V400 SERVICE MANUAL

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CHAPTER 1.0

VULCAN ON-BOARD SCALE SYSTEM

Vulcan On-Board Scales are installed on all types of vehicles including front loaders, rear loaders, side loaders, roll-offs, transfer trailers, logging trucks, flatbed trailers, chip trailers, and any commercial vehicle requiring scales. Individual commercial account pick-up weights and total truck payload weights can be measured using the Vulcan On-Board Scale System.

Typically a scale system has either four or six load cells, two Vulcoders, and one meter per truck. The number of load cells required depends on the truck's length and the load capacity.

Vulcan Scale System

Load Cells

Vulcoders

Meter

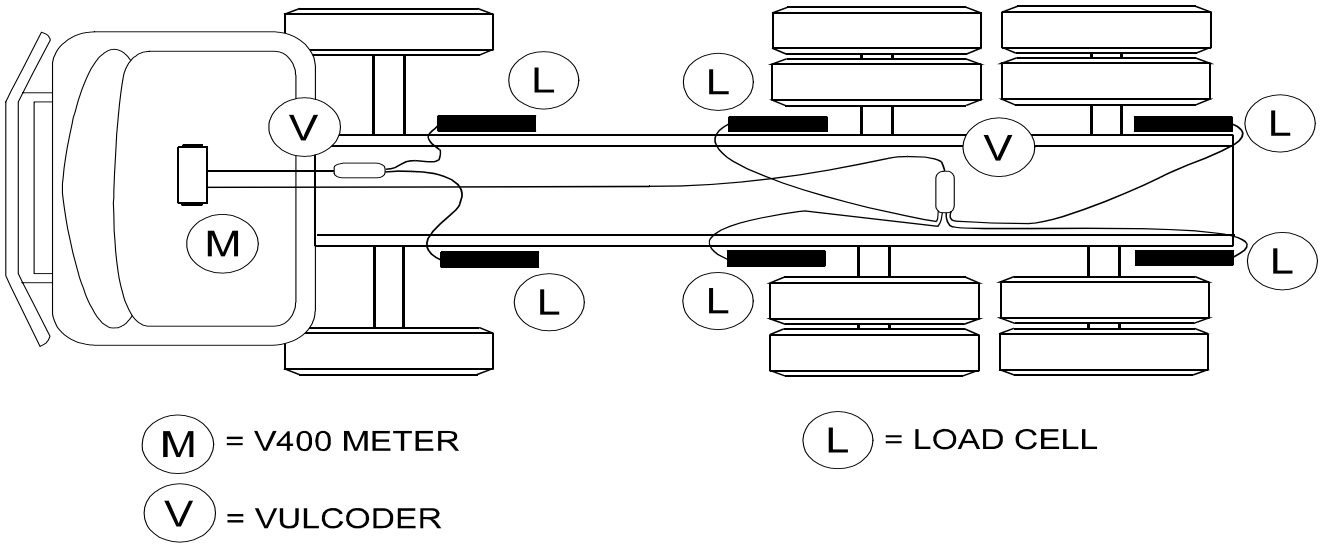


Figure 1-A: Vulcan Scale System Diagram

1.1 LOAD CELLS

Vulcan load cells are machined high strength steel beams with strain gages bonded inside. The load cells have no moving parts. A strain gage is an electrical resistance element. When weight is applied to the load cell, the strain gages stretch and compress causing a change in voltage signal. This voltage signal is then used to determine weight.

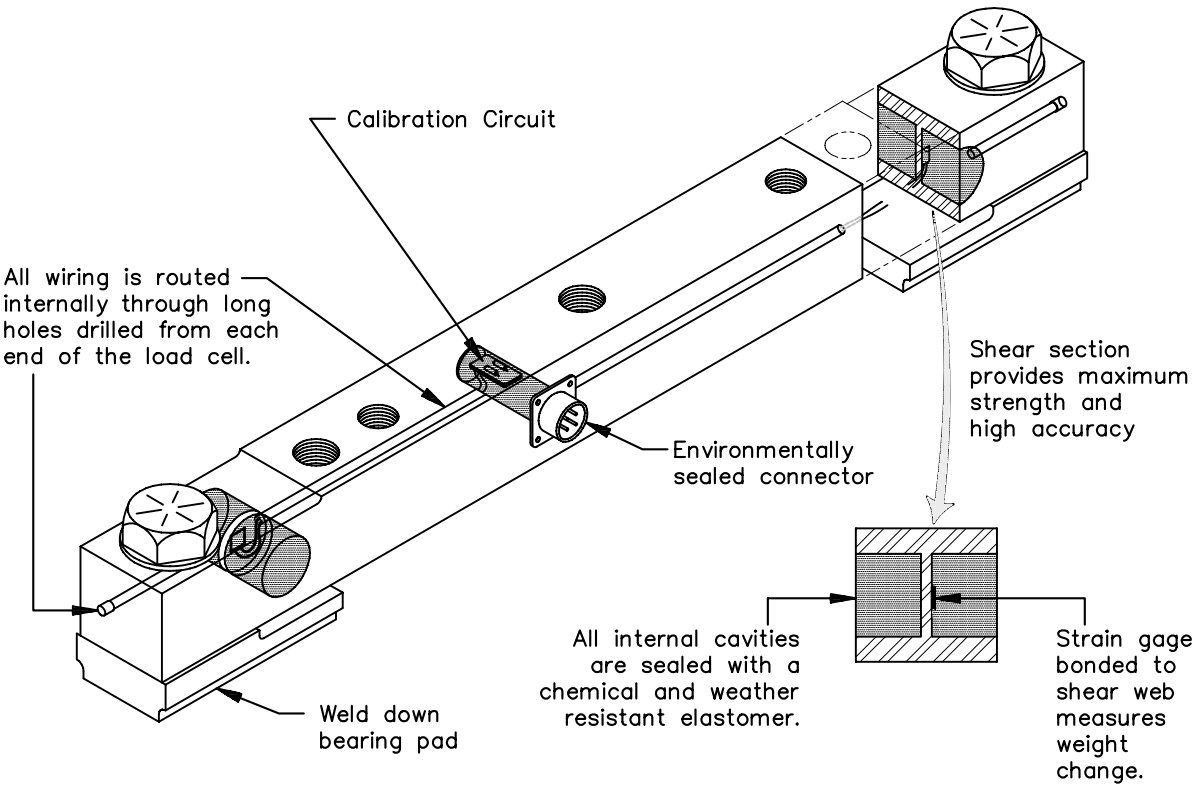


Figure 1-B: Vulcan Shear Beam Load Cell
(U.S. Patent 4,666,003 Canadian Patent 1,245,677)

1.2 VULCODERS

The primary functions of the Vulcoder are to supply the load cells with power and to relay the load cells' output to the meter. The Vulcoder receives a 12 Vdc input from the meter and supplies the load cells with 5 Vdc +/- 1 Vdc. When weight is applied, the voltage output of the load cells change. The Vulcoder then reads the change in voltage from the load cells and converts it from an analog to a digital signal. This signal is then relayed to the meter and displayed as weight.

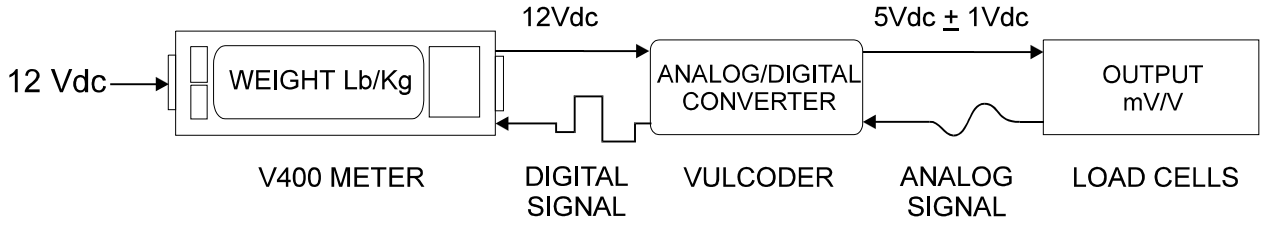


Figure 1-C: Vulcan Electronics Diagram

1.3 METER

The V400 meter's primary functions are to supply the Vulcoder with 12 Vdc and to read the digital signal transmitted from the Vulcoder. The meter reads the digital signal, makes calculations, and displays a weight in pounds or kilograms. The V400 meter is shown on the following page together with a description of the meter button functions.

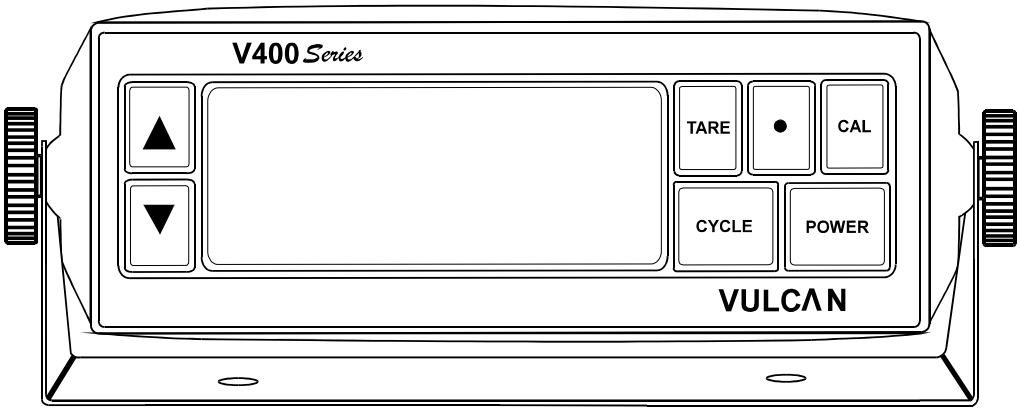


Figure 1-D: V400 Meter

POWER BUTTON:

Turns the meter on and off. Also used to switch the display mode from pounds (lb) to kilograms (kg) and to enter the Driver Lockout and Set Point modes on meter versions P8-0 and higher.

UP/ DOWN ARROW BUTTONS:

Used to increase or decrease the Cal Number and Tare Weight. Also used to change the display from pounds (lb) to kilograms (kg), adjust the Cycle Time, and to enter the Driver Lockout mode on meter versions P8-0 and higher.

CYCLE BUTTON:

Used to view the weight on different channels and to adjust Cycle Time. Also used in the Set Point and Driver Lockout modes on meter versions P8-0 and higher.

CAL BUTTON:

Used to view and adjust the Cal Number for a particular channel. Also used in the Set Point and Driver Lockout modes on meter versions P8-0 and higher.

TARE BUTTON:

Used to view and adjust the Tare Weight and to change the display graduation from 100 lb to 10 lb (or 50 kg to 10 kg) when the meter is locked on Channel A+B. Also used to access the Set Point mode on meter versions P8-0 and higher.

1.4 ELECTRONICS INSTALLATION

1. Tape Vulcoder connectors prior to routing cabling to avoid contamination. Mount Vulcoders on inside of truck frame rail or next to a structural member. Mounting surface must be in an area protected from road or hauling debris.

2. Route black cable to load cells. (**Do not** trim black cable to length).

3. **Important:** Check connectors to make sure they are clean and dry. Turn meter off while making any wire connections. **Do not** get moisture, contact cleaner, or any other substance inside of connectors.

4. Check load cell connector coming from the Vulcoder for O-ring. Attach black cable connectors to bulkhead connectors on load cells. Make sure they are finger tight plus an additional 1/8 of a turn with channel lock pliers. The additional tightening is necessary to compress O-ring preventing scale errors which can occur from moisture entering into the load cell connector. **Caution:** Do not over tighten the connectors as this can damage them.

5. Route orange Vulcoder cable to cab. **Note:** On truck-to-trailer connection, these wires may be routed using the existing truck / trailer wire harness if **two unused, ungrounded** wires are available. Additionally, you may follow the existing wire harness and use a separate connector of your choice between the truck and trailer.

6. Find suitable location for the meter and install mounting bracket. Secure cable so it does not obstruct other in cab equipment, strain relief Vulcoder orange cable, and cut to length. Unplug terminal block from back of meter, strip wires, and make all wire connections to terminal block (refer to Figures 1-E and 1-F). Do not plug terminal block into meter at this time.

7. Disassemble positive fuse holder, (red wire). Connect fused power leads directly to battery for best operation. If not connecting directly to the battery be sure to use a location that has the proper 12 Vdc available at all times, refer to Section 7.4 “System Specifications.”

Note: Some trucks are configured with variable voltage supplies, never apply more than 16 Vdc to the Vulcan system. Apply grease to the positive connector at the battery post to inhibit corrosion.

8. Review steps 1 to 7 before connecting terminal block to back of meter.

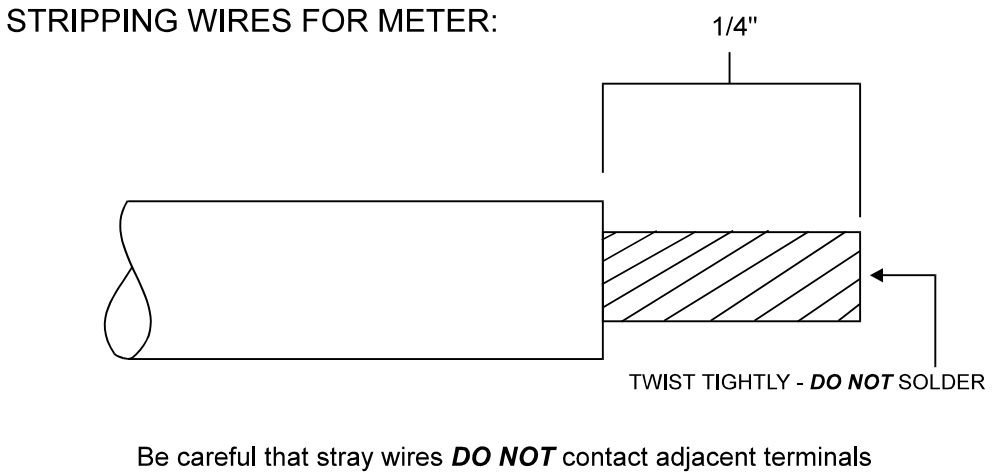


Figure 1-E: Stripping Wires for Meter

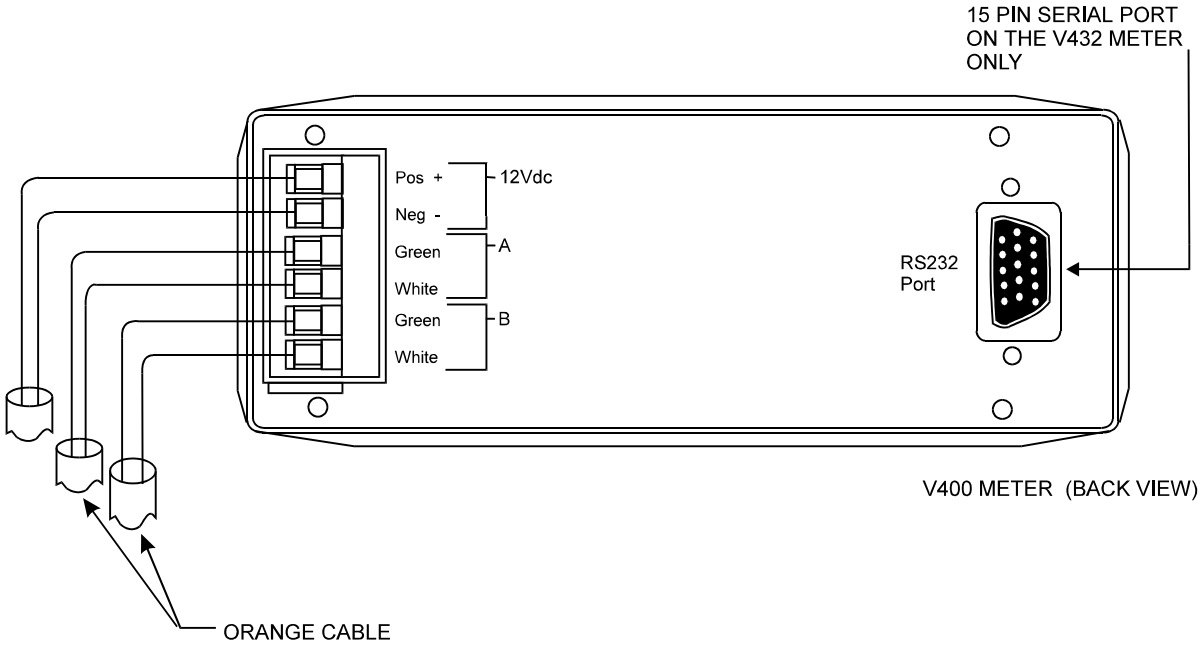


Figure 1-F: Wire Connections to Meter

CHAPTER 2.0

METER OPERATION

2.1 TURNING THE METER ON.

This can be done by turning the truck's battery cut off switch on and by pressing the **Power** button on the meter.

2.2 ADJUSTING THE CYCLE TIME.

The Cycle Time is the amount of time each channel is displayed on the meter and can be adjusted from 1 to 9 seconds. To adjust the Cycle Time, press and hold the **Cycle** button until a single digit number is displayed. While continuing to hold the **Cycle** button, use the **Up / Down Arrow** buttons to adjust the time.

2.3 LOCKING THE METER ON A PARTICULAR CHANNEL.

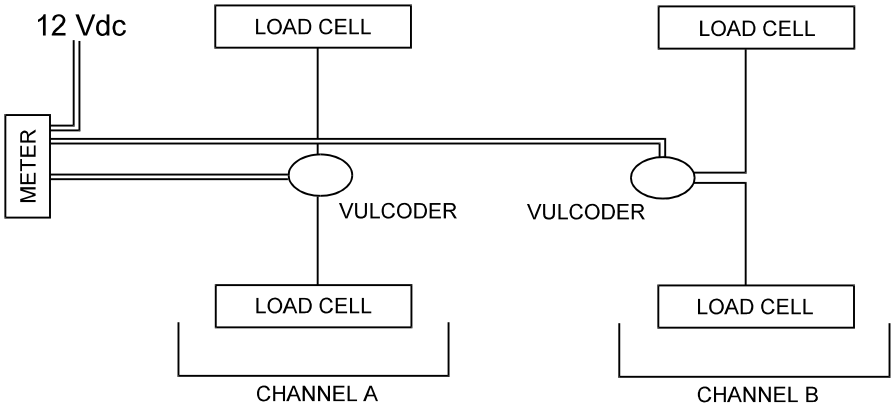
To lock the meter on a particular channel, press the **Cycle** button until the channel is displayed (Example: A+B CYCLE). Press the **Cycle** button again until the "CYCLE" indicator disappears from the meter display (Example: A+B). The meter is now locked on a specific channel (Example: Channel A+B).

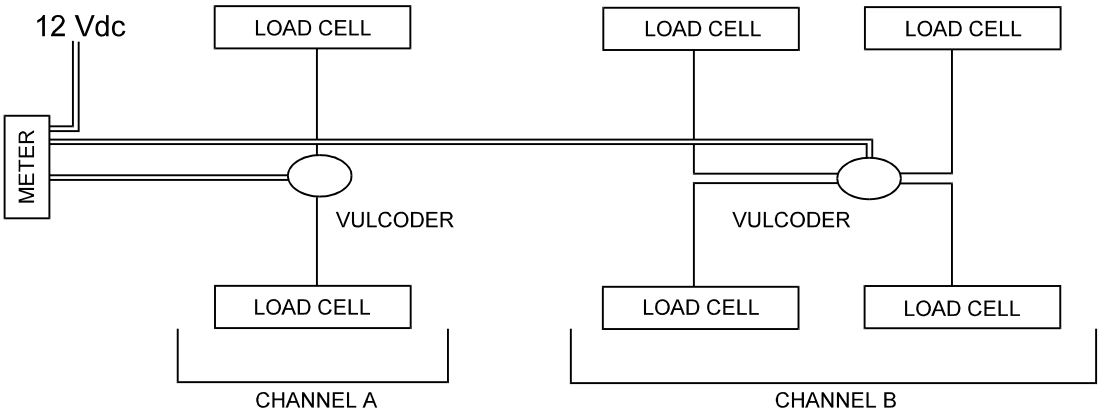
To lock the meter on a particular channel for power up:

Cycle the display to the desired channel and lock on it. Turn the meter off using the **Power** button and turn the meter back on. The meter will now repeatedly power up locked in that channel when power is disconnected.

Channel Designations for Figures 2-A and 2-B.

Channel A :	Represents the front load cells, regardless of whether it is a four or a six cell configuration.
Channel B:	Represents the rear load cells.
Channel A+B:	Represents the total weight from the front and rear load cells.





Figures 2-A and 2-B: Vulcan 4 and 6 cell configurations

2.4 DISPLAYING TARE WEIGHT.

Lock the meter on Channel A or B. The Tare Weight is the displayed reading when the vehicle is empty. For setting the Tare Weight, refer to Chapter 4.0 “Calibration and System Set-up.”

2.5 DISPLAYING CALIBRATION NUMBERS.

Lock the meter on Channel A or B. Press and hold the **Cal** button to display the Calibration Number. For setting the Calibration Numbers, refer to Chapter 4.0 “Calibration and System Set-up.”

2.6 CHANGING THE DISPLAY GRADUATION.

Cycle to Channel A+B and lock on it. Push the **Tare** button. This will cause the word “TARE” to flash in the lower right corner of the display. The meter display will read “0” and will display positive or negative weight change in 10 lb or 10 kg mode increments. To return to normal operating mode, push the **Tare** button once. To re-zero the display while in the 10 lb or 10 kg mode, push the **Tare** button twice.

2.7 SWITCHING BETWEEN LB AND KG.

Turn the meter off, press both the **Up** and **Down** buttons while turning the meter back on. Continue to hold the **Up** and **Down** buttons until the start up routine is complete (5 seconds).

2.8 DRIVER LOCKOUT
(Available on Meter Versions P8-0 and Higher)

The Driver Lockout option is available on V400 meter software versions P8-0 and higher. This option prevents drivers or other unauthorized personnel from changing the calibration settings on their scale system. The Calibration Number and Tare Weight can only be changed by successfully entering the correct four digit access number. Once an access number has been stored in permanent memory, the meter will be in the lockout state every time it is turned on.

The Driver Lockout access number is any four digit number between “0001” and “9999”. When an access number is stored in permanent memory, it replaces any previous access number. If access number “0000” is stored in permanent memory, the Lockout feature is deactivated. The meter should arrive from your Vulcan dealer deactivated. However, if the meter is in the lockout state when received, enter “0000” to deactivate the Driver Lockout feature.

Procedure for Entering a Driver Lockout Access Number is shown on the following page.

ENTERING A DRIVER LOCKOUT ACCESS NUMBER

1. Turn the meter off.

2. Press and hold the **Up Arrow** button while turning the meter on with the **Power** button. Continue holding the **Up Arrow** button until four zeros appear on the display.

3. Use the **Up** and **Down Arrow** buttons to input an access number between "0001" and "9999". To deactivate the Driver Lockout feature, enter "0000" as an access number.

4. Press the **Cal** button to store the access number in permanent memory. The display will flash three times, indicating that the access number has been stored in permanent memory. The meter then returns to normal operating mode in the lockout state.

5. Verify the Driver Lockout access number by pressing the **Cycle** button.
   Note: If the correct access number is not verified, the meter will return to the normal locked state.

6. Record the access number and store it in a safe place.
   Access Number _____

Quick Reference Steps:

Access Driver Lockout Mode	Put the meter in lockout programming mode, refer to Steps 1 and 2 above.
Deactivate Driver Lockout	To deactivate the Driver Lockout feature, enter "0000" as an access number in Step 3 above.
Verify Access Number	To verify the Driver Lockout access number, refer to Step 5 above.

2.9 SET POINT
(Available on Meter Versions P8-0 and Higher)

The Set Point Option is available on V400 meter software versions P8-0 and higher. This option will alert the driver when a pre-determined weight has been reached. The Set Point Option is available on Channel A+B only and has a range from 0 to 124,500 lb (0 to 56,550 kg). It can be entered either as gross vehicle or total net weight. When this weight is exceeded, all of the meter channels will continuously flash until the weight on Channel A+B goes below the Set Point Value.

Entering a Set Point Value

1. Turn the meter off.

2. Press and hold the **Tare** button while turning on the meter with the **Power** button. Hold the **Tare** button until "SP" appears on the screen.

   If a Set Point value has been previously entered, it will appear on the display. If a Set Point value has not been entered, "0" will appear on the display.

3. Use the **Up** and **Down Arrow** buttons to input the desired Set Point value. To deactivate the Set Point feature, enter "0" as the Set Point value.

4. Press the **Cycle** button to store the Set Point value. The meter will return to its normal operating mode. Leave the meter on for 30 seconds to store the Set Point value in permanent memory.

Quick Reference Steps:

Deactivate Set Point	To deactivate the Set Point feature, enter "0" as the Set Point value in Step 3 above.
Verify Set Point Value	To verify a previously entered Set Point Value, refer to Step 2 in the above procedure.

CHAPTER 3.0

WEIGHT MEASURING METHODS

The Vulcan Scale System can be used to measure weight by three different methods. These methods are Gross Vehicle Weight, Net Payload Weight, and Net Pick-up Weight. The Net Pick-up Weight can be determined by either the Continuous Tracking Method or the Isolated Pick-up Method. In addition to these methods, Vulcan Scales can be used to determine Axle Weight as described in Section 3.1.

Important Notice for Tipper Truck Operators:

To avoid weight measurement errors, the forks must be in the down position and the body lift cylinder pressure must be relieved at the time of measuring for all methods. The pressure relief valve should be engaged during weight measurements. If the truck is not equipped with a pressure relief valve, relieve the pressure manually. In addition, all packing should be done after the weight is recorded.

3.1 AXLE WEIGHT

Vulcan Scales can be used to reduce overweight fines by measuring a vehicle's axle weight. For refuse trucks, the scales can indicate a weight on Channel B that should not be exceeded in order to keep the truck legal. Load the truck close to the legal maximum according to a certified platform scale. The number displayed on Channel B of the meter represents an approximate rear axle group weight and may be used as a reference weight to avoid exceeding the legal limit. This reference weight may be different from the weight shown on the certified platform scale display. **Note**: Channel A does not represent steering axle weight.

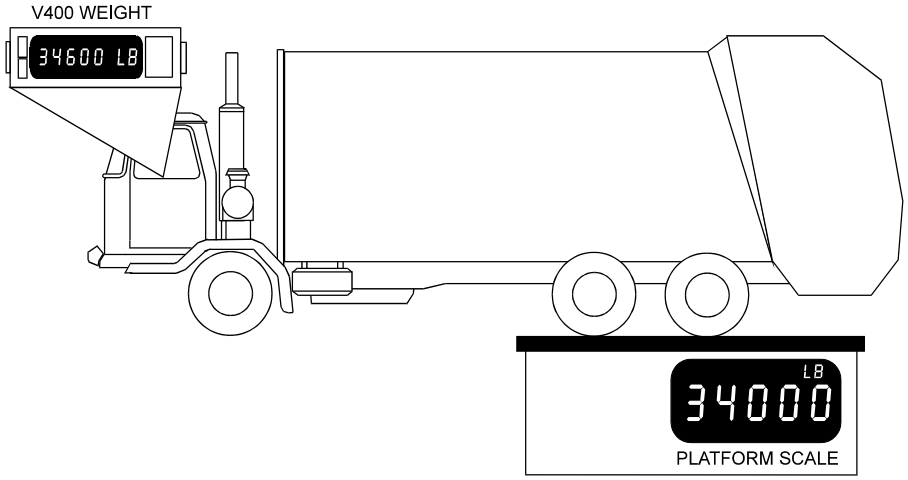


Figure 3-A: Rear Axle Group Weight (Channel B) in Relation to a Certified Platform Scale

3.2 GROSS VEHICLE WEIGHT

Gross Vehicle Weight : Entire truck weight including fuel, equipment, personnel, and payload.

In order to use the Gross Vehicle Weight method, the Tare Weight for Channel A and Channel B must be entered. The Tare Weight is the weight of the empty truck with fuel, equipment, personnel and **no payload**. For example if the Tare Weight is 30,000 lb, the meter would display this weight before any pick-ups have been made. As the pick-ups are made and the payload increases, the weight displayed on the meter will also increase. The weight displayed at all times is the Gross Vehicle Weight.

3.3 NET PAYLOAD WEIGHT

Net Payload Weight: Weight of the truck's payload only.

By using the Net Payload Weight method, pick-ups are measured cumulatively. Net Payload Weight can be measured when the truck's Tare Weight is set to zero. If the Tare Weight for Channel A and Channel B are set to zero, the weight displayed at all times during the route is the Net Payload Weight.

3.4 NET PICK-UP WEIGHT

The Net Pick-up Weight method can be used to determine the weight of individual pick-ups. The two methods used to determine Net Pick-up Weight are the Continuous Tracking Method and the Isolated Pick-up Method.

3.4.1 CONTINUOUS TRACKING METHOD

This method is used for weighing all customer pick-ups on a route. It is the most accurate, quickest method, and requires only simple subtraction at the end of the route.

Continuous Tracking Procedure

1. Lock meter on Channel A+B.

2. Stop the truck close to the first container on level ground with forks lowered.
   Note: The truck should not be in a twist or turn.

3. Press the **Tare** button to put the meter in the 10 lb mode.
   The "TARE" indicator will flash and the meter display goes to zero (+/- 20 lb / kg).

4. Write down the meter reading. In order to avoid weight measurement errors, it is important that the truck not touch the container or any other object while a meter reading is being taken.

5. a. Pick-up the load.
   b. Dump it into the vehicle.
   c. Set the container down.
   d. Back the forks out of container.
   e. Stop the truck with forks in the down position on level ground.
      Note: The truck should not be in a twist or turn.
   f. If the body lift cylinder pressure is not relieved automatically, bleed the pressure manually.

6. Write down the meter reading. In order to avoid weight measurement errors, it is important that the truck not touch the container or any other object while a meter reading is being taken.

7. Repeat steps 5 and 6 until the truck is fully loaded.

8. Subtract the previous reading from the current reading to determine the weight of each pick-up.

3.4.2 ISOLATED PICK-UP METHOD

This method is used for auditing selected customers on a route and requires two stops of the truck for every pick-up site.

Isolated Pick-up Procedure

1. Lock meter on Channel A+B.

2. Stop the truck close to the container on level ground with forks lowered.

3. Press the **Tare** button to put the meter into the 10 lb mode. The "TARE" indicator will flash and the meter display will go to zero (+/- 20 lb / kg).

4. a. Pick-up the load.
   b. Dump it into the vehicle.
   c. Set the container down.
   d. Back the forks out of container.
   e. Stop the truck with forks in the down position on level ground.
      Note: The truck should not be in a twist or turn.
   f. If the body lift cylinder pressure is not relieved automatically, bleed the pressure manually.

5. Write down the meter reading. In order to avoid weight measurement errors, it is important that the truck not touch the container or any other object while a meter reading is being taken.

6 Press the **Tare** button to view accumulated weight mode and proceed to the next customer. Repeat the above procedure for the next customer to be audited.

Example

Customer	Weight Displayed On The V400 Meter	Individual Pick-up Weight	Total Payload Weight
Meter Reading Before Pick-ups	00	0	0
Pick-up #1	300	280	280
Pick-up #2	1000	700	980
Pick-up #3	1200	250	1230

C H A P T E R 4 . 0

CALIBRATION AND SYSTEM SET-UP

Calibration is fine tuning a system to maximum accuracy in reference to a specific certified platform scale. It is important to calibrate for high accuracy in order to achieve the maximum possible payload.

It is also important that conditions remain as constant as possible throughout the calibration process. Inaccuracies may result from differences in fuel load, ice build-up, etc.. It may take 2 or 3 attempts at calibration to achieve the optimum setting.

Calibration should be done anytime a system is installed, if there are continuous questionable readings, or if meter readings repeatably do not closely match the certified platform scale weights. The Vulcan Scale System can be calibrated for either Net Payload Weight or Gross Vehicle Weight. The Net Payload Weight displays only the weight of the payload and the Gross Vehicle Weight displays the weight of both the truck and its payload.

4.1 CHANGING CALIBRATION NUMBERS AND TARE WEIGHTS WHEN THE DRIVER LOCKOUT FEATURE IS ENABLED

The meter's access code must be entered in order to make changes to the Calibration Numbers and Tare Weights if the Driver Lockout feature has been enabled. The procedure for changing Calibration Numbers and Tare Weights when the Driver Lockout feature is enabled is shown below.

1. Turn the meter off.

2. Press the **Up Arrow** button while turning the meter on with the **Power** button. Continue holding the **Up Arrow** button until four zeros appear on the display.

3. Use the **Up** and **Down Arrow** buttons to input the access number.

4. Press the **Cycle** button so the meter can verify the access number.

5. If the correct access number is entered, the meter will enter an operating mode where the Calibration Numbers and Tare Weights can be changed.

   If an incorrect access number is entered, the Driver Lockout feature remains active. To deactivate the Driver Lockout feature, enter "0000" as the access number.

6. After the desired Calibration Numbers and Tare Weight changes have been made, leave the meter on for 30 seconds to store the new numbers into permanent memory. Turn the meter off with the **Power** button and back on again. The meter will return to the Driver Lockout state again with the new Cal and Tare numbers stored in permanent memory.

4.2 CALIBRATING FOR NET PAYLOAD WEIGHT

If the Calibration or Tare Numbers cannot be entered according to the procedures listed below, the Driver Lockout feature may be enabled. Refer to Section 4.1 "Changing Calibration Numbers and Tare Weights When The Driver Lockout Feature is Enabled" for further information.

4.2.1 PROCEDURE FOR ENTERING STARTING CALIBRATION NUMBERS

Net Payload Weight Method

1. Stop the empty truck on level ground.

2. Turn on the meter. Wait for system initialization.

3. Look-up Cal Numbers for Channel A and B in Section 7.1 "Starting Calibration Numbers" and write them in the space provided below.

   Starting Channel A Cal Number: _____ Starting Channel B Cal Number :_____

4. Lock meter on Channel A using the **Cycle** button.

5. Press and hold the **Cal** button to display the Cal Number setting. If the setting doesn't match the starting Channel A Cal Number in Step 3, correct the Cal Number with the **Up** / **Down Arrow** buttons. Note: Holding down the **Up** / **Down Arrow** buttons will accelerate the number change.

6. Lock meter on Channel B using the **Cycle** button.

7. Press and hold the **Cal** button to display the Cal Number setting. If the setting doesn't match the starting Channel B Cal Number in Step 3, correct the Cal Number with the **Up** / **Down**

Arrow buttons. Note: Holding down the **Up** / **Down Arrow** buttons will accelerate the number change.

8. Use the **Cycle** button to lock the display on Channel A+B.

9. **IMPORTANT:** Leave the meter on for a minimum of 3 minutes after changing the Cal Numbers so the new values will be recorded into permanent memory. Starting the truck, turning the ignition switch, or pressing meter buttons during this time may cause the meter to reset and return to a previous setting.

4.2.2 PROCEDURE FOR ENTERING TARE WEIGHTS

NET PAYLOAD WEIGHT METHOD

1. With the truck empty and on level ground, lock the meter on Channel A using the **Cycle** button. The displayed weight is the Tare Weight. **Note:** The truck should not be in a twist or turn.

2. Press and hold the **Tare** button. Use the **Up** / **Down Arrow** buttons until the meter displays zero.

3. Lock the meter on Channel B using the **Cycle** button. The displayed weight is the Tare Weight.

4. Press and hold the **Tare** button. Use the **Up** / **Down Arrow** buttons until the meter displays zero.

5. Lock the meter on Channel A+B for normal operation.

6. **IMPORTANT:** Leave the meter on for a minimum of 3 minutes after changing the Tare Weight so the new values will be recorded into permanent memory. Starting the truck, turning

the ignition switch, or pressing meter buttons during this time may cause the meter to reset and return to a previous setting.

4.3 CALIBRATING FOR GROSS VEHICLE WEIGHT

If the Cal or Tare Numbers cannot be entered according to the procedures listed below, the Driver Lockout feature may be enabled. Refer to Section 4.1 “Changing Calibration Numbers and Tare Weights When The Driver Lockout Feature is Enabled” for further information.

4.3.1 PROCEDURE FOR ENTERING STARTING CALIBRATION NUMBERS

GROSS VEHICLE WEIGHT METHOD

1. Stop the empty truck on level ground.

2. Turn on the meter. Wait 5 seconds for system initialization.

3. Look-up Cal Numbers for Channel A and B in Section 7.1 “Starting Calibration Numbers” and write them in the space provided below.

   Starting Channel A Cal Number: _____ Starting Channel B Cal Number :_____

4. Lock meter on Channel A using the **Cycle** button.

5. Press and hold **Cal** button to display Cal Number setting. If setting doesn’t match Starting Channel A Cal Number in Step 3, correct the Cal Number with the **Up** / **Down Arrow** buttons. **Note:** Holding down the **Up** or **Down Arrow** buttons will accelerate the number change.
6. Lock the meter on Channel B using the **Cycle** button.

7. Press and hold **Cal** button to display Cal Number setting. If setting doesn't match Starting Channel B Cal Number in Step 3, correct the Cal Number with the **Up** / **Down Arrow** buttons. Note: Holding down the **Up** or **Down Arrow** buttons will accelerate the number change.

8. Use the **Cycle** button to lock the display on Channel A+B.

9. **IMPORTANT:** Leave the meter on for a minimum of 3 minutes after changing the Cal Numbers so the new values will be recorded into permanent memory. Starting the truck or turning the ignition switch during this time will cause the meter to reset and go back to a previous setting.

4.3.2 PROCEDURE FOR ENTERING TARE WEIGHTS

GROSS VEHICLE WEIGHT METHOD

1. Weigh the entire empty truck (both front and rear axles) using a certified platform scale. This is the truck's Tare Weight. Enter this number in the space provided.

   Tare Weight of Entire Truck _____

2. Weigh the rear axle group of the empty truck. This is the Rear Axle Tare Weight. Enter this number in the space provided below.

   Tare Weight of Rear Axle Group _____

3. Stop the empty truck on level ground.
4. Enter the Tare Weight of the Rear Axle Group as Channel B.
   a) Press the **Cycle** button to lock on Channel B.
   b) Press and hold the **Tare** button.

c) Use the **Up / Down Arrow** buttons until the desired value from Step 2 is shown.

5. Subtract the Tare Weight of the Rear Axle Group form the Tare Weight of the Entire Truck and enter this number on Channel A.
   a) Press **Cycle** to lock on Channel A.
   b) Press and hold the **Tare** button.
   c) Use the **Up / Down Arrow** buttons until the desired value is shown.

6. **IMPORTANT:** Leave the meter on for a minimum of 3 minutes after changing the Tare Weight so the new values will be recorded into permanent memory. Starting the truck, turning the ignition switch, or pressing meter buttons during this time will cause the meter to reset and return to a previous setting.

4.4 FINAL CALIBRATION PROCEDURE FOR NET PAYLOAD WEIGHT AND GROSS VEHICLE WEIGHT METHODS

Listed below is the final calibration procedure for both the Net Payload Weight and Gross Vehicle Weight Methods. If additional assistance is needed to fine tune your scale system, please follow the instructions shown in Section 7.2 "Fine Tuning Your Scale System."

1. Fully load the truck close to the legal limit.

2. Lock the meter on Channel A+B.

3. Weigh the **loaded** truck using a certified platform scale. Record the weight shown on the certified scale and the weight as shown on the V400 meter (Channel A+B).

   a) Weight Shown on Certified Scale (truck fully loaded).

   _____

   (Example: 56,240 lb Certified Scale: truck fully loaded)

   b) Weight Shown on V400 Meter (truck fully loaded) Channel A+B.

   _____

   (Example: 22,500 lb V400 Meter : truck fully loaded)

4. Dump the payload.

5. Weigh the **empty** truck on the **same** certified platform scale. Record the weight shown on certified scale and the weight as shown on the V400 meter (Channel A+B).

   a) Weight Shown on Certified Scale (truck empty).

_____

(Example: 35,000 lb Certified Scale: truck empty)

b) Weight Shown on V400 Meter (truck empty) Channel A+ B.

_____

(Example: 00 lb V400 Meter: truck empty)

6. Calculate the Net Weight for both the Certified Scale readings (P) and the V400 meter readings (V). Subtract the truck empty weight from the truck fully loaded weight.

P = Weight shown on Certified Scale (truck fully loaded) - Weight shown on Certified Scale (truck empty)

Example (P = 56,240 lb - 35,000 lb = 21,240 lb)

V= Weight shown on V400 meter (truck fully loaded) - Weight shown on V400 meter (truck empty)

Example (V = 22,500 lb - 00 lb = 22,500 lb)

7. If the average difference between the certified scale and the meter is more than several hundred pounds, you may want to adjust the Calibration Numbers. If so, proceed to Step 8.

8. To determine the new Calibration Number for Channel A refer to the formula shown below:

$$\text{Channel A New Cal Number} = \text{Channel A Old Cal Number} \times \frac{P}{V}$$

Example: Channel A Old Cal Number = 2050

P = 21,240 lb

V = 22,500 lb

Channel A New Cal Number = 2050 X (21,240 / 22,500) = 1935

9. To determine the Calibration Number for Channel B refer to the formulas shown below. **Note:** The Calibration Number for Channel B is different for a four load cell system and a six load cell system.

4 Load Cell System:

The Cal Number for Channel B should always equal the Cal Number for Channel A.

Channel B New Cal Number = Channel A New Cal Number

(Example: Channel B New Cal Number = 1935)

6 Load Cell System:

The Cal Number for Channel B should always be 1.85 times the Cal Number for Channel A.

Channel B New Cal Number = Channel A New Cal Number X 1.85

(Example: Channel B New Cal Number = 1935 X 1.85 = 3580)

11. Record the new Cal Numbers below. To enter the new Cal Numbers, refer to the "Procedure for Entering Starting Cal Numbers" (Section 4.2 - Net Payload Weight or Section 4.3 - Gross Vehicle Weight).

Channel A New Cal Number _____

Channel B New Cal Number _____

Example: Channel A New Cal Number = 1935

Channel B New Cal Number = 1935 (4 load cell system)

Channel B New Cal Number = 3580 (6 load cell system)

CHAPTER 5.0

MAINTENANCE

In order to keep any system functioning properly, it is important that the system be properly maintained. This includes daily vehicle inspections and preventive maintenance.

5.1 DRIVER'S DAILY VEHICLE INSPECTION

1. Check load cells, mounting brackets, and fasteners. Make sure they are secure.

2. If torque stripes have been applied, make sure they are properly aligned.
   To apply a torque stripe: Use a durable, brightly colored paint. Paint a stripe crossing the head of the fastener, continuing down the fastened structure, as shown.

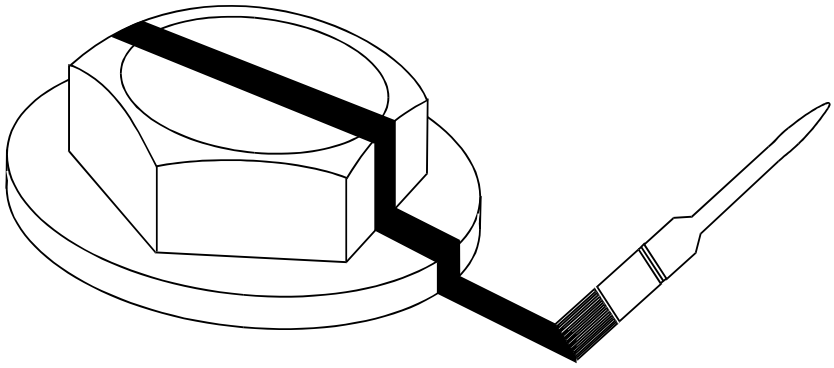


Figure 5-A: Painting a Torque Stripe

3. Check and remove any build up of mud, ice, or other debris that may obstruct the load cell load path. Refer to the drawing below and **Section A** in Figures 5-C through 5-H.

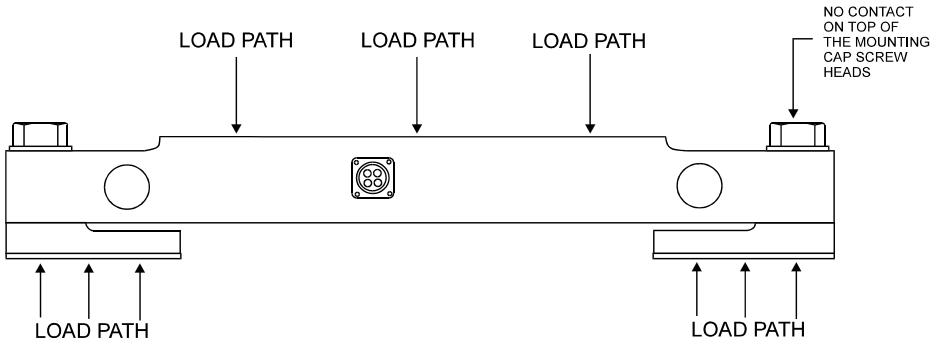


Figure 5-B: Load Path Diagram

4. Check the meter mounting and wiring, make sure they are secure.

5. Check the green plug attached to the back of the meter. Make sure it is secure.

6. Check the system. Make sure the meter powers up after it has been turned on, digits are legible, and the system functions normally.

7. Check all wiring for condition (no cracks or splits), security, chaffing, and protection from possible damage.

8. Fixed body trucks: Make sure springs are intact and bolt locks are in place.

9. Tipper type trucks: Check the bearing pads. Make sure they are not worn out and properly aligned and greased. Make sure bolt locks are in place, hinge pins are not bent, and body guides are intact.

5.2 PREVENTIVE MAINTENANCE ANDVULCAN TORQUE SPECIFICATIONS

The following simple but important preventive maintenance steps should be performed periodically after 500 miles, monthly afterwards, or more frequently if needed.

1. Look for mud, ice buildup, or other debris between the load cell and bracket. Refer to **location A** shown on Figures 5-C through 5-H.

2. Check load cell connectors (refer to **location B** shown on Figures 5-C through 5-F), make sure they are finger tight plus an additional 1/8 of a turn with channel lock pliers. The additional tightening is necessary to prevent scale errors which can occur from moisture entering into the load cell connector. **Do not** grease or lubricate inside the Vulcan load cell connector or Vulcoder connector. These components are highly sensitive to foreign substances and inaccurate readings will occur if these components are contaminated. **Your manufacturer's warranty does not cover the failure of Vulcan components due to contamination (use of grease or other conductive substance) in either the Vulcan load cell connectors or Vulcoder connectors.** If a connector is opened for any reason, you must clean the load cell connector and cable connector with cotton swabs and isopropyl alcohol, dry with a hair dryer **(DO NOT OVERHEAT)**, and replace the O-ring before reconnecting.

3. Check the torque on load cell cap screws monthly. New trucks should be checked once a week for 2 weeks. Vulcan On-Board Scales recommended torque values are shown on Figures 5-C through 5-H and on the following page. As a method of monitoring changes in fastener torque, Vulcan On-Board Scales recommends applying torque stripes to all fasteners (see Section 5.1, step 2).

Torque Specifications:	3/4"	7/8"	1"	1-1/8"	1-1/4"
lb-ft	400-500	400-590	650-890	1000-1400	1450-1780

4. Vulcan load cells are plated for increased rust protection. Certain minimum maintenance will be necessary to claim warranty of load cells. **Annually,** apply a high quality paint to the load cells, bearing pads, and mounting brackets. For environments where high concentrations of salts are used on road surfaces, undercoating is recommended (3M, Universal Rubberized Undercoating, 3M P/N: 8883). Spray undercoating when load cells are connected to electronics and fully assembled with bearing pads and brackets. See "Vulcan Load Cell Maintenance" document 44-20006-001 for further details.

5. Fill unused holes in load cells with grease to protect against rust. **Never** grease the inside of the connector.

6. Tipper Trucks: Keep bearing surfaces greased preferably with a Moly Disulfide type of grease.

7. Check and grease the rear hinge pin / pillow block assembly.

8. Check welds on upper load cell brackets. **IMPORTANT:** If a weld repair is required, either remove the load cell or do not allow the temperature of the cell to exceed 140 °F or 60 °C. **Excessive heat can damage the strain gages located inside of the load cell.**

9. Check all wiring for condition, routing, and protection.

10. Check meter for secure mounting and strain relief of wires.

11. Check system for functionality.

12. Review and address any driver concerns.

Typical Western Logger Mounting

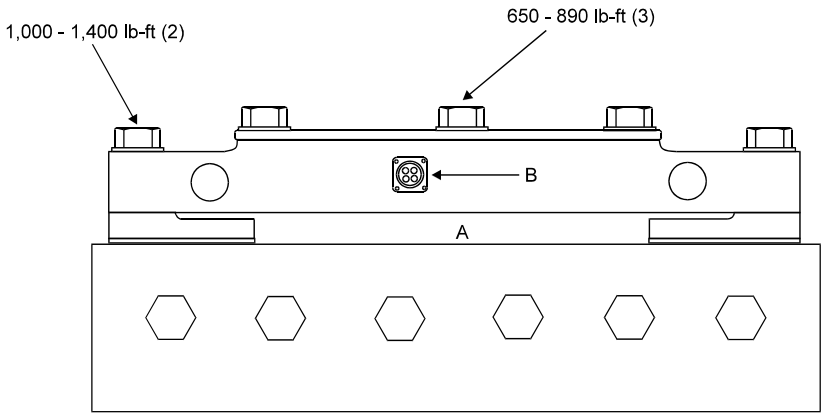


Figure 5-C

Typical Hutch or Transpro Center Hanger Mounting

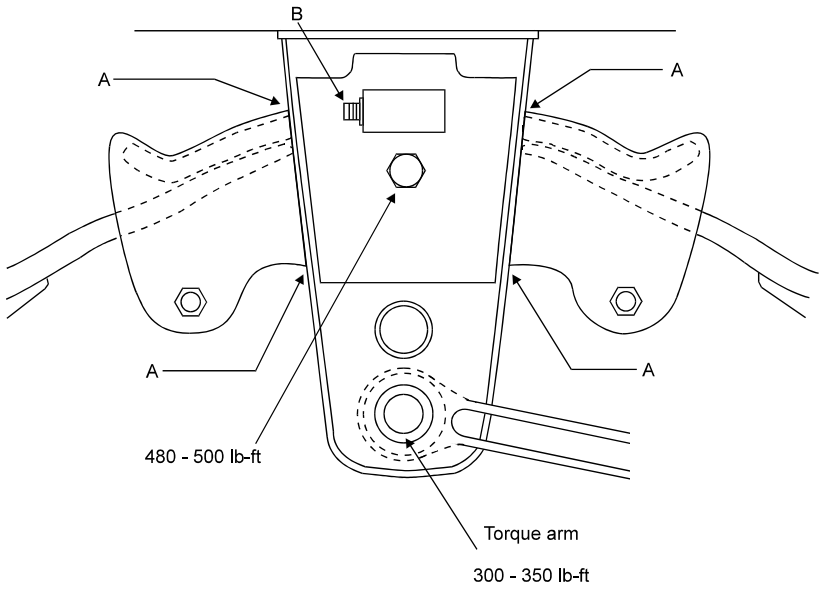


Figure 5-D

Typical Rear Hinge Mounting (Tipping Body)

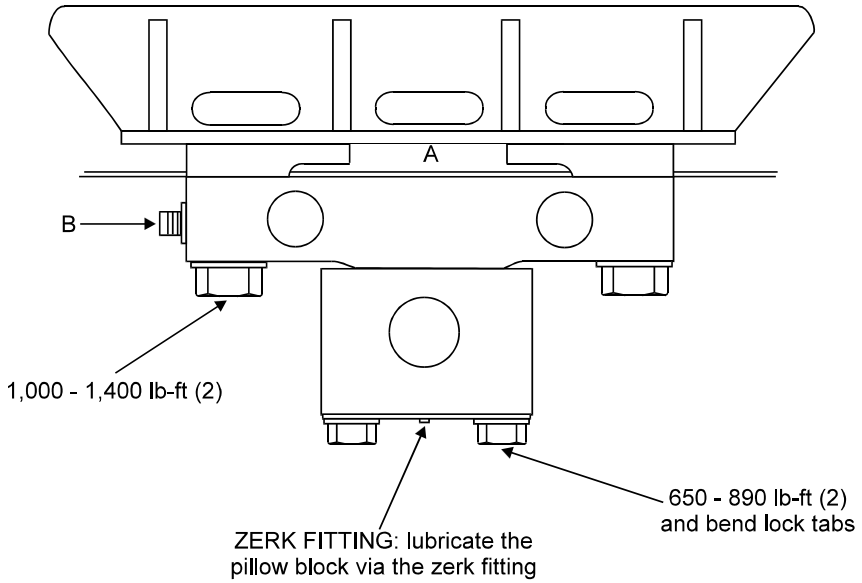


Figure 5-E

Typical Front & Middle Mountings (Tipping Body)

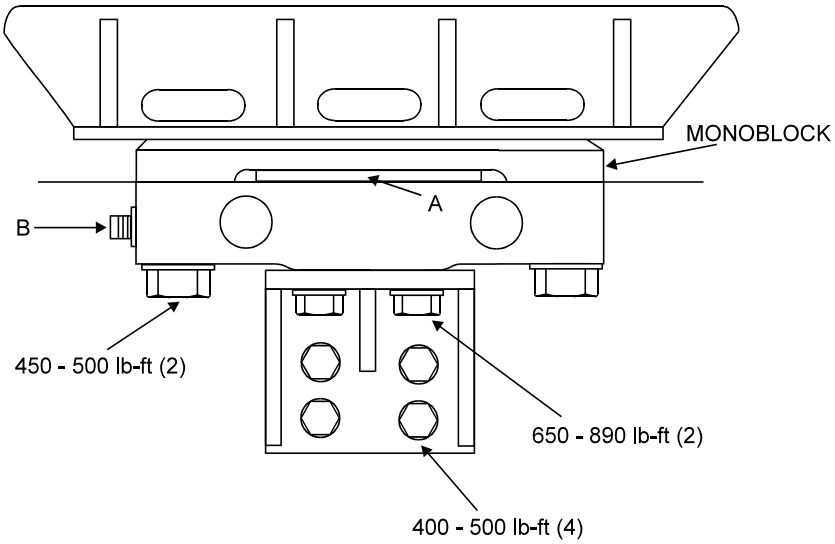


Figure 5-F

Typical Rear Mounting (Fixed Body)

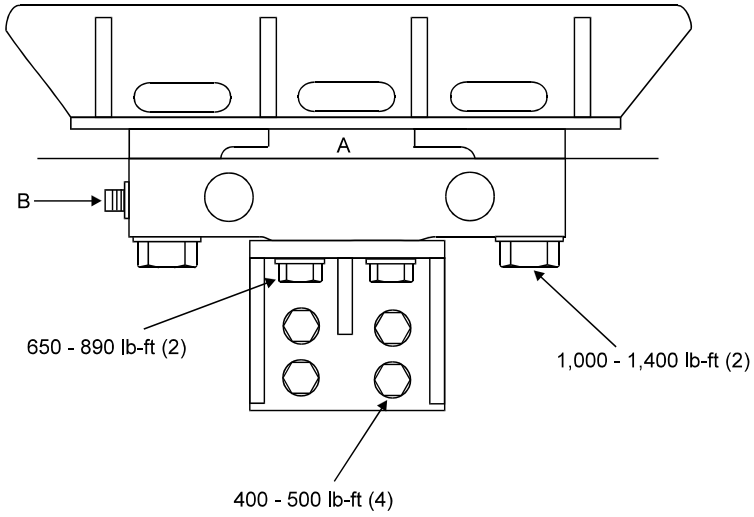


Figure 5-G

Typical Front & Middle Mountings (Fixed Body)

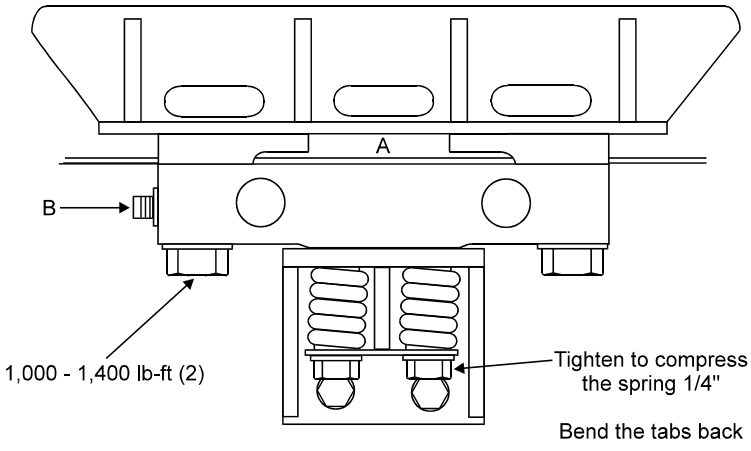


Figure 5-H

CHAPTER 6.0

TROUBLESHOOTING

In general, troubleshooting is a systematic process of testing and eliminating potential problem sources until the one that is causing the problem is found. The problem can then be fixed by repairing or replacing the faulty part.

With a little knowledge, and by following a step by step procedure, most of the problems that you may encounter will be easy to diagnose and cure. In this section, you will find guidelines on how to troubleshoot the system, some characteristics of a properly functioning system, and where to look when certain problems occur.

Occasionally, someone has a problem that is not described here. Don't panic. By approaching the problem systematically, you will be able to eliminate potential sources of trouble until you find the one that is causing the problem.

The following section covers an explanation of Load Cell Evaluation Test Procedures and Vulcan Error Codes. If a problem occurs and no Error Codes appear, use the V400 Meter to isolate the problem to either Channel A or B.

6.1 Vulcan Check-Out Box

The Vulcan Check-Out Box works as an extension to bring connector pins to the side of truck where readings can be conveniently made and it can also simulate an applied load to the Vulcoder. The Check-Out Box is required equipment for the Vulcoder Check-Out Procedure (Section 6.2.4) and is an optional equipment item for the Leakage and Resistance Tests (Section 6.2.1 and 6.2.3).

Before using the Check-Out Box, make sure the meter fuses are good. Use a multi-meter to ensure there is a minimum of 11 Vdc at the back of the meter (make sure the green plug is plugged in and the meter is turned on). If there are any error messages displayed refer to Section 6.3 "V400 Meter Error Codes."

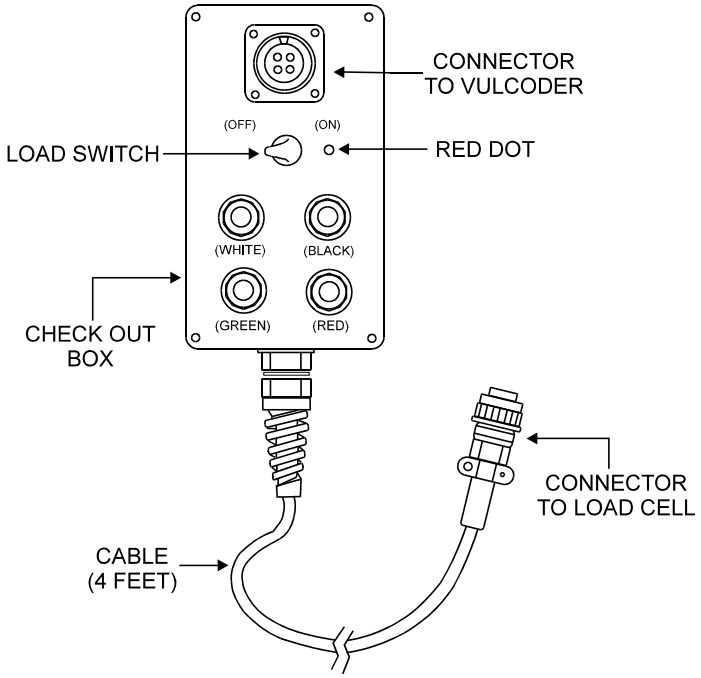


Figure 6-A: Vulcan Check-Out Box

To order a Check-Out Box (P/N: 56-10425-001), contact your Vulcan dealer.

6.2 LOAD CELL EVALUATION TESTS

The tests listed below will help identify and locate any problem you may encounter with your Vulcan Scale System.

Leakage Test
Tare Test
Resistance Test
Vulcoder Check-Out Test

6.2.1 LEAKAGE TEST PROCEDURE

Required Equipment: **Multi-meter**
Isopropyl Alcohol
Cotton Swabs
Hair Dryer
Optional Equipment: **Vulcan Check-Out Box**

The Leakage Test Procedure detects the presence of moisture that could cause erratic meter readings. The way to measure leakage is to use a digital multi-meter that has a conductivity scale. Electrical Isolation is measured between any pin and an unpainted clean surface on the load cell or the connector body. Electrical isolation should not exceed 2.0 nS (nano-siemans) or be less than 500 Meg Ohms.

Refer to Figure 6-B for the Leakage Test equipment set-up. If a Vulcan Check-Out Box is used, it is important that the Vulcoder leads from the load cells of the channel being tested are disconnected. For proper operation, the power and signal leads from the load cell must have a very high resistance to the load cell body. An electrical path between the wires and the body would indicate moisture in the cell or shorting to the body. This would result in erratic, fluctuating, or even out of range weight displays.
If the load cell fails (electrical isolation is greater than 2.0 nS or is less that 500 Meg Ohms), check the inside of the load cell connector with a dry cotton swab to make sure it is clean and dry. If not, clean with isopropyl alcohol, dry with a hair dryer, and check the electrical isolation again.

If the load cell cannot be brought to Vulcan specifications, contact your Vulcan dealer.

Caution: Do not touch the probes with your hands when making measurements. This could cause an error in the meter reading. A person's body can have 10 times the allowable conductivity of a load cell.

OR

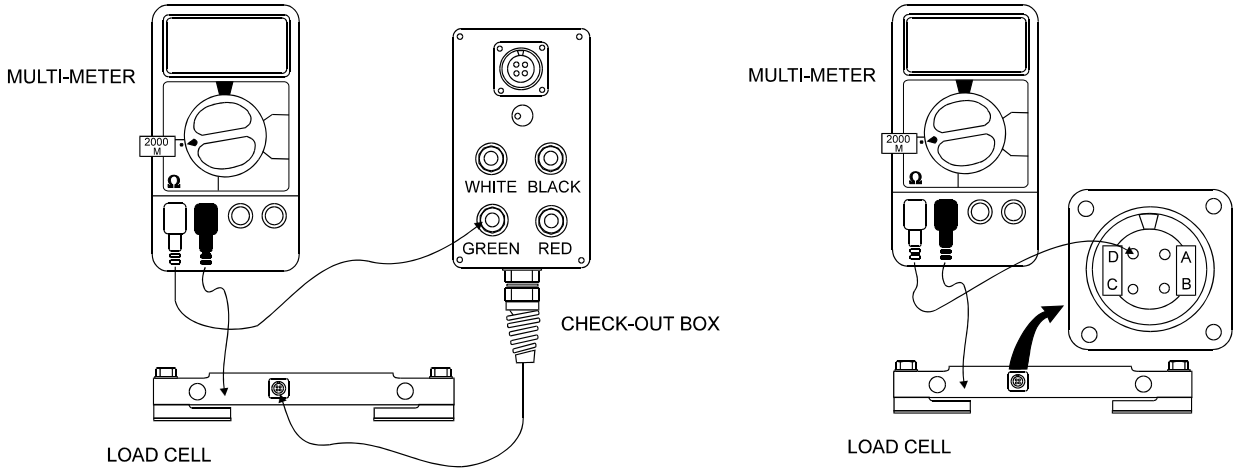


Figure 6-B: Leakage Test

Leakage Test Specifications:

Measured between any pin and an unpainted clean surface of the load cell or connector body. Electrical Isolation should not be greater than 2.0 nS or less than 500 Meg Ohms.

6.2.2 TARE TEST PROCEDURE

Required Equipment: **Vulcan V400 Meter**
Isopropyl Alcohol
Cotton Swabs
O-Rings
Hair Dryer
Channel Lock Pliers

Checks each load cell for a high Preload Number caused by mechanical damage or moisture.

1. Park the empty truck on level ground.

2. Use the **Cycle** button to lock the meter on Channel A or B where the load cells will be tested.

3. Press the **Tare** button. Record the Tare Weight.

   Current Tare Weight _____

4. Disconnect all load cells from the Vulcoder of the channel to be tested.

5. Press the **Tare** button. Use the **Up** / **Down Arrow** buttons to change the display to read zero.

6. Press and hold the **Cal** button. Write down the current Cal Number.

   Current Cal Number _____

   Then change the Cal Number using the **Up** and **Down Arrow** buttons to display 2050.

7. Clean and re-connect each load cell to the Vulcoder one at a time. The meter will display the load cell Preload Number. The Preload Number should not exceed +17,000 lb to -12,000 lb.

If the Preload Number exceeds +17,000 lb to -12,000 lb, proceed with steps 7a - 7e.

a) Clean the load cell connector and cable connector with cotton swabs and isopropyl alcohol.
b) Dry thoroughly with a hair dryer. DO NOT OVERHEAT.
c) Check the electrical isolation by performing the Leakage Test (Refer to Section 6.2.1)
d) If a Vulcan Check-Out Box is available, perform the Vulcoder Check-Out Test. (Refer to Section 6.2.4)
e) Check the Preload Number again to see if it is within the +17,000 lb to - 12,000 lb range. If the load cell is still out of range, it may be faulty. Perform the Resistance Test. (Refer to Section 6.2.3)
f) Replace the O-rings before re-connecting.

8. Measure the Preload Number of the remaining load cells one at a time.

9. Reset the original Cal Number and Tare Weight.

If the load cell cannot be brought to Vulcan specifications, contact your Vulcan dealer.

6.2.3 RESISTANCE TEST PROCEDURE

Required Equipment: **Multi-meter**

Optional Equipment: **Vulcan Check-Out Box**

Please refer to drawing below in setting up the Resistance Test. The resistance in the pins should correspond to the Vulcan specifications listed below. This test can be conducted with a multi-meter or a Vulcan Check-Out Box. Refer to acceptable resistance ranges as shown below.

OR

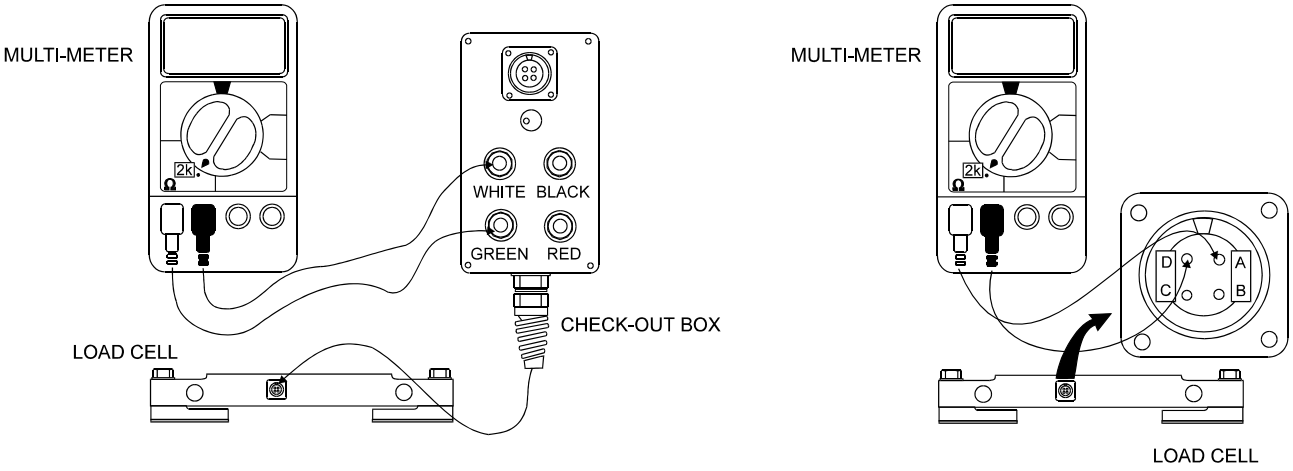


Figure 6-C Resistance Test

Pins	Terminal Color Code	Acceptable Resistance Range
A to D	Red to Black	349 to 400 Ohms
B to C	Green to White	349 to 352 Ohms
Note: For Center Hanger Load Cells, Red to Black		349 to 450 Ohms

Pin B (Green) to Pin A (Red) should be the same number as Pin B (Green) to Pin D (Black) within 1 Ohm.

Pin C (White) to Pin A (Red) should be the same number as Pin C (White) to Pin D (Black) within 1 Ohm.

If the load cell cannot be brought to Vulcan specifications, contact your Vulcan dealer.

6.2.4 VULCODER CHECK-OUT PROCEDURE

Required Equipment: **Vulcan V400 Meter**
Vulcan Check-Out Box

Using the **Cycle** button, lock the meter on the Channel that the Vulcoder will be tested on either Channel A or B. Set the Calibration Number to 2050 on the channel being tested. Set the Tare Number for that channel to zero using the following procedure. Disconnect all load cells from Vulcoder on the channel being tested. Depress the **Tare** button and use the **Up** and **Down Arrow** buttons to make the display read zero. The display must read zero while the **Tare** button is depressed. Release the **Tare** button.

With all load cells disconnected on the channel being tested, plug a Vulcoder lead into the Check-Out Box (load switch "OFF"). The meter display should read zero (+/- 200 lb). If it does not, the Tare Number is not zeroed or the cabling is damaged. Move the load switch to "ON" indicted by the red dot. The V400 meter should display 33,200 lb (+/- 200 lb). Check all leads, if any Vulcoder lead does not perform as stated above, the black Vulcoder cable is damaged and must be inspected and repaired. If all Vulcoder leads do not perform as stated above, all have been damaged or the Vulcoder needs to be replaced. Contact your Vulcan dealer for repair or replacement of damaged Vulcoder lead.

6.3 V400 METER ERROR CODES

The V400 Meter is equipped with a self diagnostic program. Should a malfunction occur, the meter will display an error code. This error code can be used to isolate and identify a problem with the Vulcan Scale System. If an error code is displayed on the screen while the meter is locked on Channel A+B, use the **Cycle** button to isolate the problem to either Channel A or Channel B.

Listed below are the error code definitions, possible causes, and procedures to correct the system malfunction.

6.3.1 Err 1

Indicates that the Vulcoder is processing an over-ranged signal. An over-ranged signal means that the load cell output is greater than the maximum that the Vulcoder will accept. Err 1 is displayed briefly when the meter is first turned on and clears after the meter and Vulcoder get in synch.

Possible Causes:

1. The load cells are being over-loaded.
2. There is moisture in a load cell connector.
3. One of the Vulcoder-to-load cell cables has been damaged.
4. A load cell is faulty.
5. A load cell has a large Preload Number.

What to Do:

1. Check and verify that the Cal Number is reasonable. Refer to Section 7.1 “Starting Calibration Numbers.”

2. Perform Tare Test (refer to Section 6.2.2).

3. Check the load cells. Check by disconnecting one load cell at a time. When the faulty load cell has been disconnected, the meter will read a number instead of the error code.

4. Check mounting of the load cell per Section 5.2 “Preventative Maintenance and Vulcan Torque Specifications” Figures 5-C to 5-H.

6.3.2 Err 2

Indicates that the reading to be displayed is beyond the limitations of the meter’s display.

Possible Causes:

1. Cal Number set too high.
2. Tare Weight set too high.

What to Do:

1. Check and reset Cal Numbers and Tare Weight.

6.3.3 Err 3

Indicates that the meter is not receiving a signal from the Vulcoder.

Possible Causes:

1. There is usually an open circuit between the meter and Vulcoder. This is the most common reason.
2. Disconnected or broken green or white Vulcoder wires between the back of the meter and the Vulcoder.
3. Faulty Vulcoder or meter.
4. Faulty load cell.
5. Moisture in the load cell connectors.

What to Do:

1. Check the wires in the green plug at the back of the meter and ensure that they are firmly in place. Unplug and plug the connector back in the meter to check for proper connection.

2. Check the voltage at the back of the meter and Vulcoder. Make sure the voltages match the required voltages in Section 7.3 “System Specifications”.

3. Check the orange cable for broken wires.

4. Check the voltage at the load cell connector. Refer to the required load cell voltages in Section 7.3 “System Specifications”. Repair or replace the Vulcoder as necessary.

5. Disconnect one load cell and then the other to see if this clears the error code. If the error code is cleared, the load cell may be faulty. Conduct all three load cell tests Leakage, Tare, and Resistance (refer to Sections 6.2.1 through 6.2.3).

6. Replace the O-rings, clean the connector with isopropyl alcohol, and dry with a hair dryer. Reconnect the load cells.

6.3.4 Err 4

Same as Err 2.

6.3.5 Err P (V400 METER VERSIONS P8-02 AND HIGHER SOFT WARE)

"Err P" Indicates that the meter has had a system reset and will display "Err P" for 10 seconds, then operate properly.

Possible Causes:

1. The software fault detector has detected an interruption in software processing This is usually caused by a voltage spike or very short interruption in power.

What to do:

1. On some trucks "Err P" will occur occasionally. If this type of reset occurs frequently or constantly, check and clean the power connections and fuses. If this doesn't cure the problem then the power cord must be connected directly to the battery.

6.4 SYSTEM MALFUNCTIONS

6.4.1 CONDITION: No Indicator Display Or Function Lights.

Possible Causes:

1. **Power** switch turned off.
2. Power to the meter has been disconnected.
3. Bad meter cable connections to the battery.
4. Battery is low (under 11 Volts).
5. A fuse is blown in the power or ground cable.
6. Meter's internal circuit breaker is blown.
7. Faulty power switch.
8. Faulty meter.
9. Reversed polarity.

What to Do:

1. Check the power to the meter. When the meter is turned on and off, the power should not change more than 1/2 Volt. Turn off the meter either by the key or truck battery switch for a few seconds and then turn on again. If the meter still does not work, proceed to step 2.

2. Check the fuses for both negative and positive leads. Use 3 amp quick blow fuses only.

3. Check that the power supply wires are attached correctly at the 12 Volt power source and to the green connector at the back of the meter. Check the battery connections for corrosion.

4. If a spare meter is available, the quickest and easiest next step is to exchange the meter. If the new meter works, try the old meter again. If the old meter now works, the problem was likely the meter's internal circuit breaker. If both the old meter and the new meter do not work, the

problem is most likely in the power source (battery, meter power cable, or fuses). If the new meter works, but the old one doesn't, the old meter is faulty.

If you do not have a spare meter, disconnect then reconnect, the green power plug on the back of the meter. If the meter doesn't work, then check the power source (battery, meter power cable, or fuses). If the power sources check out, then the meter is faulty.

6.4.2 CONDITION: Unable To Enter Tare or Calibration Numbers

Possible Causes:

1. Meter may be in the Driver Lockout mode which does not allow the Tare Weight or the Cal Numbers to be changed without an access code.

2. Faulty meter.

What to Do:

1. Unplug the green connector at the back of the meter for a few seconds, re-plug it in and try to enter the Tare or Cal Numbers again.
2. For meter revision P8-0 and higher, refer to Section 4.1 "Changing Cal Numbers and Tare Weights When the Driver Lockout Feature is Enabled."
3. Faulty meter. Call your Vulcan dealer for meter replacement. The meter contains no user serviceable parts.

6.4.3 CONDITION: Meter Reading Drifts or Wanders With Time

Possible Causes:

1. Voltage to meter or Vulcoder is less than 11 Volts.
2. Voltage out of the Vulcoder is less than the Voltage Output Required as stated in Section 7.3 "System Specifications."
3. Moisture in a load cell connector.
4. Damaged cable between Vulcoder and load cell.
5. Bad connection on green connector or broken wire or cable between meter and the Vulcoder.
6. Faulty load cell.

What to Do:

1. Using a voltmeter, check the voltage at the back of the meter. Refer to the required meter voltages in Section 7.3 "System Specifications."

2. Check the black 4-wire cabling between the load cells and the Vulcoder. If the cabling is damaged, contact your Vulcan dealer for Vulcoder repair.

3. Measure the voltage between pins A and D of the Vulcoder connector. If it measures less than 5 Volts make sure the Vulcoder cable is securely attached to the meter green plug and the length of the orange cable from the Vulcoder to the meter isn't longer than 100 ft. Also check any truck / trailer connectors in the Vulcoder signal cable.

4. Before proceeding, clean the load cell connector and cable connector with isopropyl alcohol and cotton swabs, then dry with a hair dryer. **Do not overheat**. Reconnect and operate system for one day to see if the problem is fixed. If the problem is not fixed, continue to step 5.

5. **If two load cells are connected per Vulcoder, follow the step 5a and 5b.**

    a. Disconnect the cable to the right load cell. Watch the meter display the number for a period of 5 minutes. If it wanders more than 200 lb (100 kg), make a note of it. Then clean and reconnect the right load cell.

    b. Disconnect the cable to the left load cell. Watch the meter display the number for period of 5 minutes. If it wanders more than 200 lb (100 kg), make a note of it. Then clean and reconnect the left load cell.

If any one of the load cells wanders more than 200 lb (100 kg), perform the Leakage and Resistance tests (refer to Section 6.2.1 and 6.2.3). If both of the load cells wanders more than 200 lb (100 kg), then the Vulcoder is faulty and needs to be checked (refer to Section 6.2.4 "Vulcoder Check-Out Procedure").

If four load cells are connected per Vulcoder, follow step 5c and 5d.

c. For Vulcoders with 4 load cells, disconnect the cables to all the load cells except the right front load cell. Watch the meter display a number for a period of 5 minutes. If it wanders more than 200 lb (100 kg), make a note of it.

d. Disconnect right front load cell and reconnect right rear load cell. Watch the meter display for 5 minutes. If it wanders more than 200 lb (100 kg), make a note of it.

c. Disconnect the right rear load cell and reconnect the left rear load cell. Watch the meter display for 5 minutes. If it wanders more than 200 lb (100 kg), make a note of it.

d. Disconnect the left rear load cell and reconnect the left front load cell. Watch the meter display for 5 minutes. If it wanders more than 200 lb (100 kg), make a note of it.

If any one of the load cells wanders more than 200 lb (100 kg), perform the Leakage and Resistance tests (refer to Sections 6.2.1 and 6.2.3). If all of the load cells wanders more than 200 lb (100 kg) then the Vulcoder is faulty and needs to be checked (refer to Section 6.2.4 "Vulcoder Check-Out Procedure").

6.4.4 CONDITION: Meter Reading Does Not Change When Truck is Being Loaded

Possible Causes:

1. Voltage to meter is below 11 Volts.
2. Mud or ice build-up under the load cells.
3. Calibration Number on the meter is set too low.
4. Faulty load cell.
5. Broken wire or bad connection between the load cell and Vulcoder.
6. Meter display is locked.

What to Do:

1. Using a voltmeter, check the power at the meter's green plug at the back of the meter. Refer to Section 7.3 "System Specifications." If the voltage is below 11 Vdc, the problem could be in the power source (battery, meter power cable, and / or fuses).

2. Reset the computer by unplugging the green connection on the back of the meter for a few seconds.

3. Refer to Section 7.1 "Starting Calibration Numbers", to verify that the Cal Number is reasonable.

4. Check the black cables between the load cells and the Vulcoder. If the cabling is damaged the Vulcoder needs to be repaired or replaced. Contact your Vulcan dealer.
5. Perform the Leakage, Tare, and Resistance Tests (refer to Sections 6.2.1 through 6.2.3).

6.4.5 CONDITION: Meter Restarts In Middle Of Operation And Will Display Normal Power-Up Operating Sequence.

Possible Causes:

1. An interruption on the power lines.

What to Do:

1. The power connections and fuses must be inspected and cleaned.
2. The power cord must connect directly to the batteries.

6.5 TROUBLESHOOTING WORKSHEET

Briefly describe your problem:

_____

_____

Do you have Vulcan electronics? If not, whose? _____

Do you have all Vulcan load cells? _____

If not, whose Channel A load cells? _____

If not, whose Channel B load cells? _____

HISTORY

Were the scales put on a new vehicle or were they retrofitted? _____

How long have you had this system? _____

Has the system ever worked? _____

How long has the current driver been using the vehicle? _____

Has there been any mechanical work or maintenance done to the vehicle, changed bridge beam, bunk, etc.? _____

Has there been any electrical work or maintenance done to the vehicle, battery work, generator / alternator problems, added accessories, jump start? _____

Has there been any recent maintenance of the scale system, parts exchanged, etc.? _____

Has anything else happened to the rig such as an accident? _____

SYMPTOMS

Does the problem occur on Channel A or B, or both? _____

Does the meter drift up and / or down, fast or slow, or both? _____

Is the problem intermittent, constant, or both? _____

Does problem occur on flat road or off-road or both?
Does it occur in wet or dry weather or both? _____

Does it occur at morning, at night, or both? _____

Does it occur when empty, loaded, or both? _____

INSPECTION

Has the same platform scale been used to check scale accuracy? _____

Is the power cable connected directly to the battery? _____

Have you checked fuses in both power and ground wires? _____

Are you using Vulcan yellow fuse holders? _____

Are you using Vulcan orange cable or trailer light cable? _____

Is there mud or ice build-up between the load cell pads and vehicle frame? _____

Is there any contact on top of the load cell mounting cap screw heads? _____

6.6 TROUBLESHOOTING ASSISTANCE AND REPLACEMENT PARTS

If you need additional assistance, parts, or service, give us a call at:

VULCAN CUSTOMER SERVICE

1-800-237-0022

HOURS:
7:30 a.m. - 5:00 p.m.
PACIFIC TIME

CHAPTER 7.0

APPENDIX

7.1 STARTING CALIBRATION NUMBERS

LOAD CELL		VULCODER		
	STOCK NO.	V08 (2LC)	V13,V14 (4LC)	V15 (6LC)
15" SHEAR BEAM 58-10411-002 58-10411-001	L01, L02	2050	3792	5514
17" SHEAR BEAM SINGLE POINT 58-10446-001	L03	2050	3792	5514
26" SHEAR BEAM 58-10188-002 58-10188-004 58-10188-005	L08,L09,L10	2050	3792	5514
26" SHEAR BEAM HEAVY DUTY 58-10325-002	L11	3075	5688	8271
22" SHEAR BEAM LSR 58-10460-002 59-20500-001	L06, L07	2100	3885	5649
CENTER HANGER 58-10408-002 58-10408-001 58-10408-003	L12,L13,L14	1950	3607	5245
FIFTH WHEEL 58-10386-001 58-10386-003 58-10386-005	L04,L05,L16	2050	N/A	N/A

NOTES:

1 - Final Cal Number should be within +/- 200 counts of Starting Cal Number.
If not, troubleshoot the system for possible mechanical or electrical problem.

2 - Vulcoder Stock No. V09 (designed for 7-Pin Connectors) use Cal Number 5514.

7.2 FINE TUNING YOUR SCALE SYSTEM
(For refuse applications only)

1. Using the **Cycle** button lock the meter on Channel A+B and be sure that "TARE" is not flashing.

2. Fine tuning: Complete a row of information each time using the same certified scale. Do this six times filling in rows 1 through 6.

   Channel A Cal Number = 2050
   Channel B Cal Number = 2050 for a 4 cell system or
   3792 for a 6 cell system.

		Truck Fully Loaded		Truck Empty	
No.	Date	Meter Display	Platform	Meter Display	Platform
1					
2					
3					
4					
5					
6					

3. When you have entered six certified scale weights, call Vulcan Customer Service at 1-800-237-0022 to determine your fine tuned Cal numbers. Enter the new Cal numbers in the meter.

   Channel A New Cal Number = _____
   Channel B New Cal Number = _____

4. Confirmation: Complete a row of information for six more certified scale weights.

		Truck Fully Loaded		Truck Empty	
No.	Date	Meter Display	Platform	Meter Display	Platform
7					
8					
9					
10					
11					
12					

5. Call Vulcan Customer Service again at 1-800-237-0022 to confirm the system calibration.

Final Calibration Channel A Cal Number = _____

Final Calibration Channel B Cal Number = _____

Final Calibration Numbers set _____ (Date)

7.3 SYSTEM SPECIFICATIONS

Load Cells

Electrical:	350 Ohms nominal impedance.
Connector:	4 pin bulkhead, military type.
Voltage Required:	4.9 to 5.1 Vdc.
Material:	High grade alloy steel.
Operating Temp:	-40 to +140 degrees F.
System Accuracy:	Typical error less than 1% Full Scale of actual weight for operating temperature range and normal loading conditions.

Vulcoder

Environment:	Environmentally sealed electronics.
Operating Temp.:	-40 to 180 degrees F.
4-Wire Cable, Black:	Custom, shielded, 4 conductor, polyurethane jacketed with drain wire, 5 ft. lengths (standard).
2-Wire Cable, Orange:	Custom polyurethane jacketed (industrial strength extension cord, can be used in a pinch), 45 ft length.
Connectors:	4 pin, military type.
Voltage Input Required:	11.0 to 16.0 Vdc.
Voltage Output Required:	4.9 to 5.1 Vdc.
Signal Input Range:	-1.5 to 3 mV/V.

Meter

Display:	Automatically backlit liquid crystal display.
Cycle Speed:	Variable cycle speed, 1 - 9 seconds.
Graduation:	10 / 100 lb increments in lb mode, 10 / 50 kg in kg mode.
Display Range:	-99,900 to 124,500 lb or kg.
Voltage Required:	11.0 to 16.0 Vdc Across Red and Black (Positive and Negative). 11.0 to 14.0 Vdc Across Green and White (Channel A). 11.0 to 14.0 Vdc Across Green and White (Channel B).
Current Draw:	160 mA to 400 mA.
Protection:	Internal, reverse polarity and external, 3 amp quick blow fuses.
Hookup:	Screw type, quick release terminal block on rear panel.
Operating Temp:	20 to 160 degrees F.
Weight:	17 oz. (including bracket).
Installation:	Power cables, fuses, mounting bracket and thumb screws provided.
Serial Output:	RS-232 output available, contact factory for specifications.

NOTES