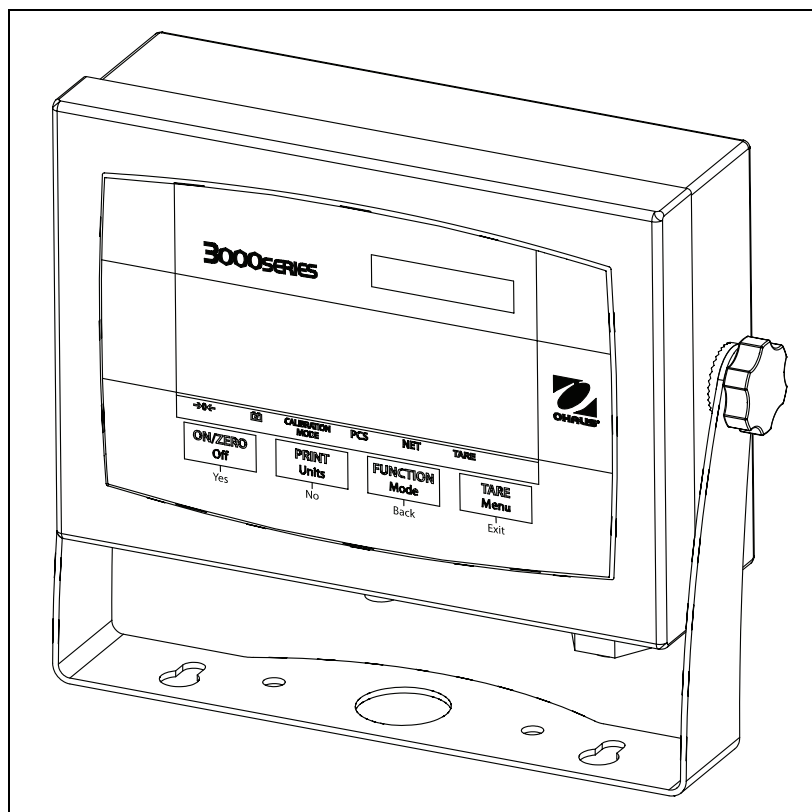




SERVICE MANUAL

3000 Series

T32XW Indicators





SERVICE MANUAL

3000 Series T32 Indicators:

T32XW

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1.1 INTRODUCTION

This service manual contains the information needed to perform routine maintenance and service on the Ohaus T32XW Indicators. The contents of this manual are contained in five chapters:

Chapter 1 Getting Started – Contains information regarding service facilities, tools and test equipment, specifications, hardware setup, operating the Indicator, and configuring the Indicator's communication and Legal-for-Trade menus.

Chapter 2 Troubleshooting – Contains a problem solver chart and error code table.

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

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

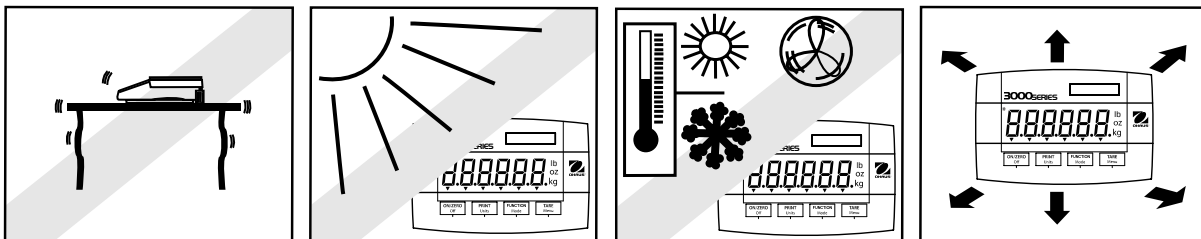
Chapter 5 Drawings and Parts Lists – Contains exploded views of T32XW Indicators, identifying all serviceable components.

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

1.2 SERVICE FACILITIES

To service an indicator, the service area should meet the following requirements:

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



1.3 TOOLS AND TEST EQUIPMENT REQUIRED

In order to properly service the Indicator, certain special tools and test items are required in addition to standard electronic tool kits. These items are listed as follows:

1.3.1 Special Tools and Test Equipment List

1. Ohaus Scale Base.
2. Load Cell Simulator (optional).
3. Computer with RS232 Interface for testing RS232 communications.
4. RS232 Interface cable (9-pin PN 80500552; 25-pin 9-pin PN 80500553).
5. Data Printer for use with RS232 communications.
6. ESD work station or mat.

1.3.2 Standard Tools and Test Equipment List

1. Standard Electronics Tool Kit.
2. Digital Voltmeter (DVM), with clip-on probes. Input impedance of at least 10 megohms in the 1 Volt dc position.
3. Soldering Iron, solder and flux remover.

1.4 SPECIFICATIONS
TABLE 1-1. SPECIFICATIONS

Capacity Range	5 to 20,000 kg or lb
Maximum Displayed Resolution	1:20,000
Approved Resolution	1:6,000
Minimum Avg. Piece Weight	1d
Weighing Units	Kg, lb, g, oz, lb:oz
Functions	Weighing, Parts Counting
Display	1 in./2.5 cm digit height, 6-digit, 7-segment 1.5 in./3.8 cm high x 4.9 in./12.5 cm wide backlit LCD
Backlight	White LED
Keypad	4-button membrane switches
Ingress Protection	IP65 for PCBA Chamber
Load Cell Excitation Voltage	5V DC
Load Cell Drive	Up to 4 x 350 ohm load cells
Load Cell Input Sensitivity	Up to 3mV/V
Stabilization Time	Within 2 seconds
Auto-Zero Tracking	Off, 0.5, 1 or 3 divisions
Zeroing Range	0%, 2% or 100% of capacity
Span Calibration	5 kg or 5 lb to 100% capacity
Interface	RS232
Overall Dimensions (W x D x H) (in/mm)	8.3 x 2.8 x 5.8 / 212 x 71 x 149
Net Weight (lb/kg)	7.1 / 3.2
Operating Temp. Range	-10°C to 40°C / /14°F to 104°F
Power – Battery	Internal rechargeable, Sealed Lead-Acid Battery (58-hour typical life)
Power – AC	100-240 VAC~0.5A MAX / 50-60 Hz, Internal Power Supply

1.5 HARDWARE SETUP

The T32XW connects to a scale base through a Load Cell Cable that connects to the Indicator's Main Printed Circuit Board (PCB). When supplied as part of a scale, the Indicator has a mounting bracket that attaches to the column bracket of the base scale. To remove the mounting bracket, remove the threaded knobs, holding the Indicator by hand.



CAUTION:

ELECTRICAL SHOCK HAZARD. REMOVE ALL POWER CONNECTIONS TO THE INDICATOR BEFORE SERVICING OR MAKING INTERNAL CONNECTIONS.

Remove the five screws shown in Figure 1-1. Carefully open the housing, and allow it to rest on the curved guides, at a 90° angle.

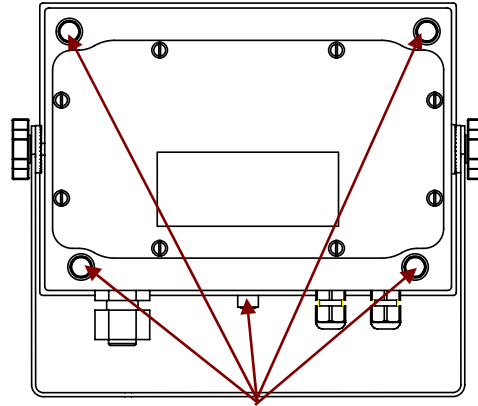


Figure 1-1. Housing screws.

Figure 1-2 shows connectors, jumpers, terminals and switches on the Main PCB. The Load Cell Cable connects to Terminal Block J5.

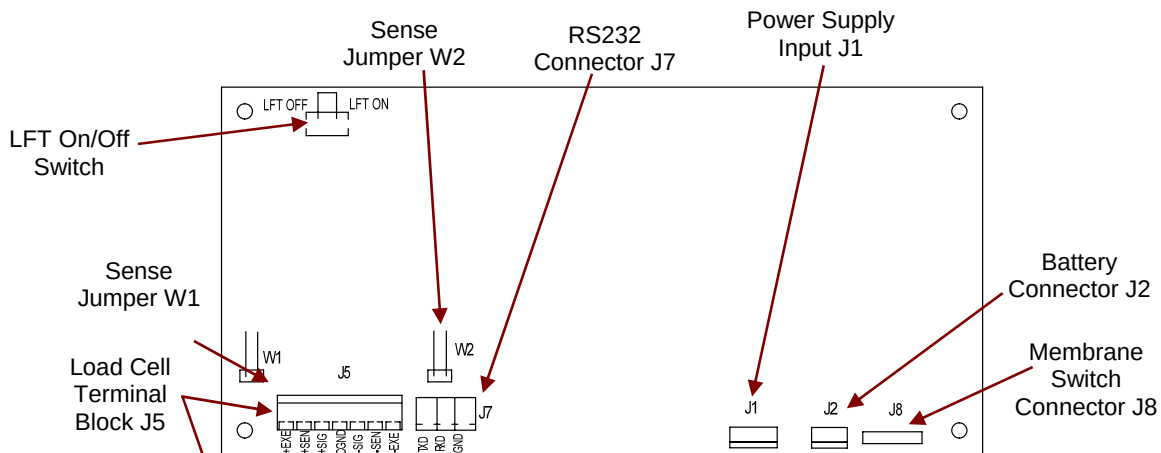


Figure 1-2. Printed Circuit Board (PCB), T32XW Indicator

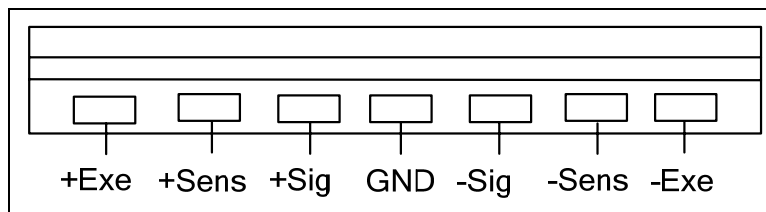


Figure 1-3. Load Cell wiring.

1.5.1 Jumper Connections

For a 4-wire load cell with no sense wires,
short Jumpers W1 and W2.

For a 6-wire load cell with sense wires,
open Jumpers W1 and W2.

For load cells with an extra ground shield wire,
connect the shield to the center position (GND).

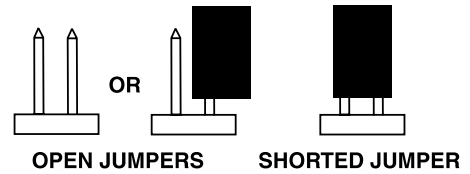


Figure 1-4. Jumpers.

1.5.2 RS232 Interface

A 3-wire insulated RS232 cable is fed through the strain relief (and made water-tight), as illustrated in Figure 1-5.

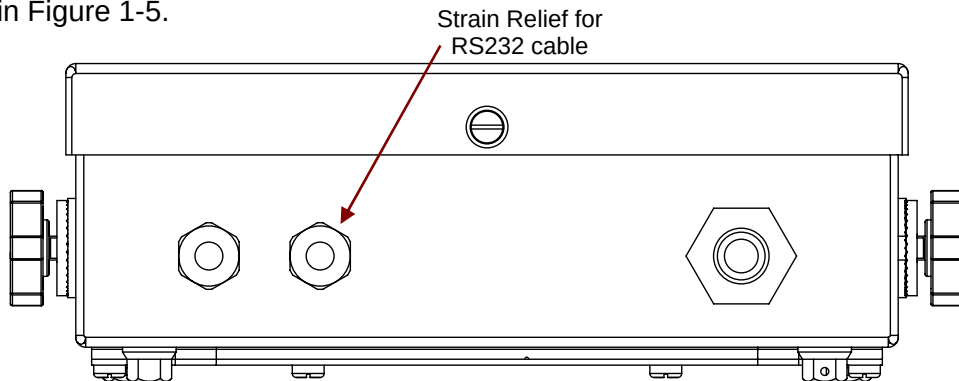


Figure 1-5. Bottom of Housing.

Connect the RS232 cable wires, as
indicated in Figure 1-6.

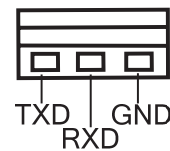


Figure 1-6. RS232 wiring on Main PCB.

To adjust RS232 settings, see Section 1.8, page 1-8, or the Instruction Manual.

1.6 OVERVIEW OF THE CONTROLS

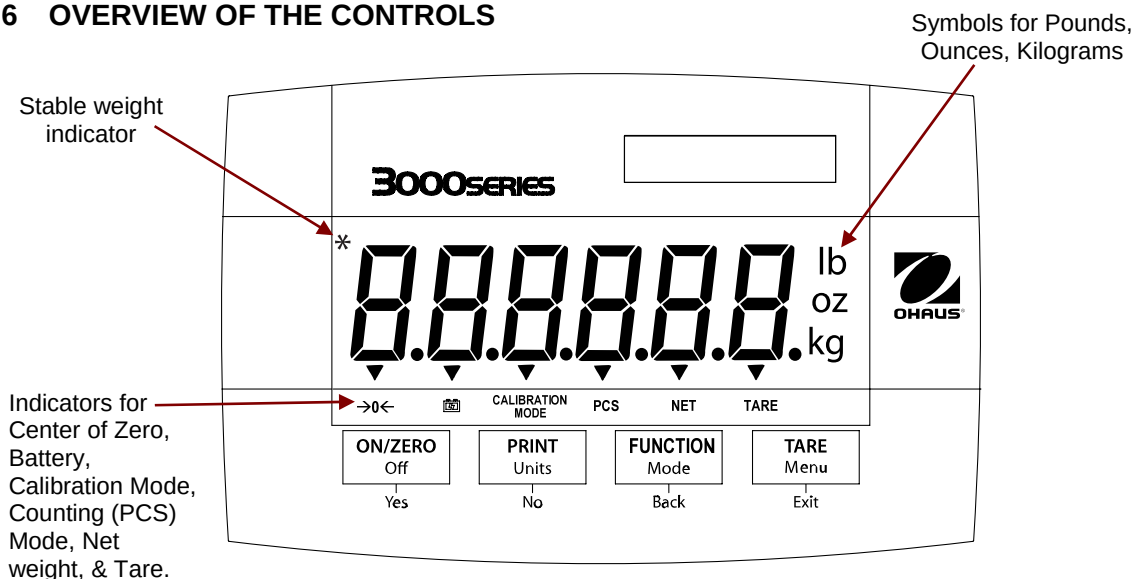


Figure 1-7. T32XW Display.

TABLE 1-2. FUNCTIONS OF DISPLAY CONTROLS

Button	ON/ZERO Off Yes	PRINT Units No	FUNCTION Mode Back	TARE Menu Exit
Primary Function (Short Press)	ON/ZERO Turns the Indicator on.	PRINT Sends the current value to the COM port if AUTOPRINT is set to Off.	FUNCTION Initiates an application mode.	TARE Performs a tare operation.
Secondary Function (Long Press)	Off Turns the Indicator off.	Units Changes the weighing unit.	Mode Allows changing the application mode. Press and hold allows scrolling through modes.	Menu Enter the User menu. <i>Extended press:</i> View the Audit Trail event counters.
Menu Function (Short Press)	Yes Accepts the current setting on the display.	No Advances to the next menu or menu item. Rejects the current setting on display, advances to next available setting. Increments value.	Back Moves back to previous menu item. Decrements the value.	Exit Exits User menu. Aborts calibration.

1.7 OPERATION

1.7.1 Power ON

To turn the indicator on, short-press **ON/ZERO/Off** (1 second). The indicator performs a display test, momentarily displays software version, and then enters the active weighing mode.

1.7.2 Power OFF

To turn the power off, long-press **ON/ZERO/Off** (3-5 seconds). The indicator shuts down.

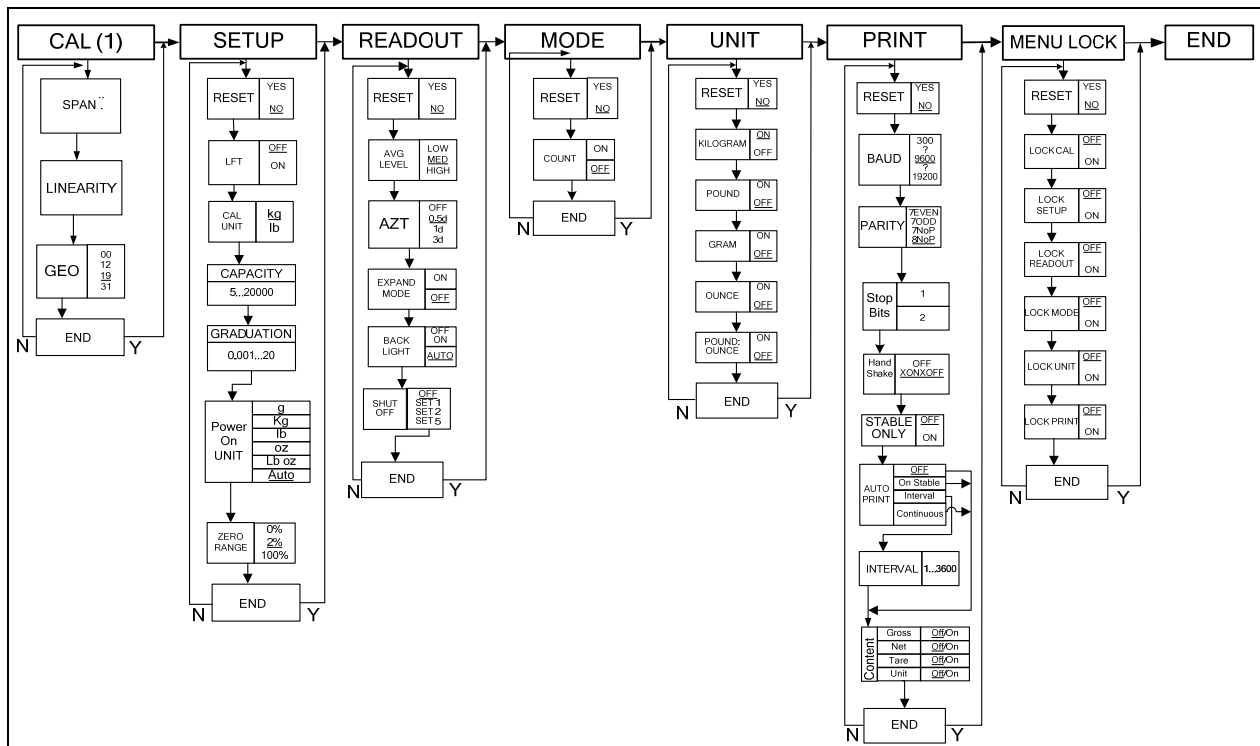
1.7.3 Menu Setup

To enter the Menu Mode, press and hold the **TARE/Menu** button until MENU appears on the display. The first upper level menu appears on the display.

Use **Yes**, **No**, **Back**, and **Exit** to navigate in Menu Mode:

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

Table 1-3. T32 MENU STRUCTURE



1.8 RS232 INTERFACE CONNECTION

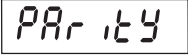
The T32 has a bi-directional RS232 interface for communication with printers and computers. Data can be output various ways, depending on PRINT menu settings.

For RS232 cable connections, see Section 1.5.2, page 1-5.

1.8.1 Setting Communications Parameters

The T32 Indicator's default communication parameters are: baud rate 9600 bits per second (bps), 8 databits, no parity, Handshake XON/XOFF, Stable Only Off, and Autoprint Off.

To change these settings use the PRINT menu, as follows:

1. Press and hold **TARE/Menu** until **C.A.L.** appears. Press **No**. **S.E.t.U.P** appears. Press **No**. **r.E.A.d** appears. Press **No**. **M.O.d.E** appears. Press **No**. **U.N.I.t** appears. Press **No**. **P.r.i.n.t** appears. Press **Yes**. **rESEt** appears. Press **No**.
2. **bAUd** appears. Press **Yes**. 
3. The default Baud rate setting, **9600** bps, appears. To change the setting, press **No**. The menu cycles to the next setting each time you press **No**: first 9600, then 300, 600, 1200, 2400, 4800, and 9600 again. Press **Yes** when the desired setting appears. **bAUd** appears again. Press **No**.
4. **PARitY** appears. Press **Yes**. The default Parity setting, **8 NONE**, appears. To change the setting, press **No**. 
5. The menu cycles to the next setting each time you press **No**: first 7 Even, then 7 Odd, 7 None, and 8 None again. Press **Yes** to accept a setting. **PARitY** appears again. Press **No**.
6. **StOP** appears. Press **Yes**. The default Stop Bit setting, **1**, appears. To change the setting, press **No**. 
7. The menu toggles to the next setting each time you press **No**: first 1, then 2, then 1 again. Press **Yes** when the desired setting appears. **StOP** appears again. Press **No**.
8. **HANd** appears. Press **Yes**. The default Handshake setting, **On-Off** (Xon/Xoff), appears. To change the setting, press **No**. 
9. The menu toggles to the next setting each time you press **No**: first Off, then On-Off, then Off again. Press **Yes** when the desired setting appears. **HANd** appears again. Press **No**.
10. **StAbLE** appears. Press **Yes**. The Stable setting allows the Indicator to print values only when the stability criteria are met. To choose **ON**, press **Yes**. If you press **No**, **Off** appears. Press **Yes** to accept a setting. Then **StAbLE** appears. Press **No**. 
11. **A.Print** appears. Press **Yes**. Auto Print sets printing to occur each time stability criteria are met (**ON.StAB**), or at a defined interval (**INtEr**), or continuously (**CONt**). The default setting is **Off**. 
12. Press **No** until the preferred setting appears. Then press **Yes**. **A.Print** appears. Press **No**. **INtEr** appears.
13. If **INtEr** was selected, use the **INtEr** sub-menu to set the interval, from 1 to 3600 seconds. Press **No** to advance, **Back** to regress, and **Yes** to accept a setting. After you press **Yes**, **INtEr** appears again. Press **No** twice, then **Yes** when **End** appears, **No** when **P.r.i.n.t** appears, **No** again, and **Yes** when **End** appears again to exit menu mode.

1.8.2 Interface Commands

The RS232 Interface enables a computer to be used to control some functions of the Indicator using the commands listed in Table 1-4.

TABLE 1-4. SERIAL INTERFACE COMMAND TABLE.

Command	Function
IP	Immediate Print of displayed weight (stable or unstable).
P	Print stable displayed weight (according to stability setting).
CP	Continuous Print
SP	Print when stable.
xP	Interval Print x = Print Interval (1-3600 sec)
Z	Same as pressing Zero button
T	Same as pressing Tare button
xT	Download Tare value in grams (positive values only). Sending 0T clears tare (if allowed)
PU	Print current unit: g, kg, lb, oz, lb:oz
xU	Set scale to unit x: 1=g, 2=kg, 3=lb, 4=oz, 5=lb:oz
PV	Version: print name, software revision and LFT ON (if LFT is set ON).
Esc R	Global reset to reset all menu settings to the original factory defaults

NOTES:

- Commands sent to the Indicator must be terminated with a carriage return (CR) or carriage return-line feed (CRLF).
- Data output by the Indicator is always terminated with a carriage return-line feed (CRLF).

1.8.3 Output Format

The default serial output format is shown below.

TABLE 1-5. DEFAULT SERIAL OUTPUT FORMAT

Field:	Polarity	Space	Weight	Space	Unit	Stability	Legend	CR	LF
Length:	1	1	7	1	5	1	3	1	1

Definitions:

Polarity, “-” sign if negative, blank if positive.

Weight, up to six numbers and one decimal, right justified, leading zero blanking.

Units, up to five characters.

Stability, “?” character is printed if not stable, blank if stable.

Legend, up to 3 characters: G = gross weight, NET = net weight, T = tare

1.9 LEGAL FOR TRADE (LFT)

NOTE: When LFT is set to ON through the LFT sub-menu, and the LFT switch on the Main PCB is set to ON (see Figure 1-2, page 1-4), the following menu settings cannot be changed:

Span Calibration, Linearity Calibration, Calibration Unit, GEO, LFT, Capacity, Graduation, Zero Range, Stable Range, AZT, Modes, and Units.

To enable editing of these menu settings, open the Indicator and return the LFT switch on the Main PCB to the OFF position. Then set the LFT menu item to OFF, as follows:

1. Press and hold **TARE/Menu** until **C.A.L.** appears, then press **No**.
2. **S.E.t.U.P** appears. Press **Yes**.
3. **rESEt** appears. Press **No**.
4. **Lft** appears. Press **Yes**.
5. **OFF** appears. Press **Yes**.
6. **Lft** appears again. Press **No**. Continue to press **No** until **END** appears. Press **Yes**. (Or simply press **Exit** after leaving the LFT menu.)
7. The Indicator returns to weighing mode. It is now possible to use the menus mentioned above.

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

The weights and measures official may apply a wire or paper security seal as shown below.

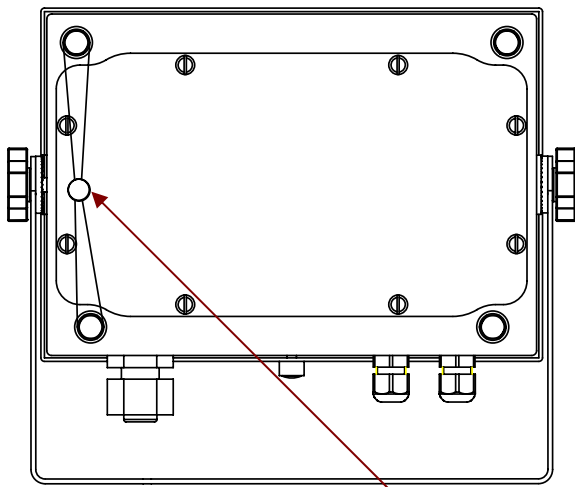


Figure 1-8. T32XW Wire Seal

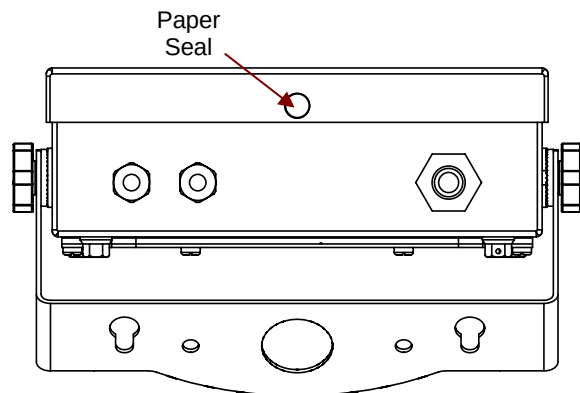


Figure 1-9. T32XW Paper Seal

2.1 INTRODUCTION

This section of the manual covers visual inspection of the Indicator, troubleshooting, an Error Code table, Table 2-1, and a Problem Solver, Table 2-2. For setup and connection to either a known good base or simulator, see Chapter 1. Follow all directions step by step. Make certain that the work area is clean and use care when handling components of the Indicator.

2.2 VISUAL INSPECTION

Carefully remove the Indicator from its packing container and remove any packing material fastened to the unit. Note all items supplied with the unit. Keep a record of all items and note their condition.

1. Examine the Indicator for damage on top cover or base or on corners.
2. Open the Indicator by removing the screws shown in Figure 1-1. Be careful not to damage the cables that connect the main Printed Circuit Board (PCB).
3. Examine the top of the main PCB for cracks or signs of corrosion.
4. If it appears that corrosion may have affected the board and you want to examine the bottom of the PCB, remove the four screws holding it to the housing.
5. Carefully lift out the main PC board. If it is cracked or shows signs of corrosion, it requires replacement. See Chapter 3, Maintenance Procedures, for board replacement and testing. If the Indicator shows no sign of physical damage, continue with procedures.

See chart below for visual checking procedures.

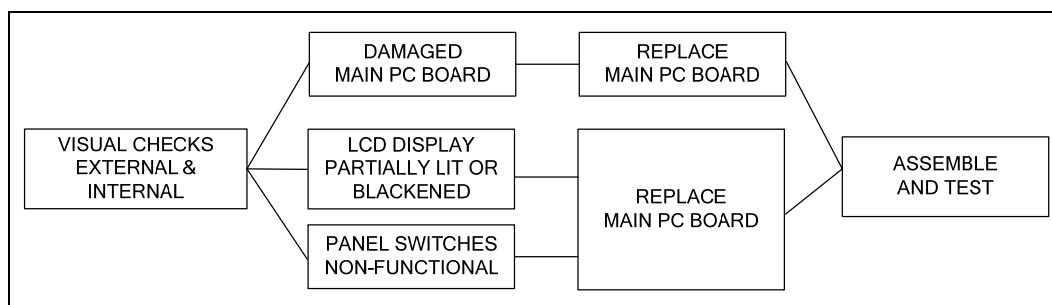


Figure 2-1. Visual Checking Procedures.

2.3 ERROR CODES

When a problem occurs using the weighing unit, the display will indicate an error code. Table 2-1 describes the various error codes and specifies the probable cause and remedy.

TABLE 2-1. ERROR CODES

ERROR	PROBABLE CAUSE	REMEDY
Error 7.0	Unstable weight reading when defining reference weight.	Check platform location. Test with Strain Gauge Simulator.
Error 8.1	Weight reading exceeds Power On Zero limit.	Remove load from scale. Recalibrate scale. If error continues, Test the PCB, replace if necessary.
Error 8.2	Weight reading below Power On Zero limit.	Add load to scale. Recalibrate. If error continues, Test the PCB, replace if necessary.
Error 8.3	Weight reading exceeds Overload limit.	Reduce load on scale. If error continues, Test the PCB, replace if necessary.
Error 8.4	Weight reading below Underload limit.	Recalibrate. If error continues, Test the PCB, replace if necessary.
Error 9.0	Internal fault.	Cycle power. If error continues, Test the PCB, replace if necessary.
Error 9.5	Calibration data not present.	Calibrate scale. If error continues, Test the PCB, replace if necessary.
Error 53	EEPROM data incorrect.	Cycle power on and off. If error continues, Test the PCB, replace if necessary.
CAL E	Calibration Error. Calibration value outside allowable limits.	Repeat calibration using correct calibration weights. If error continues, Test the PCB, replace if necessary.
LOW rEF	In Pieces mode, the average piece weight of the parts is small (warning).	You may continue to weigh, but results may not be accurate, because average piece weight is smaller than can be accurately counted.

2.4 PROBLEM SOLVER

TABLE 2-2. PROBLEM SOLVER

Symptom	Possible Cause(s)	Remedy
Unit will not turn on using AC power.	Power cord problem. Power outlet not supplying electricity.	Check power cord connections. Make sure power cord is plugged in properly into the power outlet. Check power source. Check Power Supply PCB; replace if necessary. Section 3.6 .
Unit will not turn on using battery power.	Battery problem.	Test Battery. Recharge if necessary. Section 3.8 . If problem persists, check Power Supply PCB; replace if necessary. Section 3.6 If Power Supply PCB tests positive, replace the Lead Acid Battery.
Battery indicator is flashing.	Battery discharged.	Connect Indicator to power and charge battery.
Battery fails to charge fully.	Battery is defective.	Replace battery.
Cannot zero the Scale, or will not zero when turned on.	Load on Scale exceeds allowable limits. Load on Scale is not stable. Load Cell is damaged. PCB is damaged.	Remove load on Scale. Wait for load to become stable. Replace Load Cell. Test/Replace PCB. Section 3.4 .
Poor accuracy	Improper calibration Unstable environment PCB is damaged. Load Cell is damaged.	Perform calibration. Move scale to suitable location. Test/Replace PCB. Section 3.4 . Replace Load Cell.
Unable to calibrate	Unstable environment Incorrect calibration mass Lock Calibration Menu set to On. Lock switch on PCB is "on". LFT menu set to On.	Move the scale to suitable location. Use correct calibration mass. Set Lock Calibration Menu to Off. Set the Lock switch on PCB to Off. Set LFT menu to Off. If problem continues, test/replace PCB.
Cannot display weight in desired weighing unit	Unit not set to On.	Enable unit in Units Menu. Section 1.7 .
Cannot change menu settings.	Menu has been locked. Lock switch is set to On.	Set desired menu to Off in Lock Menu. Section 1.7 . Set Lock Switch on PCB is set to Off. Section 1.5 .

3.1 PREVENTIVE MAINTENANCE

Ohaus Indicators are precision instruments and should be carefully handled, stored in a clean, dry, dust-free area, and cleaned periodically. Follow these precautionary steps:

- When an Indicator has had chemicals or liquids spilled on it, all exterior surfaces should be cleaned as soon as possible with warm water on a damp cloth.
- Allow at least 10 minutes for the Indicator to stabilize after the indicator reaches the temperature of the environment.

3.1.1 Preventive Maintenance Checklist

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

1. Unplug the AC Adapter before cleaning.
2. Clean the outside using approved cleaning solutions for the stainless-steel Indicator housing and rinse with 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 TESTING AND REPLACEMENT OF MAJOR COMPONENTS

The decision to replace any component should only be made after thoroughly diagnosing the problem. This chapter provides guidance for testing all components prior to replacement. It includes an explanation of how load cells work, and how a load cell simulator may be used to test the indicator.

If, after the replacement of any component, the Indicator is still non-functional and no other information on the subject is available in the manual, contact Ohaus Corporation by visiting www.ohaus.com. In the United States call Ohaus Aftermarket toll free, 800-526-0659 between 8:00 a.m. and 4:00 p.m. EST.

3.3 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.

CAUTION



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

3.3.1 PCB Voltage Measurements

1. Disconnect the power and open the indicator housing.
2. Connect AC power to the scale and turn it on.
3. Using a DVM, measure power from Main PCB's AC power supply jack. (See Figure 3-1.) It should read between 6.75 and 6.9 volts dc with power off and 7.2 - 7.5 volts dc with power on.
4. Measure the excitation voltage (EXE+ and EXE- in Figures 3-2 and 3-3.) 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 3.2.)
5. Perform Operational Tests. (See Chapter 4.)
6. Perform simulator testing. (Next section.)

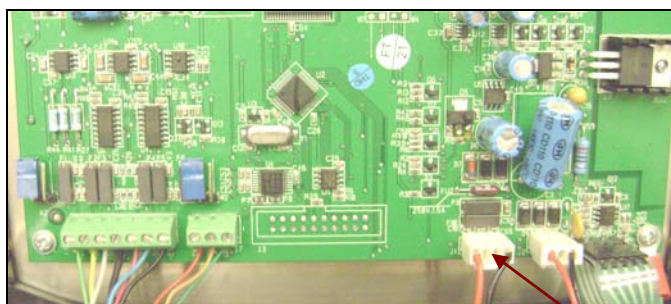


Figure 3-1. Main PCB's AC power supply jack.
Place DVM probes into rear sockets.

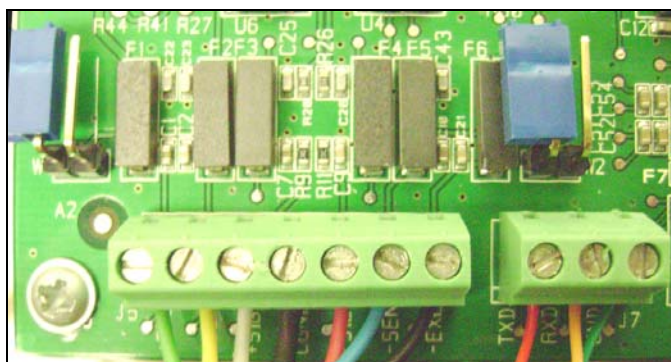


Figure 3-2. Load Cell and RS232 terminals on Main PCB.

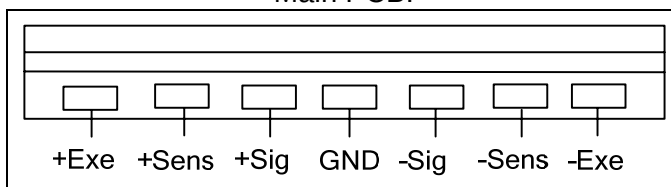


Figure 3-3. Load Cell terminals close-up.

3.3.2 Simulator Testing

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

The next section explains in detail how simulators work and what type of load cells they can "substitute for," *i.e.*, simulate.

3.3.2.1 How Strain Gauge Load Cells Operate

Load Cells convert force into a signal. The Strain Gauge Load Cell is a metal beam with holes drilled in it. Strain gauges are affixed to the beam at the top and bottom to measure changes in the beam due to deflection. The gauges sense very small deflections in the metal caused by the load applied to the cell.

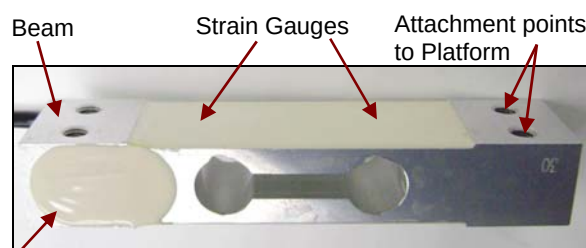


Figure 3-4. Typical Strain Gauge Load Cell.

At zero load, all strain gauges are unstressed. Weight placed on the Load Cell bends the beam, causing two gauges to stretch and two to compress in opposition, changing the electrical resistance of the circuit.

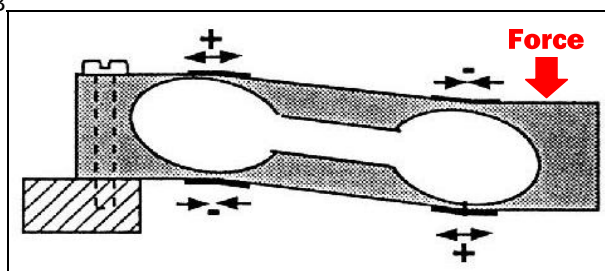


Figure 3-5. Downward force on Load Cell bends the beam.

The difference in the output signal before and after the mass was placed on the Load Cell is measured, interpreted and then becomes the value displayed on the indicator.

The strain gauges are wired into a Wheatstone Bridge Circuit, as illustrated in Figure 3-6.

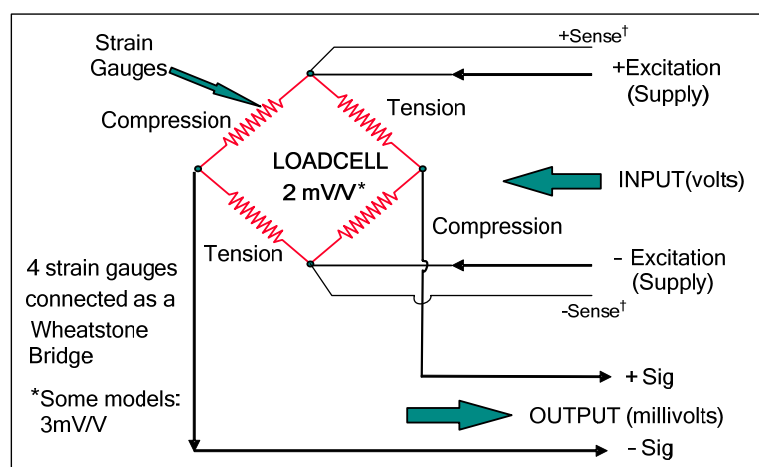


Figure 3-6. Load Cell input and output through Wheatstone Bridge circuit.

A Load Cell is a force sensor, which receives a voltage (excitation) from a regulated power source in the Indicator, and returns a low-voltage millivolt (mV) signal relative to the force applied. The Load Cell signal is converted to a numeric value and displayed. This output value increases as weight is loaded on to the Load Cell.

For example, a 500kg Load Cell with 2mV/V output and 5V excitation would have a change of 0.02mV per kg change in the load, that is:

$$\frac{2\text{mV/V} * 5\text{V}}{500 \text{ kg}} = 0.02\text{mV/kg}$$

At 250kg load the signal voltage would increase by 5mV from the value measured at no load.

***Note:** Some load cells send 3mv/V as opposed to 2mv/V. This increases accuracy, and is sometimes used for high resolution, or for high capacity scales with large dead-load platforms.

3.3.2.1 How Strain Gauge Load Cells Operate *continued*

†**Sense wires:** In some cases the load cell is equipped with **Sense** wires which run parallel with the positive and negative Excitation wires. The Sense wires compensate for resistance in the cable and are often used if there is long distance between load cell and indicator.

Note that some weighing units *do not* have Sense connectors. When they do, they also have Sense Jumpers (W1 and W2 in Figure 7), which must be shorted if the load cell does not have Sense wires to connect to the terminal.

The “Shield” terminal is often labeled “GND” (Ground), but its function is to shield current to or from the other connectors, to ensure accurate measuring results.

Figure 3-7 shows a typical Load Cell wiring scheme for an indicator.

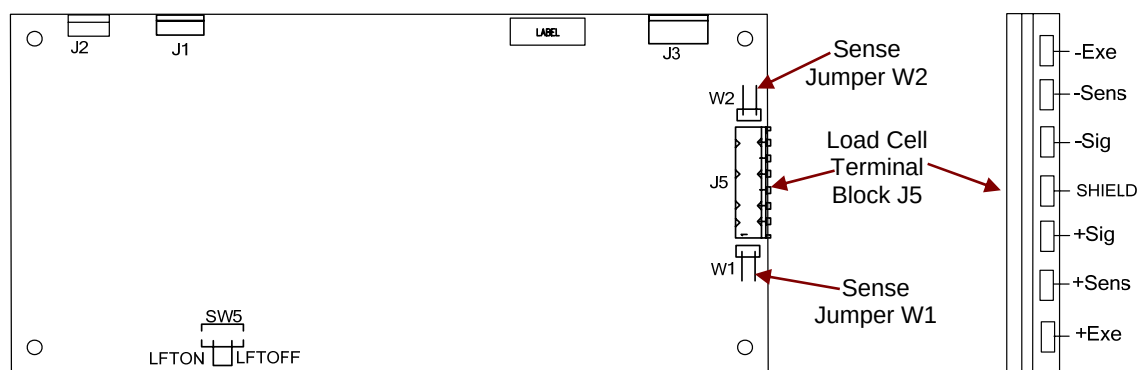


Figure 3-7. Typical Indicator Printed Circuit Board (PCB).

Figure 3-8. Load Cell wiring.

3.3.2.2 How to Operate Simulators

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. A typical Ohaus Load Cell is rated at 2mV/V output with a 5-Volt excitation voltage applied. (These values vary for specific models.)

The simulator's wires connect to the Load Cell wiring terminals on the Main PCB of the indicator or scale. (See Figure 3-8.) **Note** that some simulators do not have Sense terminals. (See Figure 3-9.) The simulator creates the same “Wheatstone Bridge” circuit as a load cell does.

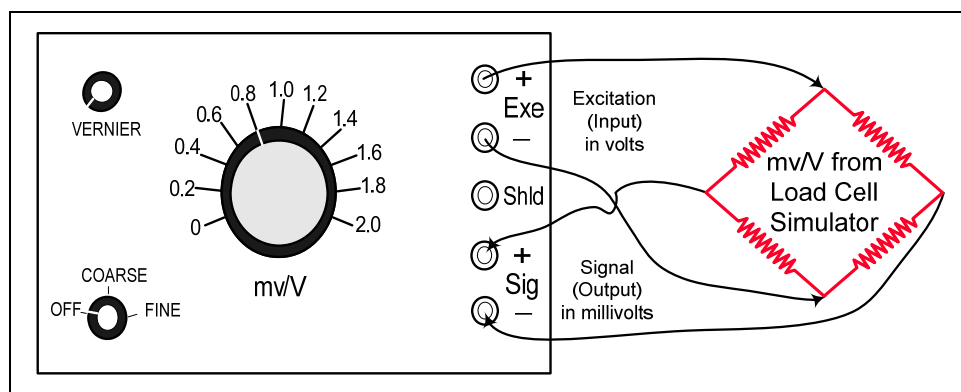


Figure 3-9. Simulator connects to Wheatstone Bridge, replacing load cell.

3.3.2.3 Correcting Underload and Overload Errors

When first connected to a simulator and turned on, the indicator may display an underload error with the simulator set to 0. Turn the simulator's main knob to 0.2. The indicator should read close to 0. Use the "Coarse-Fine" knob to adjust the reading to display zero.

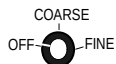


Figure 3-10. Preferred 0 and max settings.

Similarly, at a simulator setting of 2.0, the indicator may display an overload error. Turn the simulator's main knob to 1.8. The indicator should read close to full capacity. Use the "Coarse-Fine" knob to adjust the reading until the display shows full capacity.

3.3.2.4 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.

CAUTION



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

1. Disconnect power from the scale, and open the indicator housing. Also remove the battery.
2. Disconnect the Load Cell cable from the PC Board.
3. With the Simulator set to zero, attach it to the PCB. (See Figure 3-11.)
4. Connect a known good AC Adapter to the scale and connect to a power source.
5. Turn on the scale. Correct for underload and overload errors, as explained above.
6. Set the scale to indicate weight in kilograms (kg) and set the calibration value to maximum span value.
7. Adjust the Simulator to simulate 0% load, 50% load and 100% load for the capacity that the unit is rated for:
For zero, set the simulator to 0.2mv/V, and use 1.8mv/V for full capacity.
For half capacity, use 1.0, and so on.
If the resulting readings are unstable, the Main PC Board is defective.
8. Use the Simulator to calibrate the scale in the next procedure.

3.3.2.5 Calibration Test

1. Calibrate the scale using the simulator, following steps in Appendix A.
2. Follow the scale prompts. When the indicator displays a given weight to be placed on the scale, set the simulator to an equivalent value, as explained in point 7 above.
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.

3.4 REPLACING THE PRINTED CIRCUIT BOARD (PCB)

Replace the PCB as follows:

1. Unplug Indicator from AC power source.
2. Open the Housing.
3. Disconnect the wires connected to the RS232 Connector Block J7.
4. Disconnect the wires from the scale's load cell to the PCB's Load Cell Terminal Block J5.
(See Figures 3-11, 3-2 and 3-3.)

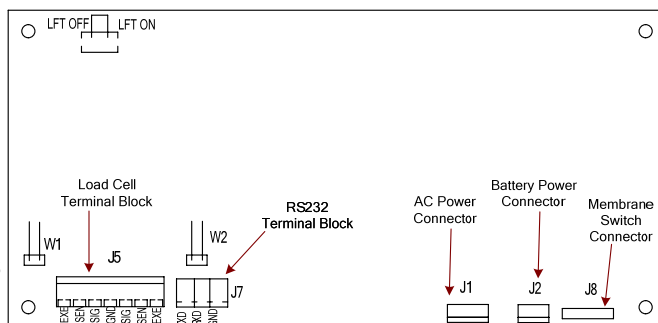


Figure 3-11. Main PCB.

5. Carefully disconnect AC power and battery connectors, and the Membrane Switch cable.
6. Remove the four screws from the PCB and lift out the PCB.



CAUTION

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

7. Carefully re-position the replacement PCB over the screw holes in the Top Cover. Re-insert and tighten the screws.
8. Reconnect the Cable Sets and connectors removed in Steps 3 – 5.
9. Perform calibration procedures. (See Appendix A.)
10. Perform testing procedures. (See Chapter 4.)

3.5 CABLE SET REPLACEMENT

Note: The cables that connect the PCB to the Load Cell connector, the RS232 connector, and the power jacks are all sold as a single set. Replace them as follows:

1. Open the Housing.
2. Disconnect the cables from any of the connectors (RS232, Load Cell, power jacks) for which the cable set is to be replaced.
3. Reconnect the wires to the PCB.

3.6 TESTING/REPLACING THE POWER SUPPLY PCB

**CAUTION**

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

Measure the power from the Power PCB to the Main PCB. (See Section 3.3.1.)

If the test does *not* read between 6.75 and 6.9 volts dc with power off and 7.2 - 7.5 volts dc with power on, replace the Power PCB.

1. Disconnect the power and open the indicator housing.
2. Remove the screws holding the Power PCB cover in place.
3. Remove the cover.
4. Lift up the Power PCB and remove the two connectors.
5. Attach the connectors to the new Power PCB and seat it in the space.
6. Attach the cover and measure power as in step 3 above.

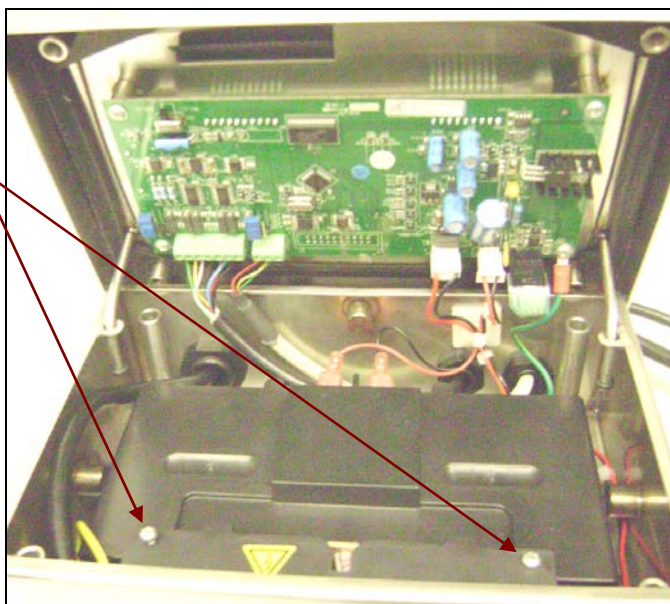


Figure 3-12. Power PCB cover, at front of bottom housing.

3.7 TESTING/REPLACING THE MEMBRANE SWITCH

The Membrane Switch is part of the front panel controls. Perform a continuity test to see that all switches are functioning properly. Using an ohmmeter, test each switch, as follows:

1. Remove the Top Housing.
2. Disconnect the Membrane Switch connectors from the Main PCB.
3. Using an Ohmmeter, measure the resistance across the pins indicated in Figure 3-14.

Before pressing a button, reading should be open (infinity).

When a button is pressed, there should be continuity: ~25 ohms. If continuity is not present on any switch, replace the Membrane Switch.

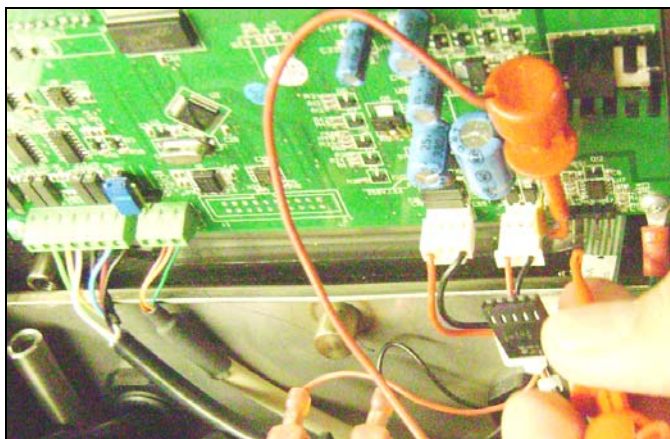


Figure 3-13. Membrane Switch connector removed, Ohmmeter probe is attached to Membrane Switch pin on Main PCB.

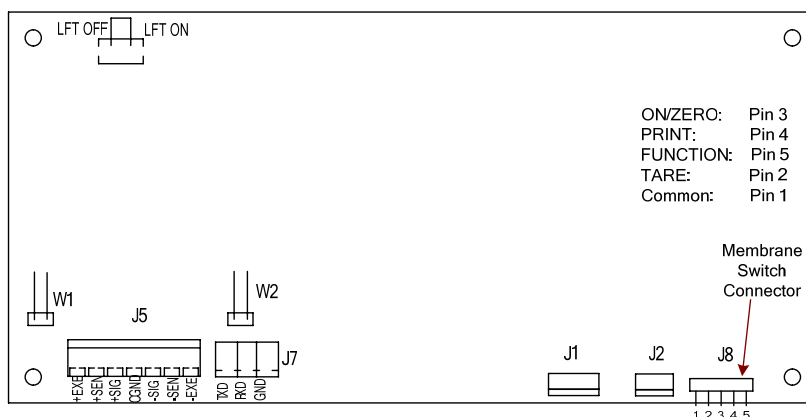


Figure 3-15. Main PCB with Membrane Switch pins labeled.

Replacing the Membrane Switch:

1. Open the Housing and disconnect the plastic ribbon cable that connects the Membrane Switch to the PCB Connector J8. (See Figures 3-13 and 3-14.)
2. Remove the old Membrane Switch. It is held in place with a strong adhesive.
3. Clean the Top Cover and remove all traces of adhesive.
4. Remove the protective backing from the back of the new Membrane Switch. Carefully position it on the Top Housing, starting at the bottom of the cover. Use a rolling motion to smooth it into position.
5. Connect the Membrane Switch's plastic ribbon cable to the PCB Connector J8.
6. Close the Housing, re-insert and tighten the screws previously removed.
7. Perform calibration procedures. (See Appendix A.)
8. Perform testing procedures. (See Chapter 4.)

3.8 TESTING/REPLACING THE BATTERY

The T32XW Indicator has a Lead Acid internal rechargeable battery, which may require replacement. Battery life is affected by factors such as ambient temperature, method of charging, depth of discharge, and the amount of time between charge and discharge.

3.8.1 Precautions for Battery Handling



WARNING: DEATH OR SERIOUS INJURY CAN OCCUR

- Charge the battery only with the charger in the scale. Charging it under any other conditions may cause the battery to overheat, emit hydrogen gas, leak, ignite or burst.
- Operate the battery within 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 it. Dispose of the defective battery in accordance with local regulations for lead-acid type batteries.
- *Check the battery for any sign of irregularities in appearance. If there is any damage to the case such as cracks, deformation or leakage, replace the battery with a new one.*
- **Do NOT charge the battery with the charger terminals reversed.**

3.8.2 Indications of Battery Problems

Indications of a failing battery may include:

- A reduction in operating time between charging and a new low battery condition.
- A continuous low battery condition even after charging.
- Scale cannot be operated without the power pack connected.
- Scale will not power on even with the power pack connected.
(A small power supply PCB is installed with the battery option. This PCB contains a replaceable fuse that provides over-current protection. A scale that will not power on should have this fuse checked prior to suspecting a defective battery.)

3.8.3 Accessing the Battery

1. Remove the screws on the rear housing that hold the battery cover.
(See Figure 3-15.)
2. Lift off the Battery Cover.
3. Carefully avoid stressing the wires and terminals.
4. Note battery's position to duplicate it with the replacement.

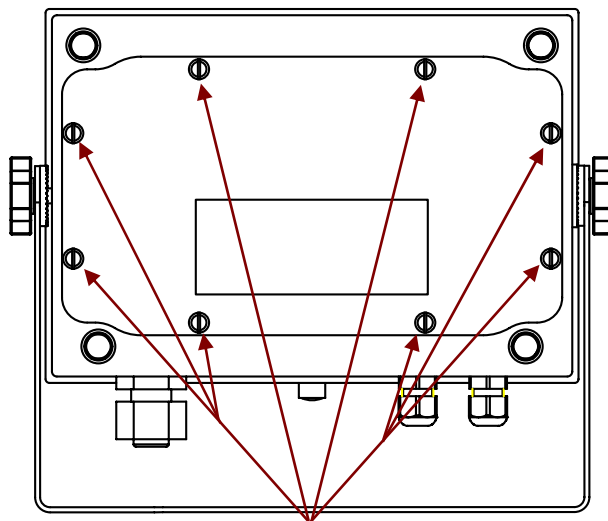


Figure 3-15. Screws on rear panel holding the Battery Cover.

3.8.4 Battery Tests

The battery's service life depends on the type of use. If the indicator is connected to AC power all the time, the battery receives a small charge when battery voltage is low. Under these circumstances, service life can be many years. Frequent charging extends battery life.

1. Upon receipt of the scale, plug the indicator into an AC power source and 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. With AC power connected, measure the battery voltage at the battery terminals; the voltage should be approximately **6 to 7 Volts dc** when charging. The voltage should be approximately **6.75 – 6.9 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.

Figure 3-16 indicates the capacity of the battery in percentage after a full charge. Allow a charged battery to stand overnight without being charged, then measure the terminal voltage to see capacity of the battery.

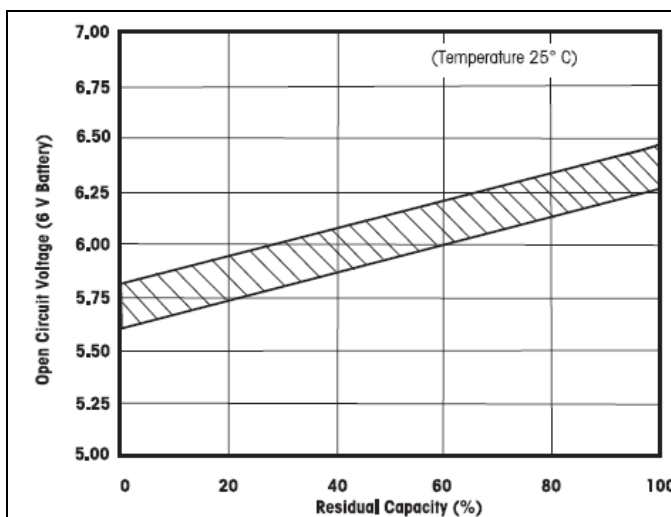


Figure 3-16. Battery Capacity with full charge.

3.8.5 Battery Replacement

See warnings for battery handling, on previous page.

1. Disconnect the quick-connect tabs, then re-connect them to the replacement Battery.
2. Insert the replacement Battery and replace the Battery Cover.
3. Perform testing procedures. (See Chapter 4.)

4.1 TESTING

Before and after servicing the Indicator, perform operational and performance tests to determine if it meets specifications. Turn the Indicator ON and allow it to warm up for at least 10 minutes before performing these checks. The masses used for calibration should be ASTM Class 4 or OIML F2 tolerance or better.

**NOTE:**

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

4.2 Power Test

The purpose of this test is to determine if the electronic circuitry of the Indicator is functioning properly. In some cases, the line cord supplied with the Indicator may have become defective.

1. Check that the power cord is not damaged.
2. With the Indicator connected to an appropriate power supply, press the **ON/ZERO Off** button. The Indicator performs a self-test, indicates the software revision and then goes into weighing mode.
3. If all of the displays appear normal in this test, continue with the next test.
If the display was erratic, the PC board is defective and requires replacement.

4.3 Performance Tests Using a Scale Base

These tests are performed on the Indicator using a known good scale base and test mass. At this point, the Indicator has been checked for full display, menu setup and calibrated.

If using a Load Cell Simulator, proceed to paragraph 4.4.

4.3.1 Overload/Underload Test

This test determines if the Indicator displays the proper indication when an underload or overload condition exists on the scale base.

1. With the Indicator ON and no mass on the scale base, lift up on the scale base platform and observe the display. The display should indicate Error 8.4. Release the platform. The display should return to zero.



Note: Do not exceed Load Cell capacity when testing the Indicator.

2. Place a mass on the scale base platform which slightly exceeds the capacity of the scale base, and observe the Indicator display. The display should indicate Error 8.3. Remove the mass from the scale base. The display should return to zero.

4.4 Performance Tests Using a Load Cell Simulator

A simulator can be used in place of a scale base if available.

- Connect the simulator to Terminal Block J5 (the Load Cell terminal block) on the PCB, so that EX+, EX–, S+ and S– are matched at each end of the cable. (See Figures 1-2 and 1-3, on page 1-4.)

4.4.1 Overload/Underload Test

1. Set the simulator to zero. Power on the Indicator. Perform a Span Calibration, with zero at the simulator's 0.2 setting, and 100% capacity at the 1.8 mv/V setting.
2. Adjust the simulator to zero mv/V. The indicator should show Error 8.4.
3. Adjust the simulator to 2.0 mv/V. The indicator should show Error 8.3.
4. Adjust the simulator to each setting between 0.2 mv/V and 1.8 mv/V. The indicator reading should be stable and linear throughout the range of settings.

4.5 Calibration Retention Test

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

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

4.6 RS232 Interface Test / Print Test

The RS232 Interface performance can be monitored using an external printer or computer connected to the Indicator.

To set up communication parameters, see Section 1.8.

Once the communications parameters match between the Indicator and either a computer or printer, it is possible to test the Indicator's print function.

- Press the **Print/Units** button. Printing to an external printer or computer should occur each time the button is pressed.

This section of the manual contains exploded views for the 3000 Series T32XW Indicator. The exploded view drawings are designed to identify the parts which can be serviced on the Indicator in the field.

NOTE:

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

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

Ohaus Corporation
www.ohaus.com
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 3000 SERIES T32XW INDICATOR: HOUSING & INTERNAL PARTS

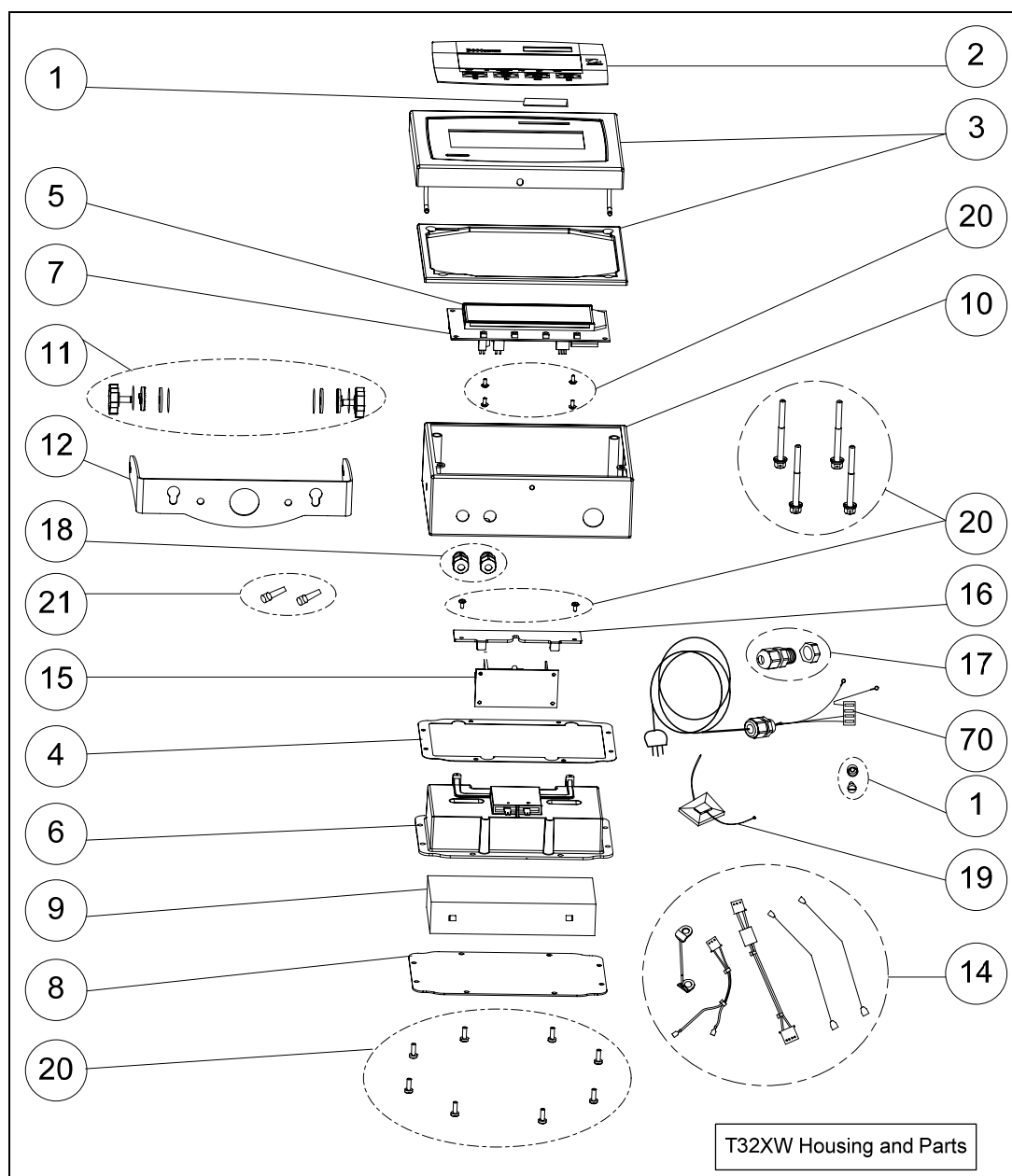


Figure 5-1. Series 3000 T32XW Indicator: Housing & Internal Parts.

5.1 3000 SERIES T32XW INDICATOR: HOUSING & INTERNAL PARTS

TABLE 5-1. T32XW INDICATOR: HOUSING & INTERNAL PARTS

Drawing Item	Description
1	LFT Sealing Kit
2	Membrane Switch
3	Top Housing, w/Gasket
4	Seal, Battery Box
5	LCD, w/backlight
6	Battery Box
7	Main PCB
8	Battery Cover
9	Lead Acid Battery
10	Bottom Housing
11	Knobs (set of 2)
12	Wall Mount Kit (Accessory)
14	Cable Set (5)
15	Power PCB
16	Power PCB Cover
17	I/O Fitting, M20
18	I/O Fitting, M12
19	Internal Cable Mounts
20	Hardware Kit
21	I/O Filler Plugs
70	Line Cord

For all models, see specific parts lists through your local Ohaus office.

APPENDIX A. CALIBRATION

Two calibration processes are available: Span Calibration and Linearity Calibration.

A.1 PRELIMINARY STEPS

1. Be sure appropriate calibration masses are available before beginning calibration.
2. Be sure the scale base is level and stable during the entire calibration process.
3. If LFT is set to On, calibration is unavailable.
To set LFT to OFF, see Section 1.10, page 1-13.

Note: To use the LFT mode again after turning it off, it is necessary to have the Indicator locked and sealed by local Weights and Measures authorities.

4. If the Calibration Menu is locked in the Menu Lock submenu, turn it back on:
 - Press and hold **TARE/Menu** until **C.A.L.** appears, then press **No**.
 - **SETUP** appears. Press **No**. **READOUT** appears. Press **No**.
 - **MODE** appears. Press **No**. **UNIT** appears. Press **No**.
 - **PRINT** appears. Press **No**.
 - **MENU LOCK** appears. Press **Yes**. **RESET** appears. Press **No**.
 - **CALIBRATE** appears. Press **Yes**. Then press **No** continuously until **End** appears.
 - Press **Yes** twice to exit menu mode.
5. Allow the Indicator to warm up for approximately five minutes after stabilizing to room temperature.
6. To abort calibration, press the **Exit** button anytime during the calibration process.

A.2 SPAN CALIBRATION

Span Calibration uses two points: the first point is the zero value, with no weight on the scale. The second point is the Span value, with a calibration mass placed on the scale.

Press and hold **TARE/Menu** until **C.A.L.** appears, then press **Yes**.

SPAN appears. Press **Yes** to access the Span Calibration menu.

The display flashes **0**. With no weight on the scale, press **Yes** to establish the zero point.

The display shows **--C--** while the zero point is established.

The display flashes the span calibration point. Place the specified weight on the scale and press **Yes**.

To choose a different span point, press **No** to increment the selections, or **Back** to decrement the selections. (See Appendix A for available span points.) When the desired value is displayed, place the specified weight on the scale and press **Yes**.

The display flashes **---C---** while the span point is established.

If span calibration was successful, the scale exits to the active weighing mode and displays the actual weight value.

A.3 LINEARITY CALIBRATION

Linearity calibration uses three calibration points: the first with no weight on the scale, the second at approximately half capacity, the third at capacity. The Linearity calibration points are fixed and cannot be altered user during the procedure. See Appendix A for the linearity points.

Press and hold **TARE/Menu** until **C.A.L.** appears, then press **Yes**.

SPAN appears. Press **No**. **Linearity** appears. Press **Yes** to access the Linearity Calibration menu.

The display flashes **0**. With no weight on the scale, press **Yes** to establish the zero point.

The display shows **--C--** while the zero point is established.

The display flashes the mid-calibration point. Place the specified weight on the scale and press **Yes**.

The display shows **--C--** while the mid-calibration point is established.

The display flashes the full calibration point. Place the specified weight on the scale and press **Yes**.

The display shows **--C--** while the full calibration point is established.

After successful calibration, the scale exits to the active weighing mode and displays the actual weight value.

A.4 SETUP & CALIBRATION VALUES

Use Table A-1 to determine appropriate setup and calibration values for specific configurations.

TABLE A-1. SETUP & CALIBRATION VALUES

Capacity	Graduation size with LFT OFF	Graduation size with LFT ON	Span calibration points	Linearity calibration points
5	0.0005, 0.001, 0.002, 0.005	0.001, 0.002, 0.005	5	2, 5
10	0.0005, 0.001, 0.002, 0.005, 0.01	0.002, 0.005, 0.01	5, 10	5, 10
15	0.001, 0.002, 0.005, 0.01	0.005, 0.01	5, 10, 15	5, 15
20	0.001, 0.002, 0.005, 0.01, 0.02	0.005, 0.01, 0.02	5, 10, 15, 20	10, 20
25	0.002, 0.005, 0.01, 0.02	0.005, 0.01, 0.02	5, 10, 15, 20, 25	10, 25
30	0.002, 0.005, 0.01, 0.02	0.005, 0.01, 0.02	5, 10, 15, 20, 25, 30	15, 30
40	0.002, 0.005, 0.01, 0.02	0.01, 0.02	5, 10, 15, 20, 25, 30, 40	20, 40
50	0.005, 0.01, 0.02, 0.05	0.01, 0.02, 0.05	5, 10, 15, 20, 25, 30, 40, 50	25, 50
60	0.005, 0.01, 0.02, 0.05	0.01, 0.02, 0.05	5, 10, 15, 20, 25, 30, 40, 50, 60	30, 60
75	0.005, 0.01, 0.02, 0.05	0.02, 0.05	5, 10, 15, 20, 25, 30, 40, 50, 60, 75	30, 75
100	0.005, 0.01, 0.02, 0.05, 0.1	0.02, 0.05, 0.1	5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100	50, 100
120	0.01, 0.02, 0.05, 0.1	0.02, 0.05, 0.1	5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100, 120	60, 120
150	0.01, 0.02, 0.05, 0.1	0.05, 0.1	5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100, 120, 150	75, 150
200	0.01, 0.02, 0.05, 0.1, 0.2	0.05, 0.1, 0.2	5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100, 120, 150, 200	100, 200
250	0.05, 0.1, 0.2	0.05, 0.1, 0.2	5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100, 120, 150, 200, 250	120, 250
300	0.02, 0.05, 0.1, 0.2	0.05, 0.1, 0.2	5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100, 120, 150, 200, 250, 300	150, 300
400	0.02, 0.05, 0.1, 0.2	0.1, 0.2	5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100, 120, 150, 200, 250, 300, 400	200, 400
500	0.05, 0.1, 0.2, 0.5	0.1, 0.2, 0.5	5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100, 120, 150, 200, 250, 300, 400, 500	250, 500
600	0.05, 0.1, 0.2, 0.5	0.1, 0.2, 0.5	5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100, 120, 150, 200, 250, 300, 400, 500, 600	300, 600
750	0.05, 0.1, 0.2, 0.5	0.2, 0.5	5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100, 120, 150, 200, 250, 300, 400, 500, 600, 750	300, 750
1000	0.05, 0.1, 0.2, 0.5, 1	0.2, 0.5, 1	5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100, 120, 150, 200, 250, 300, 400, 500, 600, 750, 1000	500, 1000
1200	0.1, 0.2, 0.5, 1	0.2, 0.5, 1	5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100, 120, 150, 200, 250, 300, 400, 500, 600, 750, 1000, 1200	600, 1200
1500	0.1, 0.2, 0.5, 1	0.5, 1	5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100, 120, 150, 200, 250, 300, 400, 500, 600, 750, 1000, 1200, 1500	750, 1500

APPENDIX A CALIBRATION

TABLE A-1. SETUP & CALIBRATION VALUES

Capacity	Graduation size with LFT OFF	Graduation size with LFT ON	Span calibration points	Linearity calibration points
2000	0.1, 0.2, 0.5, 1, 2	0.5, 1, 2	5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100, 120, 150, 200, 250, 300, 400, 500, 600, 750, 1000, 1200, 1500, 2000	1000, 2000
2500	0.2, 0.5, 1, 2	0.5, 1, 2	5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100, 120, 150, 200, 250, 300, 400, 500, 600, 750, 1000, 1200, 1500, 2000, 2500	1200, 2500
3000	0.2, 0.5, 1, 2	0.5, 1, 2	5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100, 120, 150, 200, 250, 300, 400, 500, 600, 750, 1000, 1200, 1500, 2000, 2500, 3000	1500, 3000
5000	0.5, 1, 2, 5	1, 2, 5	5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100, 120, 150, 200, 250, 300, 400, 500, 600, 750, 1000, 1200, 1500, 2000, 2500, 3000, 5000	2500, 5000
6000	0.5, 1, 2, 5	1, 2, 5	5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100, 120, 150, 200, 250, 300, 400, 500, 600, 750, 1000, 1200, 1500, 2000, 2500, 3000, 5000, 6000	2500, 5000
7500	0.5, 1, 2, 5	2, 5	5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100, 120, 150, 200, 250, 300, 400, 500, 600, 750, 1000, 1200, 1500, 2000, 2500, 3000, 5000, 6000, 7500	3000, 7500
10000	0.5, 1, 2, 5, 10	2, 5, 10	5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100, 120, 150, 200, 250, 300, 400, 500, 600, 750, 1000, 1200, 1500, 2000, 2500, 3000, 5000, 6000, 7500, 10000	5000, 10000
12000	1, 2, 5, 10, 20	2, 5, 10	5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100, 120, 150, 200, 250, 300, 400, 500, 600, 750, 1000, 1200, 1500, 2000, 2500, 3000, 5000, 6000, 7500, 10000, 12000	5000, 10000
15000	1, 2, 5, 10	5, 10	5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100, 120, 150, 200, 250, 300, 400, 500, 600, 750, 1000, 1200, 1500, 2000, 2500, 3000, 5000, 6000, 7500, 10000, 12000, 15000	7500, 15000
20000	2, 5, 10, 20	5, 10, 20	5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100, 120, 150, 200, 250, 300, 400, 500, 600, 750, 1000, 1200, 1500, 2000, 2500, 3000, 5000, 6000, 7500, 10000, 20000	10000, 20000

APPENDIX B. GEOGRAPHICAL ADJUSTMENT

B.1 Geographical Adjustment Factor

The Geographical Adjustment Factor (GEO) is used to compensate for variations in gravity. Local gravity variance (depending on distance from the equator and altitude above sea level) is compensated for by entering a Geocode (conversion factor).

Note: Changing the GEO Factor alters the calibration. The GEO value was set at the factory and should only be changed if the location of use varies from the default setting.

To adjust the GEO Factor, press and hold **TARE/Menu** until **C.A.L.** appears. Press **Yes**.

SPAN appears. Press **No**. **Linearity** appears. Press **No**. **GEO** appears. Press **Yes**.

The default GEO setting appears. Press **No** to increment the number, or **Back** to decrement, until the desired number appears. Then press **Yes**.

GEO appears again. Press **No** to exit the **GEO** menu. **End** appears.

Press **Yes** to return to the **CAL** menu. Press **No** continuously until **E.n.d** appears.

Press **Yes** to return to weighing mode.

TABLE B-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
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

APPENDIX B GEOGRAPHICAL ADJUSTMENT

TABLE B-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
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
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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