.

APPENDIX A. STANDARD CALIBRATION & SETUP

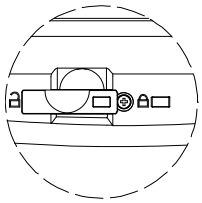
A.1 CALIBRATION

Standard calibration should be performed prior to using a scale, and after service.

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

Preliminary Steps:

1. Be sure the scale is level and stable during the entire calibration process.
2. Allow the scale to warm up for approximately five minutes after stabilizing to room temperature.
3. To abort calibration, press **Exit** key or turn the scale off anytime during the calibration process.
4. Before performing the calibration, be sure to have the appropriate calibration weights as listed in table A-1.
5. Ensure that the LFT switch/calibration lock is set to unlocked position.



6. Or adjust the GEO setting according to your location (see instruction manual).

Table A-1.

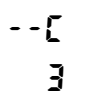
Suggested Span Calibration Mass (sold separately)			
Max	**Mass**[1]	**Max**	**Mass**[1]
1500g	1.5kg / 3lb	15000g	15kg / 30lb
3000g	3kg / 6lb	30000g	30kg / 60lb
6000g	6kg / 15lb		

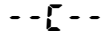
A.2 SETUP AND CALIBRATION

Note: Be sure units are set to **kg** before starting calibration.

1. Turn on the scale. Press and hold **Menu** until [MENU] (Menu) is displayed. When the button is released, the display will show [CAL]. 

2. Press **Yes** to accept. [SPAN] will then be shown. Press **Yes** to begin the span calibration. [0 kg] will be displayed. 

3. Press **Yes** to accept. [--C--] will be displayed while zero reading is stored. Next, the display shows the calibration weight value (e.g. 3). 

4. Place the specified calibration mass on the pan. Press **Yes** to accept the weight or **No** to select an alternate weight. [--C--] will be displayed while the reading is stored. 

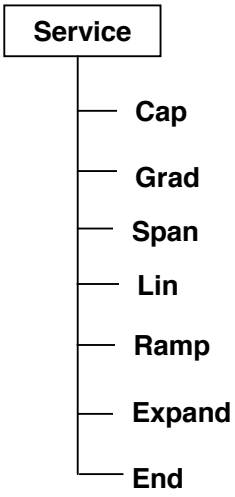
5. The display will show [donE] if the calibration was successful. The scale returns to the previous application mode and is ready for use. 

APPENDIX B. SERVICE CALIBRATION

This section describes the Service Menu and sub-menus, which allow authorized service personnel to perform factory Linearity and Span calibrations (no pre-set limits).

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

B.1 Service Menu Structure



B.2 Entering the Service Menu

Turn the scale off.

Press the **On/Zero** then hold the **Function** and **M+** keys simultaneously for 6 seconds until **S.E.r.U.C.E** is displayed.

S.E.r.U.C.E

B.3 Capacity Menu

When **CAP** appears, press **YES** to accept the Capacity menu item, or press **NO** to advance to the menu item.

CAP

The current Capacity Setting is displayed, blinking.
(Outlined characters represent a flashing display.)

3

Note: The default setting is 3

Press **YES** to accept the setting and move to the Service Grad menu item.

Press **NO** to enter another value using the numeric keypad and then press **YES** to store the new value.

B.4 Graduation Menu

When **GrAd** appears, press **YES** to accept the Graduation menu or **No** to advance to the Service Span Calibration menu.

GrAd

Set the graduation of the scale.

0.00005,…,0.02

B.5 Service Span Calibration

SPAN

When **SPAN** appears, press **YES** to accept the Service Span Calibration menu or **No** to advance to the Service Linearity Calibration menu.

0 flashes. With no weight on the pan, press **Yes** to establish the zero point. (Outlined characters represent a flashing display.)

0

- - C - - flashes while the zero point is established.

--C--

Service Span Calibration point flashes.
(The example shows the value for a Scale Capacity of 3 kg.)
Place the specified calibration weight on the pan and press **Yes**.

3

--C--

- - C - - flashes while the span point is established.

If span calibration was successful, the actual weight reading appears for three seconds, followed by the Service Linearity Calibration menu item.
(The example shows a 3 kg span weight on the pan.)

3.000

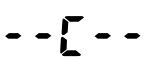
B.6 Service Linearity Calibration

This calibration method uses three points. The full-calibration point is established with a weight on the scale. The mid-calibration point is established with a weight equal to half of the full calibration weight on the scale. The zero calibration point is established with no weight on the scale. The mid-calibration points cannot be altered by the user during the calibration procedure.

When **L in** appears, press **YES** to accept the Service Linearity Calibration menu, or **No** to advance to the Ramp menu item.

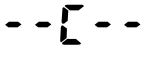
0 flashes. The **kg** LED is lit to indicate the calibration unit.
With no weight on the pan, press **Yes** to establish the zero point.
(Outlined characters represent a flashing display.)

- - C - - flashes while the zero point is established.



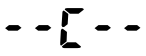
The mid calibration point value flashes. The **kg** LED is lit to indicate the calibration unit. (The example shows the mid calibration point value for a Scale Capacity of 3 kg.)
Place the specified calibration weight on the pan and press **Yes**.

- - C - - flashes while the mid point is established.



The full calibration point value flashes. The **kg** LED is lit to indicate the calibration unit. (The example shows the full calibration point value for a Scale Capacity of 3 kg.)
Place the specified calibration weight on the pan and press **Yes**.

- - C - - flashes while the full point is established.



If linearity calibration was successful, the scale will exit the service menu and enter weighing mode.
(The example shows a 3 kg span weight on the pan.)

If linearity calibration was successful, **S.End** appears.
Press **YES** to exit the Service menu and return to the weighing mode, or **NO** to return to the first Service menu item.

NOTE: If calibration fails, ensure that the test area is free from drafts and the surface the scale rests on is level and free of vibrations. Then try to calibrate again. If it continues to fail, there may be an internal problem. To resolve internal problems, follow procedures in Chapter 3.

B.7 Ramp Menu

When rAMP appears, press **YES** to accept the Ramp menu, or **No** to advance to the Expand menu item.

The Ramp value is displayed as a percent of the A/D range. Press **YES** to advance to the Expand menu item.

Note: Ramp is used to troubleshoot load cell problems. 0% represents no signal from the A/D, 100% reflects the upper signal range of the A/D.

B.8 Expand Menu

When E.PAnd appears, press **YES** to accept the Expand menu, or **No** to advance to the End menu item.

OFF = disabled

ON = enabled

Note: Expand is required for various performance tests.

B.9 End Menu

When E.n.d appears, press **YES** to return to exit the service menu, or **No** to advance to the CAP menu.