SMART SCALE
AIR AND STRAIN GAUGE MANUAL

Version V_5.0

Manual Version V_5.0 Smart Scale Technologies Inc. 877-757-7888
info@truckweight.com 225 Ridgevale Drive, Bedford, Nova Scotia, B4A 4B3 Canada

INSTALLATION & OPERATING MANUAL

www.TruckWeight.com

NOTE: For your safety, follow all truck-trailer manufacturers' safety procedures. Please read this manual thoroughly before installing and operating your TruckWeight Smart Scale system. The safety messages presented throughout this manual are reminders to the operator to exercise care when installing and using this unit.

Parts:

A) Sensors

Air sensor for air suspensions.

Mechanical Sensor for mechanical suspensions, with a strain gauge.

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C) HandHeld

D) HandHeld with mount

Note, the Display can be taken outside the truck for loading or can be locked in position so that it cannot be removed by the operator.

The display power cable connects to truck power 8-30 volt

Getting Started:

a. **Please read the "Important Safety Notices"** section of this manual before installing and operating the TruckWeight Smart Scale system.

b. **Examine the parts** to familiarize yourself with the parts and to ensure that you have all of the required parts to begin the installation of your TruckWeight system.

c. **Turn on the Display** by pressing the screen. Note, you may have to charge it first.

The Display has an internal rechargeable lithium-ion battery.

The HOME screen will appear. To extend battery life, the power turns off automatically in ten minutes when not in use.

Home Screen

NOTE, your sensor(s) will most likely already be set up in the Display for that is being installed on your Rig, when shipped to you.

If you have any questions, please send them via email to info@TruckWeight.com or call toll-free at 1-877-757-7888 and speak with one of our technical service representatives.

Display Instructions. (see video for display tutorial at www.truckweight.com/manuals.htlm)

a. Connect power to the display and charge the battery (Two hours). The battery will last 4-5 hours with continuous use. When powered up HOME screen will appear.

b. Press **"Menu"** to display the Maintenance menu. Enter password **11258** which you should note as it is required to enter the menu.

Keypad operation, press the left arrow to delete characters. Press up and down arrows to display letters and numbers.

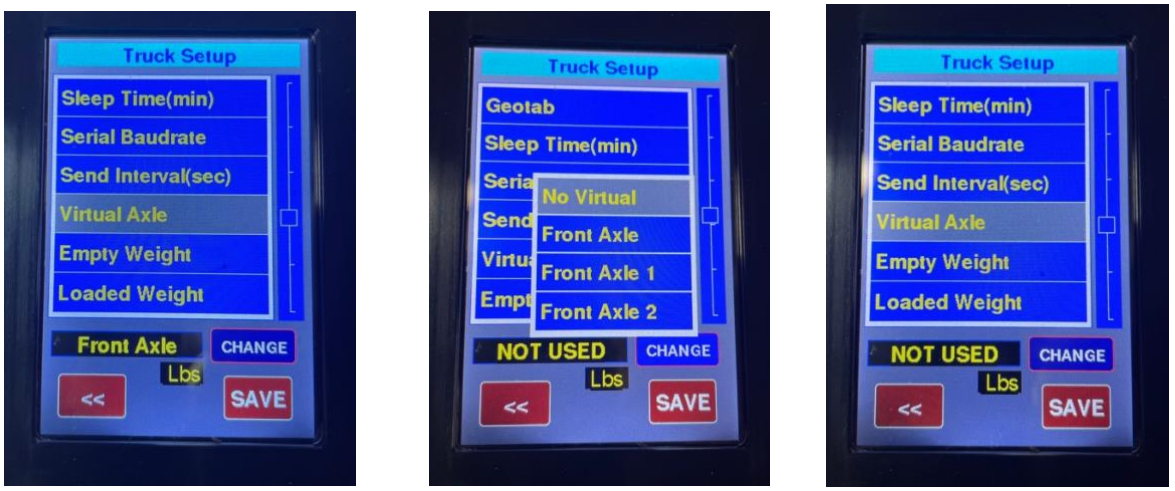
c. Truck ID in TRUCK SETUP must be completed first. Note, on a Rigid or Straight truck where there is a sensor on the front axle(s) and on the drive and lift axle(s) ALL MUST have the sensor Equipment ID as the Truck ID in Truck SETUP, or they will not appear on the screen. The Truck ID will appear at the top line in the **HOME** screen "TRK1" as (fig xx) above. If the Truck ID is not completed it will show NO TRUCK!!! and you must go into "**Maint**" select **TRUCK SETUP** and enter a Truck ID.

d. Also in **TRUCK SETUP**, you must select "**Scale**" and choose **METRIC** or **IMPERIAL**.

Square curser to drag down and up

e. Under **TRUCK SETUP** you must set up the front axle configuration of that Truck. Scroll down by dragging the square box in the top right corner to the bottom of the screen where

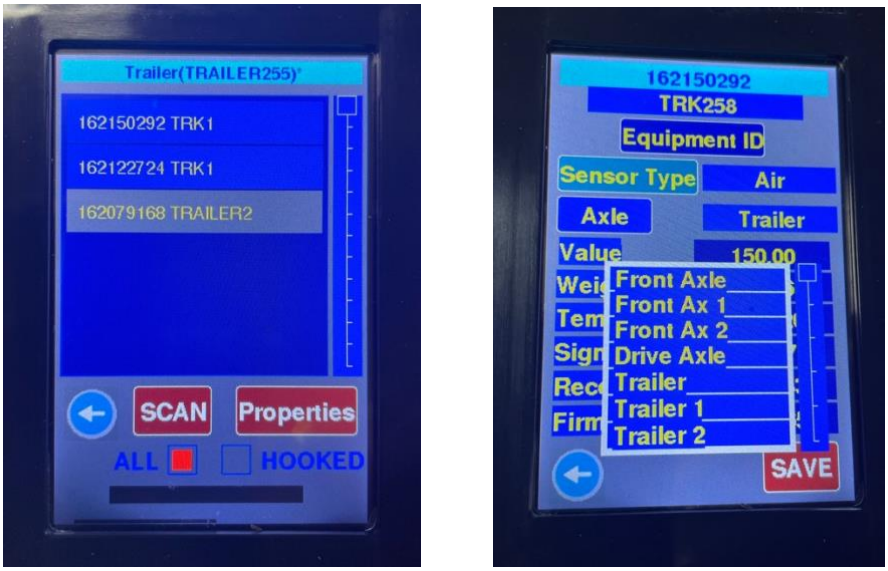
you can see “Virtual Axle”. For a tractor with a fifth wheel, we do not put a real sensor, we use a Virtual Sensor, where the computer calculated the front axle weight based on the weight on the drive axle(s). For this set configuration Select “Virtual Axle” press CHANGE and select “Front Axle”. Note, calibration weights for the Virtual front axle are entered in TRUCK SETUP at “Empty Weight” and Loaded Weight”.



Select “No Virtual” is a sensor is being installed on the front axle, like on straight dump trucks.

f. Editing Sensors: Note that the display and sensors normally are shipped to customers configured for the truck(s) and/or Trailer(s) before shipping. In the event that you need to change the settings on a sensor press **Maint,** then press **SENSORS**, then press the sensor you want to change, then press **Properties**. In Properties, you can edit Axle, Sensor Type, and Equipment ID. Does not matter which you do first, press **SAVE.**

Select Sensor **Select Axle**



Enter Equipment ID

Select Sensor Type

Air Sensors Installation:

Once you have a satisfactory signal from all of your sensors in the mounting locations you have chosen, it is time to finish the physical installation of your sensors.

a. In all cases, the tee must be placed into the airline of the air suspension system between the airbags (see diagram below).
   - First turn off your truck, set the brakes, and dump the airbags.
   - Cut the airline and insert the T-Fitting (Part F). The below diagram reflects a typical installation.
   - It is OK to put the sensor on the inside of the frame rail as long as you get your signal where you need it. It is also OK to protect the sensor with a plastic case or bag; however, it is not necessary. **Mount the sensor in a location where it is not surrounded by metal.**

Typical Installation

   - Cut a suitable length of D.O.T. tubing (not provided) to run from the mounted sensor to the tee.
   - Connect the D.O.T tubing to the T-Fitting and to the sensor via the 90-Fitting

- Secure the tubing with tie wraps (Part H).
- **IMPORTANT: Make certain D.O.T. runs in a downward position from the sensor fitting to prevent any moisture in the airline from running into the sensor.**

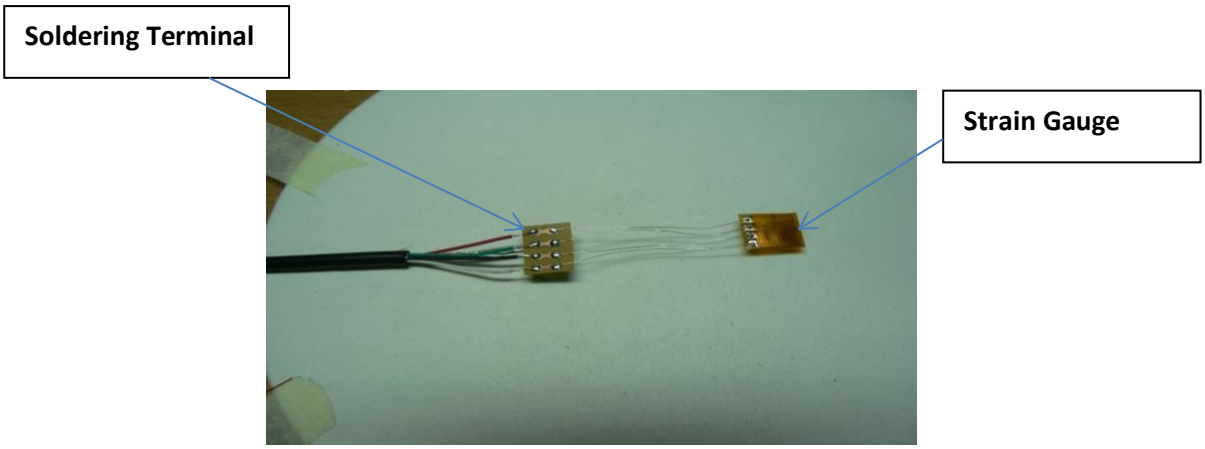
b. Using an existing hole on the tractor and/or trailer frame, fasten the sensor to the frame using the Sensor Bolt Assemblies (Part E). Tighten the locking nut to about 20 ft-lb.

MECHANICAL SENSOR (Strain Gauges) INSTALLATION INSTRUCTIONS:

a. **Physical Installation of Mechanical Sensors: Watch Installation Video on home page bottom right corner at** www.truckweight.com/manual.html **click mechanical "installation video".**

b. **Handle strain gauges with care. They are very fragile. Note, if you damage a strain gauge a replacement strain gauge lead can be replaced quickly and easily.**

c. **The temperature should be 70 degrees or warmer prior to gluing strain gauges to metal. If installing outdoors in winter strain gauges should be heated with a hair dryer after bonding and to get a good cure on the glue.**



Strain Gauge Lead

d. Measure and mark spring, walking beam, or axle on the side marking the spot to sand and where strain gauge will be glued on the middle of the spring or axle. Mark such that the strain gauge(s) are symmetrical, see illustrations below.

Strain gauges work better when under pre-strain when the truck is empty. Jack up frame so the axles are handing, then bond the strain gauge(s). This will put the strain gauges under pre-strain when the truck or trailer is empty.

e. Clean metal service where the sensor will be glue with a grinder or coarse sandpaper, removing all paint, rust, rust pitting, Clear area about 2-3 inch around the point where strain gauge will be glued exposing metal around it.

f. The sand area where strain will be glued about 1 inch square with fine sandpaper about 200 grit.

g. Complete the same preparation for all strain gauges on spring, walking beam, or axle locations where strain gauges will be glued.

h. Clean surface(s) with acetone or 99% Isopropyl alcohol. Wipe with a clean white paper towel minimum of three times. After wiping the surface, observe the towel surface to ensure it is clean and white.

i. Keep Plastic cover on strain gauge for protection against dirt.

j. Do Not Touch the bottom of the strain gauge. If touched gentle clean with acetone or Isopropyl.

k. Remove Plastic cover once you have run the cable and are ready to glue strain gauge onto the prepared metal surface.

l. Position Strain Gauge cable and secure with loose-fitting tie-wrap.

m. Peal 3M tape off the back of soldering terminal, then position strain gauge in position bending the wires on a 45-degree angle so that Loctite 430 glue can be swiped under the strain gauge prior to holding it down to set. Press 3M tape to the metal surface after it is in the correct position.

n. Observe that the surface is clean, and no dust or dirt has fallen or blown onto the surface. Swipe a thin layer of Loctite 430 under the strain gauge making a sure call the area is covered.

o. Carefully press stain gauge onto metal placing a small piece of wax paper between your thumb and the strain gauge. Holding your thumb steady, not sliding it, gently roll your thumb left to right to ensure a solid contact with the metal surface. Hold thumb into place for four minutes. Remove thumb and let stand for 15 min. All Loctite 430 should be completely dry.

p. Test Strain that bond was made correctly. If not bonded properly, sand surface, clean and glue a replacement strain gauge down. The test is performed by connecting the transmitter four wires direct to each cable one at a time, then applying strain to the spring to confirm that reading moves up and down or down and up when strain is applied to the spring. Once the test is completed then connect wires together, green to green, white to white, black to black, and red to red. Use heat shrink to form a watertight seal. Note, you do not have to connect the bare shield wire, this can be trimmed.

Test each strain gauge after the Loctite 430 sets as described above.

You can use a jack under the suspension section where it has been glued. Observe the handheld to ensure the strain value in the top right corner of the handheld is move up and down when strain is applied. Once you have confirmed the strain is moving with strain, then you may proceed to cover the strain gauge with Loctite 5510 as shown in the video. If sensor strain reading is not moving up and down with strain (should move more than two to five points with strain, repeat strain to confirm) then sand, clean and glue down another strain gauge. Note, the stainless-steel cap in the image is no longer used, as Loctite 5510 provides able protection.

q. Carefully remove wax paper pealing from cable side to strain gauge. I any tears or remains glued to metal ignore it and proceed.

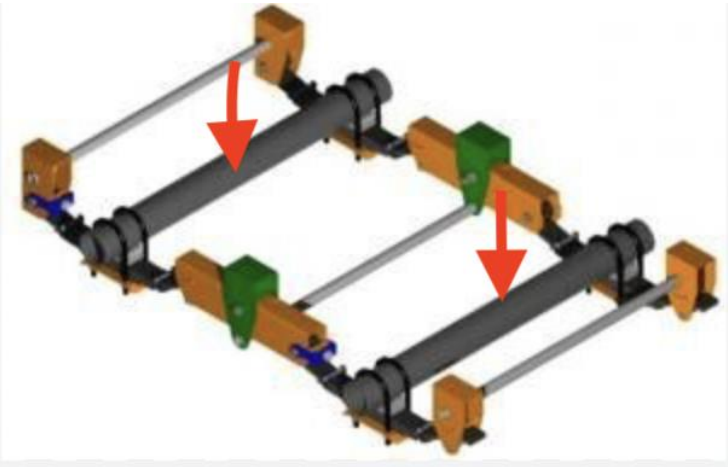
r. Gently spread Loctite 5510 overstrain gauge, wires, soldering terminal, cable, and surrounding metal area with a thin layer, being careful not to damage any of the delicate wires.

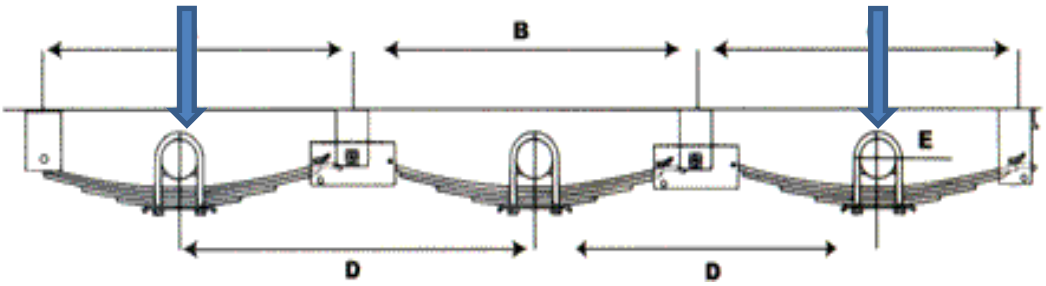
s. Carefully place 5510 over the strain gauge and soldering terminal. Spread excess Loctite 5510 over the entire sanded surface to prevent rusting, and a thick layer overstrain gauge and cable area as shown in the video. You can now operate the vehicle. Note it will take a few days before the Loctite 5510 is completely dry, but you may operate the vehicle in the meantime.

t. Secure cable with tie-wraps, and mount transmitter in a suitable location.

Where to glue sensors:

Hutch Type or Single Point Suspension sensors are glued on in the middle on top of the axles, not on the springs.

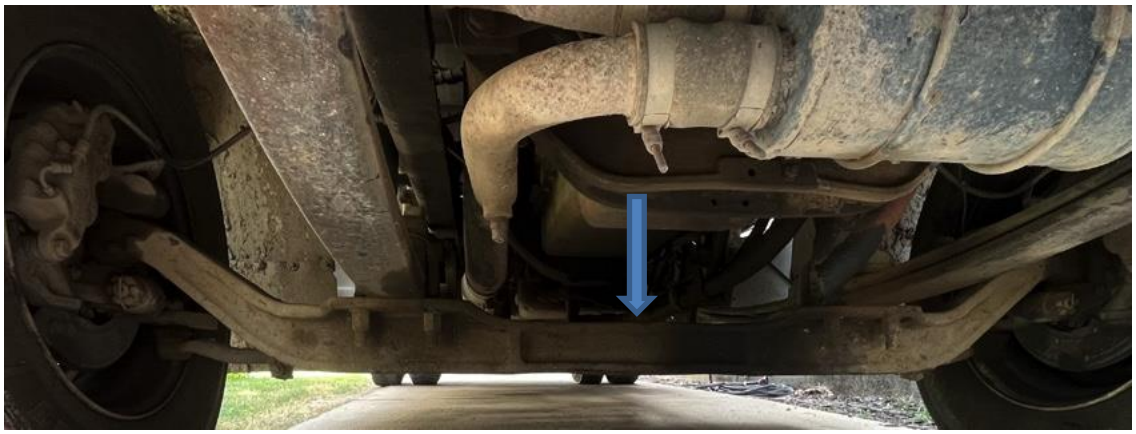




Tridem Spring Suspension MS-2 On top in middle of each axle.

Chalmers Suspension MS-2

Front Axle MS-1



In middle on top of I-Beam, on either side of center weld seam not on top of weld seam.

- For greater protection use ¼ in hi-temp split loom protective cover to protect the cable against chaffing etc... Mount the TruckWeight Transmitter in a suitable location. Route the Strain Gauge cable on the backside of the axle, around the outer shackle nut, and up the aft side of the outer shackle U-bolt. Allow some slack between the top of the spring and the bottom of the frame. Secure the wire harness with tie-raps. NOTE: (make sure not to route the wire between the spring and the spring stop pad). In off-road logging applications and other applications, where material can potentially hook cable the runs along the axle, take extra measures using extra tie-raps to better secure the cable to the axle.

Calibration Instructions:

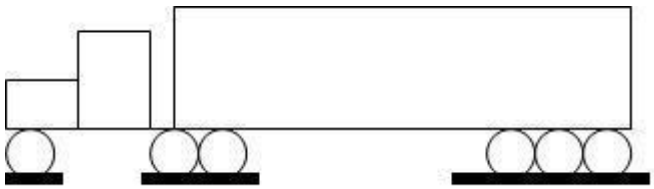
a. **Calibration Steps for a Sectional Platform Scale:**

***** For more specific instructions on how to calibrate using a plain platform scale (non-sectional) section 2 of the Calibration Instructions. *****

1. Drive to an accurate set of scales. **You will need to do all steps twice (first with loaded and then with unloaded weights or visa-versa).**

2. Use the Calibration Data Sheet supplied in this manual on Page 12 to record your calibration data.

3. When using a sectional platform scale, pull the truck onto the scale making sure that each section of the truck (steers, drives, and trailer) is properly on the scales as in the picture below.



4. **Dump and refill your airbags** before getting your PSI from the handheld on Peterbilt, International, and Volvo drive air suspensions. Watch the PSI reading in the top right-hand corner of the screen to make certain the updated pressure is constant as some suspensions take longer than others to settle.

- Ensure that the **air brakes are off** while on the scale. (Applying the brakes during the calibration process can place a slight torque on the air suspension system, which may affect the accuracy of the air pressure reading.)

- **Let the suspension settle** before taking a reading.

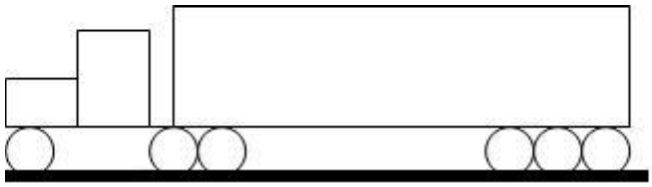
5. While on the scale, write down the pressure reading for each axle group/sensor from the handheld along with the weight for each axle group from the in-ground scale. The PSI reading is in the top right corner on the handheld display.

- To switch between sensors use the Left and Right buttons on the handheld to move the cursor below the desired axle group.
- Keep this written document for your records.
- **Do this step for both the loaded and unloaded weights.**

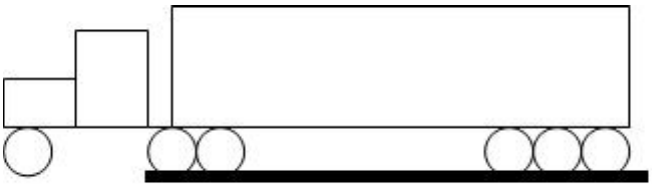
b. **Calibration Steps for a Platform Scale (Non-sectional):**

1. Drive to an accurate set of scales. **You will need to do all steps twice (first with loaded and then with unloaded weights).**

2. **Record the Gross Vehicle Weight**:
   - Pull onto the scale as shown below
   - Dump and refill your airbags before getting your pressure reading from the handheld and ensure that the air brakes are off while on the scale. (Applying the brakes during the calibration process can place a slight torque on the air suspension system, which may affect the accuracy of the air pressure reading.)
   - Let the suspension settle
   - Record the weight and PSI displayed by each sensor on the steers, drives, and trailer, and then record the corresponding scale weight.



3. **Record the Drives & Trailer weight**:
   - Pull the truck forward so that just the drives and trailer are remaining on the scale
   - Dump and refill your airbags before getting your pressure reading from the handheld and ensure that the air brakes are off while on the scale.
   - Let the suspension settle till the PSI is similar to the previous readings[4]
   - Record the weight and PSI of the sensors on the drives and trailer and then the corresponding scale weight



[15] If the pressure reading is off by more than 0.3PSI it may indicate that the truck is not on a level surface. Calibrating on an unlevel surface will cause a reduction in the accuracy of the system.

4. **Record the Trailer weight only**:
   - Pull the truck ahead until only the trailer is on the scale
   - Dump and refill your airbags before getting your pressure reading from the

handheld and ensure that the air brakes are off while on the scale.

- Let the suspension settle till the PSI is similar to the previous readings
- Record the weight and PSI from each sensor on the trailer and then the corresponding scale weight

5. **Calculate the weight of each axle group** as follows and record the weights on the Calibration Data Sheet with the PSI reading from the handheld.
    - Steers Weight = (Weight in Step 2) – (Weight in Step 3)
    - Drives Weight = (Weight in Step 3) – (Weight in Step 4)
    - Trailer Weight = (Weight in Step 4)
    - Total Gross Vehicle Weight= Steers Weight + Drives Weight + Trailer Weight

6. **Calibration of Lift Axles Controlled by a Regulator (note most rigs can obtain weights without placing sensors on lift axles, if you require more information please contact TruckWeight)**

    a. With a loaded rig, position the trailer on the scale so that the weight of only the lift axle can be obtained.
    b. Apply air pressure to the lift axle of between 20 to 25 PSI. Record the weight on that axle from the scale and the air pressure displayed on the handheld, and this will be the empty calibration setting.
    c. Increase the pressure to between 40 to 45 PSI. Record the weight from the scale and the air pressure displayed on the handheld, and this will be the loaded calibration setting.

NOTE: The sensors on your drive axles and/or tandem axles should be calibrated with the lift axles up.

7. **Adjusting Calibration for Dual Leveling Valves**

If you have dual leveling valves for your air suspension you must adjust the calibration information that you recorded during the calibration procedure as in the example below:

Example Unloaded Calibration Data: Left Sensor Pressure Reading: 10.0 PSI Right Sensor Pressure Reading: 15.0 PSI Empty Weight: 10,000 Lbs

a. Add the two pressure readings together:
10.0 + 15.0 = 25.0 PSI (this is the **Total Pressure**)

b. Divide the Weight by the Total Pressure:
10'000 Lbs/ 25.0 PSI = 400 Lbs / PSI (this is **Proportion** of pounds per psi)

c. Multiply the Left Sensor Pressure Reading by the Proportion calculated in step "b" for the Left Sensor Weight:
10.0 PSI x 400 Lbs / PSI = 4000 Lbs (**Left Sensor Weight**)

d. Multiply the Right Sensor Pressure Reading by the Proportion calculated in step "b" for the Right Sensor Weight:
15.0 PSI x 400 Lbs / PSI = 6000 Lbs (**Right Sensor Weight**)

Therefore, your Empty Calibration information is;

Sensors	Weight	Pressur
Left	4000 pounds	10.0 psi
Right	6000 pounds	15.0 psi

Keep the original readings and the calculation for your records. Do the same steps for the Loaded Calibration Data.

Entering calibration data:

Select Sensors

Select Sensor Press Calibrate

Enter Calibration Data

- The first line on the Calibration Screen is Empty Value for your empty PSI.
- The second line is for Empty Weight.
- The third line is for Loaded Value for your loaded PSI.
- The fourth line is for your Loaded Weight.

Note, select KG or Lbs and PSI or Kpa at the bottom of the screen.

a. Press the SAVE button to save the calibration data and return to the Maint Screen.

b. Repeat the above steps for all sensors.

After all the data is inputted into the Display the sensors are calibrated. Note, the calibration data for each sensor stays with the sensors, so any trailer you hook with will already have the calibration data in it.

NOTE: If you change components of your air suspension system, you may be required to perform a second calibration to retain the same high level of accuracy.

Calibration sheet to record calibration data for future use if needed.

	Sensor #	Loaded Weights/ PSI	Empty Weights/ PSI
Steers			
Drives			
Trailer axel 1			
Trailer axel 2			
Trailer axel 3			

8) WARRANTY AND TERMS OF SALE

I. WARNINGS

- **DO NOT OPERATE DISPLAY WHILE DRIVING.**

a. **Many air suspension systems maintain residual pressure in the airlines after the engine has been turned off. Please take the following precautions:**
   - Wear safety glasses, chemical-resistant gloves, and protective clothing when connecting and disconnecting airlines.
   - Confirm ZERO pressure before connecting and disconnecting airlines.

b. **Beware of the risk of unexpected vehicle movement. Please take the following precautions.**
   - Block the drive wheels before installing the sensors.
   - Ensure the parking brake is set.
   - Do not leave a running vehicle unattended. A moving vehicle can cause injury.

c. **The engine has moving parts and there is a risk of entanglement. Please take the following precautions:**
   - Do not place tools on fenders or anywhere within the engine compartment.
   - Keep yourself, your clothing, adapters, and service hoses clear of moving parts such as fan blades, belts, and pulleys.
   - Users and bystanders should wear safety goggles when near a running engine. Moving components can cause eye injuries.

d. **Maintain your focus on the road. Do not use the handheld unit while driving.**

e. **Beware of the risk of burns. Please take the following precautions:**
   - If at all possible, avoid working near hot truck components, and instead allow the truck to cool off before proceeding. However, if it is absolutely necessary to do so, ensure that protective gloves are worn.
   - Do not touch hot exhaust systems, manifolds, engines, radiators, etc. Hot components can cause injury or severe discomfort.

II. All quotations and sales by Smart Scale Technologies Inc., (Smart Scale) its subsidiaries, or

affiliates are subject to these terms and conditions.

a. Terms of payment are cash or equivalent; prices are CIF; and wireless truck scale prices do not include any taxes, insurance, handling, duty, or other similar charges, payment of which will be the sole responsibility of the customer unless otherwise specified on the invoice.

b. Smart Scale may select a carrier. TruckWeight responsibility for any loss or damage ends, and title passes, when Wireless Truck Scales are delivered to the carrier, to the customer, or customer's agent.

c. The Smart Scale Wireless Truck Scale is warranted against defects in material or workmanship for 2 years from the date of the original purchase. If the Wireless Truck Scale, which, because of a manufacturing mistake or malfunction, proves to be defective within the 2 year warranty period, it will be replaced Smart Scale with a handling and service charge to you, provided you have proof of purchase. Note handling and service charges may change from time to time and region to region. This warranty does not cover incidental or consequential damage to persons or property caused by use, abuse, misuse, failure to comply with installation or operating instructions, or damage caused by battery malfunction. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above warranty does not apply in those states. This warranty gives you specific legal rights and you may also have other rights, which vary from state to state.

d. SmartScale SHALL HAVE NO RESPONSIBILITY FOR OVERLOAD FINES RECEIVED WHILE USING THIS WIRELESS TRUCK SCALE.

e. Wireless TruckScales are deemed accepted by the customer unless the customer notifies SmartScale in writing within 10 days of delivery of Wireless TruckScales shortages, damage, or defect. **Nore turns may be made for any reason without obtaining a Return Authorization Number(RAN#) issued by SmartScale.** If a customer refuses to accept tender or delivery of any Wireless TruckScales or returns any Wireless Truck Scales without authorization from SmartScale., such Wireless Truck Scales will be held by SmartScale awaiting customer's instruction for 20 days, after which SmartScale.may deem the Wireless Truck Scales abandoned and dispose of them as it sees fit, without crediting customer's account. Refunds are not permitted.

f. SmartScale will not be liable for any failure or delay in its performance or in the delivery or shipment of Wireless TruckScales, or for any damages suffered by the customer by reason of such failure or delay, when such failure or delay is caused by, or arises in connection with, any fire, flood, accident, riot, earthquake, severe weather, war, governmental interference or embargo, strike, shortage of labor, fuel, power, materials or supplies, delay in delivery by SmartScale suppliers or any other cause or causes beyond ScaleScale's reasonable control. SmartScale reserves the right to cancel without liability any order, the shipment of which is or may be delayed for more than 30 days by reason of any such cause. SmartScale reserves the right to allocate in its sole discretion among customers or potential customers, or defer or delay the shipment of, any Wireless TruckScale which is in short supply.

g. All quotations and sales are made only upon these terms and conditions and those on the invoice. The invoice and not any purchase order or other customer document (which, if construed to be an offer is hereby rejected), will be deemed an offer or counter-offer and is a rejection of any other terms or conditions. Customer, by accepting any Wireless TruckScales, making any payments, or ordering any WirelessTruckScales accepts these terms and conditions and will be deemed to have assented to these terms and conditions, notwithstanding any terms contained in any prior or later communication from customer and whether or not SmartScale will specifically or expressly object to any of customer's terms. SmartScale's failure to object to any document, communication, or act of customer will not be deemed a waiver of any of these terms and conditions. Any addition or change to these terms and conditions must be specifically agreed to in writing by a duly authorized officer of SmartScale before becoming binding on SmartScale.

h. Unless specifically otherwise agreed in writing by SmartScale customer acknowledges that Wireless TruckScales sold by SmartScale is not intended for and will not be used in life support systems, human implantation, nuclear facilities or systems, or any other application where Wireless TruckScale failure could lead to loss of life or catastrophic property damage. The customer will indemnify and hold SmartScale harmless from any loss, cost, or damage resulting from the customer's breach of the provisions of this paragraph.

i. Any or all Wireless TruckScales may be subject to export or resale restriction or regulation, and the customer acknowledges that it will comply with such regulations or restrictions. Any or all Wireless TruckScales may have been imported. Country of origin information is as provided to SmartScale by its suppliers and is, where applicable, located on the Wireless TruckScales themselves or the supplier's innermost packaging thereof.

j. Except for the warranty coverage referenced in paragraph 3, above, NEITHER SMART SCALE NOR ITS SUPPLIERS WILL HAVE ANY LIABILITY OR OBLIGATION TO CUSTOMER OR ANY OTHER PERSON FOR ANY CLAIM, LOSS, DAMAGE, OR EXPENSE CAUSED IN WHOLE OR IN PART, DIRECTLY OR INDIRECTLY, BY THE INADEQUACY OF ANY WIRELESS TRUCK SCALES FOR ANY PURPOSE, BY ANY DEFICIENCY OR DEFECT IN ANY WIRELESS TRUCK SCALE (WHETHER OR NOT COVERED BY ANY WARRANTY), BY THE USE OR PERFORMANCE OF ANY WIRELESS TRUCK SCALES OR BY ANY FAILURE OR DELAY IN TRUCK WEIGHT PERFORMANCE HEREUNDER, OR FOR ANY SPECIAL, DIRECT, INDIRECT, INCIDENTAL, CONSEQUENTIAL, EXEMPLARY OR PUNITIVE DAMAGES, HOWEVER CAUSED, INCLUDING, WITHOUT LIMITATION, PERSONAL INJURY OR LOSS OF BUSINESS OR PROFIT, WHETHER OR NOT CUSTOMER WILL HAVE INFORMED TRUCK WEIGHT OF THE POSSIBILITY OR LIKELIHOOD OF ANY SUCH DAMAGES.

k. SmartScale may assign accounts receivable to an affiliate. In order to defray the cost of customer account administration, any credit balance or other sum owed to a customer who remains unclaimed by that customer for a period of eighteen months will become the property of SmartScale.

l. No order may be canceled, rescheduled, or reconfigured without SmartScale's prior written authorization, and in such event; the customer will be liable for any additional costs and expenses incurred by SmartScale.

m. Prices are subject to change by Smart Scale upon customer rescheduling or reconfiguration of orders.

Prices are also subject to change in response to supplier price increases.

Smart Scale Technologies Inc.
225 Ridgevale Drive
Bedford, Nova Scotia, Canada, B4A 4B3.

Contact Information:

Our office is open Monday through Friday 9 am to 5pm Eastern Standard Time.

Call: +1-877-757-7888 in North America

Call: +1-902-404-3452 **Ext** 117

Fax: 902-431-9587

Email: **info@TruckWeight.com**