

V200 SERVICE MANUAL

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CHAPTER 1.0

VULCAN V200 ON-BOARD SCALE SYSTEM

Vulcan On-Board Scales are installed on all types of vehicles including, hook lifts, logging trucks, flatbed trailers, chip trailers, and many other commercial vehicles requiring scales. Total truck payload weights and gross vehicle 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.

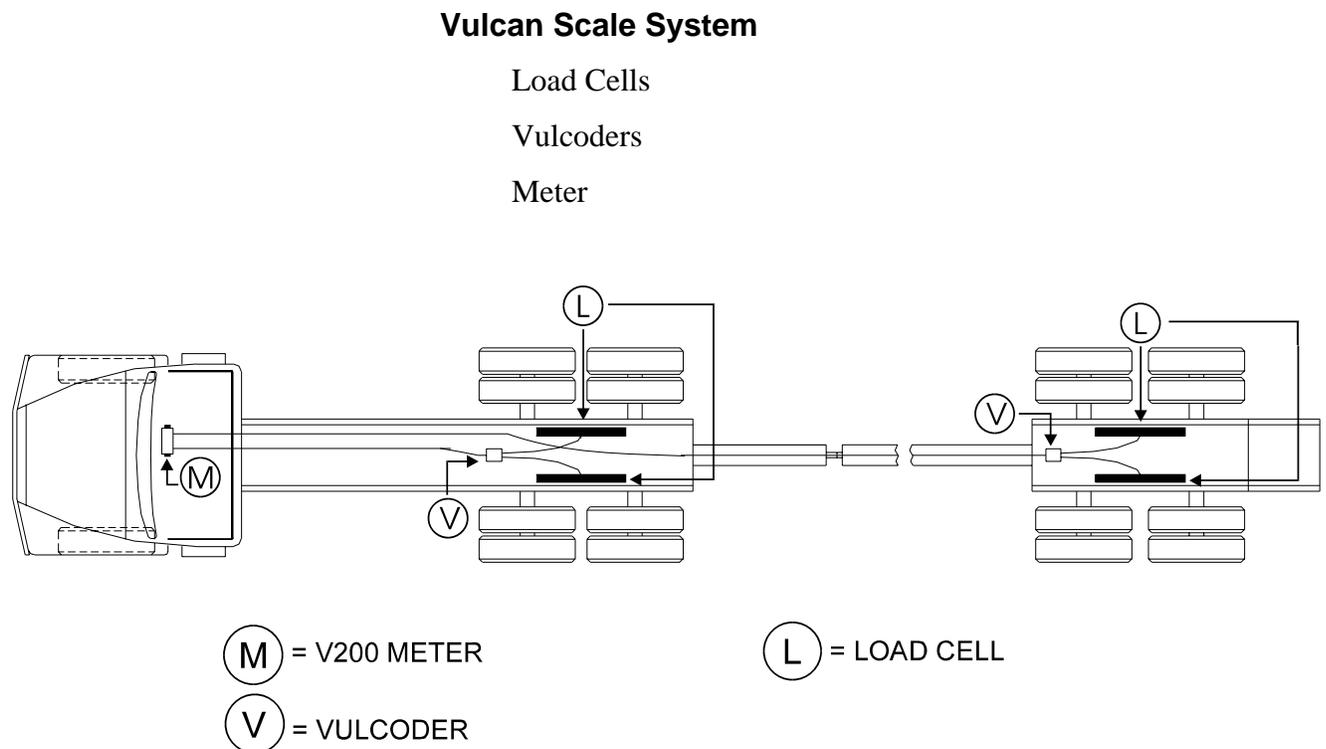


Figure 1-A Typical Long Logger System

1.1 LOAD CELLS

Vulcan load cells and pressure sensors are machined from solid blocks of high strength steel. The Strain gages are bonded inside the load cell or pressure sensor to sense extremely small dimensional changes in the material. A strain gage is a precision electrical resistance element. When force is applied to these sensors, the strain gages stretch or compress, causing a change in output signal voltage.

Example: Vulcan Super - Beam Load Cell

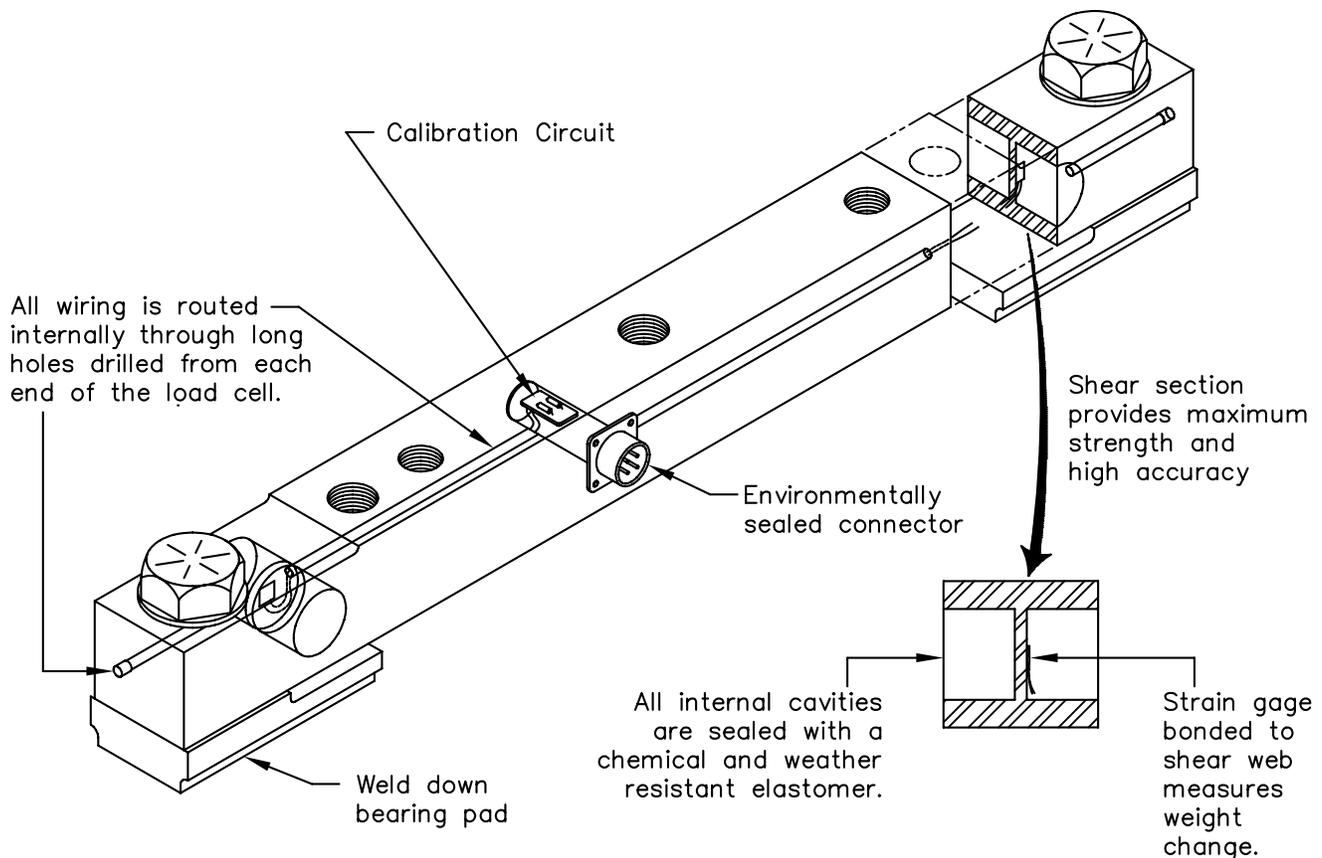


Figure 1-B: Vulcan Super - Beam Load Cell
 (Covered by one or more of the following patents:
 US Patent RE. 35,301, 4,459,863
 Canadian Patent 1,245,677)

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 7.5 Vdc \pm .5 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.

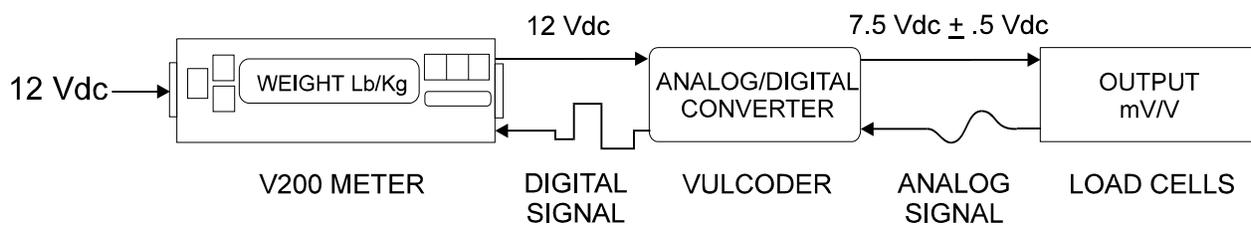


Figure 1-C: Vulcan Electronics Diagram

1.3 METER

The V200 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 V200 meter is shown on the following page together with a description of the meter button functions.

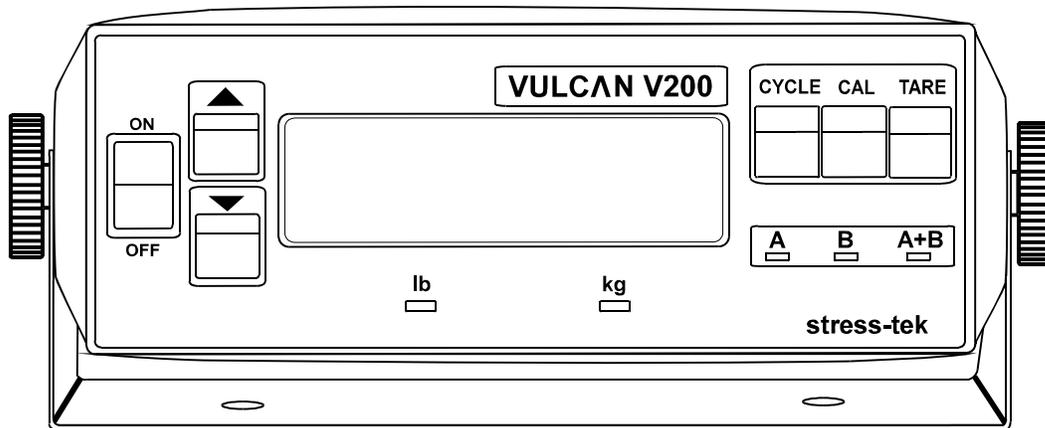


Figure 1-D: V200 Meter

POWER BUTTON:

Turns the meter on and off.

UP/ DOWN ARROW BUTTONS:

Used to increase or decrease the Cal Number and Tare Number.

CYCLE BUTTON:

Used to view the weight on different channels.

CAL BUTTON:

Used to view and adjust the Cal Number for a particular channel.

TARE BUTTON:

Used to view and adjust the Tare Weight for a particular channel.

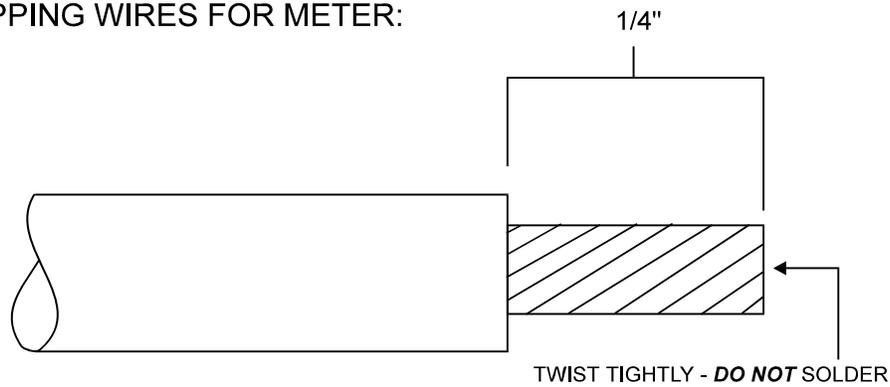
1.4 ELECTRONICS INSTALLATION

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.

STRIPPING WIRES FOR METER:



Be careful that stray wires **DO NOT** contact adjacent terminals

Figure 1-E: Stripping Wires for Meter

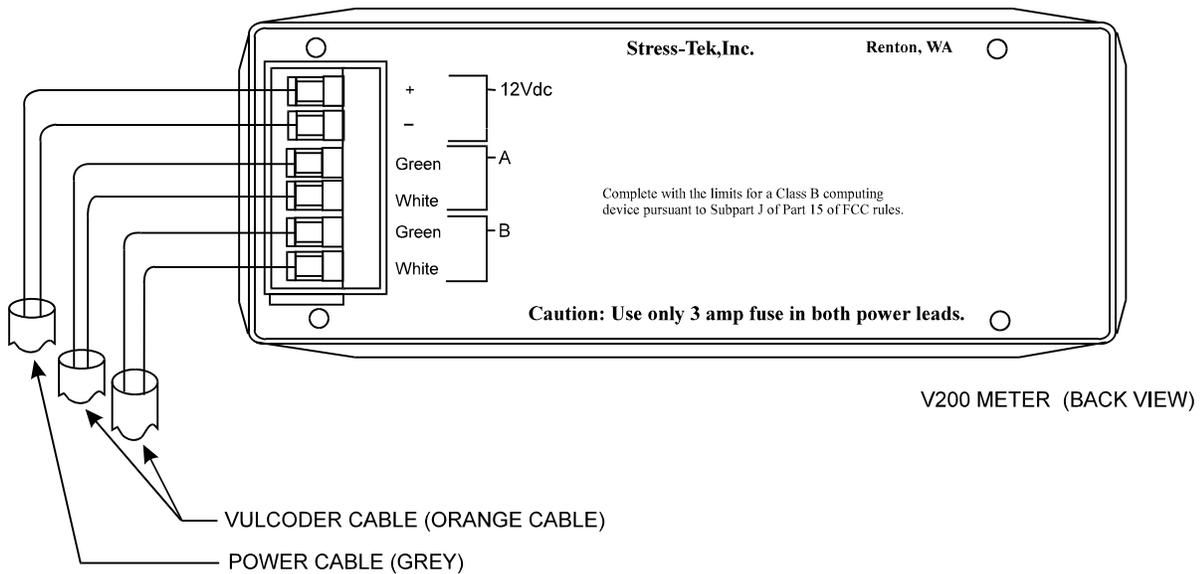


Figure 1-F: Wire Connections to Meter

CHAPTER 2.0

METER OPERATION

2.1 TURNING THE METER ON

This can be done by pressing the **Power** button on the meter.

2.2 LOCKING THE METER ON A PARTICULAR CHANNEL

To lock the meter on a particular channel, press the **Cycle** button until the channel light is displayed. Press the **Cycle** button again, the meter is now locked on a specific channel.

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

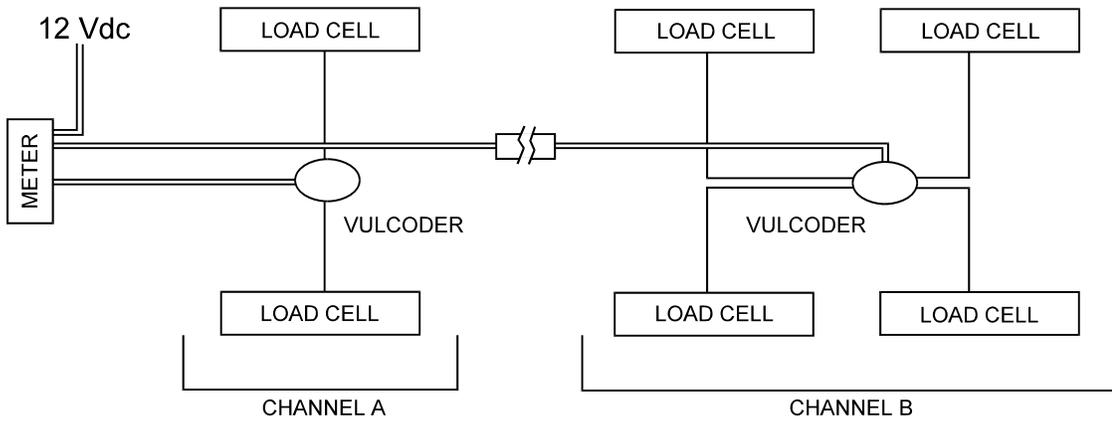
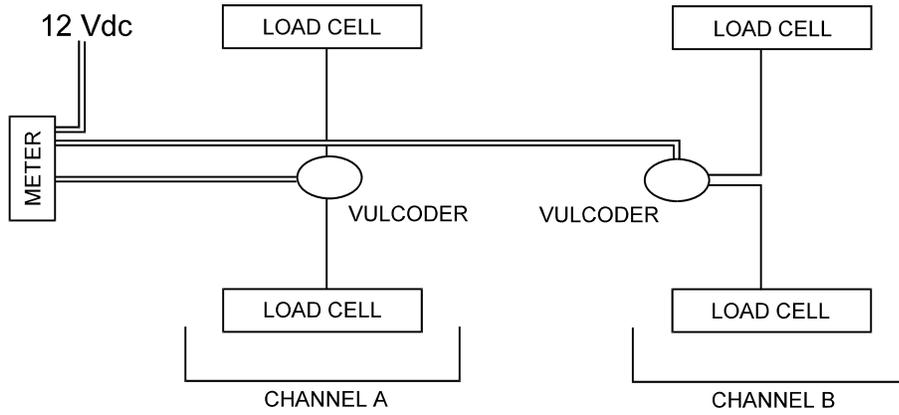
Channel A :	Represents the truck or front load cells, regardless of whether it is a four or a six cell configuration.
Channel B:	Represents the trailer or rear load cells.
Channel A+B:	Represents the total weight from the front and rear load cells.

2.3 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”.

2.4 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”.



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

CHAPTER 3.0

WEIGHT MEASURING METHODS

The Vulcan Scale System can be used to measure weight by two different methods. These methods are Gross Vehicle Weight, and Net Payload Weight.

3.1 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 will display this weight before any payload has been loaded. As the payload increases, the weight displayed on the meter will also increase. The weight displayed on Channel A at all times is the Gross Truck Weight. The weight displayed on Channel B at all times is the Gross Trailer Weight and the weight displayed on Channel A + B is the Total Gross Vehicle Weight (truck and trailer).

3.2 NET PAYLOAD WEIGHT

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

By using the Net Payload Weight method, payload pickups 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.

CHAPTER 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 Gross Vehicle Weight and Net Payload 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 PROCEDURE FOR ENTERING STARTING CALIBRATION NUMBERS

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 **Cal** button to display Cal Number setting. If setting does not match starting Channel A Cal Number in Step 3, correct the Cal Number with the **Up** or **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 does not match starting Channel B Cal Number in Step 3, correct the Cal Number with the **Up** or **Down Arrow** buttons. **Note:** Holding down the **Up** or **Down Arrow** buttons will accelerate the number change.
8. **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.

4.2 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 Empty Truck _____

2. Weigh the entire empty trailer (all axles). This is the trailer's Tare Weight. Enter this number in the space provided.

Tare Weight of Entire Empty Trailer _____

3. Stop the empty truck and trailer on level ground.

4. With the truck empty, lock the meter on Channel A using the **Cycle** button. The displayed weight is the Tare Weight. **Note:** The truck and trailer must not be in a twist or turn.
5. Press and hold the **Tare** button to display Tare Reference Number. Use the **Up** or **Down Arrow** buttons to change the value displayed, so when the **Tare** button is **released**, it matches the Empty Truck weight. **Note:** When **Tare** button is held down the number displayed is not the Tare Weight.
6. Lock the meter on Channel B using the **Cycle** button. The displayed weight is the Tare Weight.
7. Press and hold the **Tare** button to display Tare Reference Number. Use the **Up** or **Down Arrow** buttons to change the value displayed, so when the **Tare** button is **released** it matches the Empty Trailer Weight. **Note:** When **Tare** button is held down the number displayed is not the Tare Weight.
8. **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 during this time will cause the meter to reset and return to a previous setting.

4.3 CALIBRATION PROCEDURE FOR GROSS VEHICLE WEIGHT METHODS

1. Fully load the truck close to the legal limit.
2. Weigh the loaded truck and then the loaded trailer using same certified scale, write them here:
 - a) Channel A Loaded Weight: _____ (Loaded truck)
 - b) Channel B Loaded Weight: _____ (Loaded trailer)
3. Park on level ground.
4. Lock meter on Channel A using the **Cycle** button to display weight. If displayed weight does not match** Channel A Loaded Weight in Step 2, correct as follows:
 - a) Press and hold **Cal** button down to display Cal Number.
 - b) Use the **Up** or **Down** button to increase or decrease the Cal Number until the value displayed when the **Cal** button is released matches Channel A loaded truck weight above.
5. Lock meter on Channel B using the **Cycle** button to display weight. If displayed weight does not match** Channel B Loaded Weight in Step 2, correct as follows:
 - a) Press and hold **Cal** button down to display Cal Number.
 - b) Use the **Up** or **Down** button to increase or decrease the Cal Number until the value displayed when the **Cal** button is released matches Channel B loaded truck weight above.

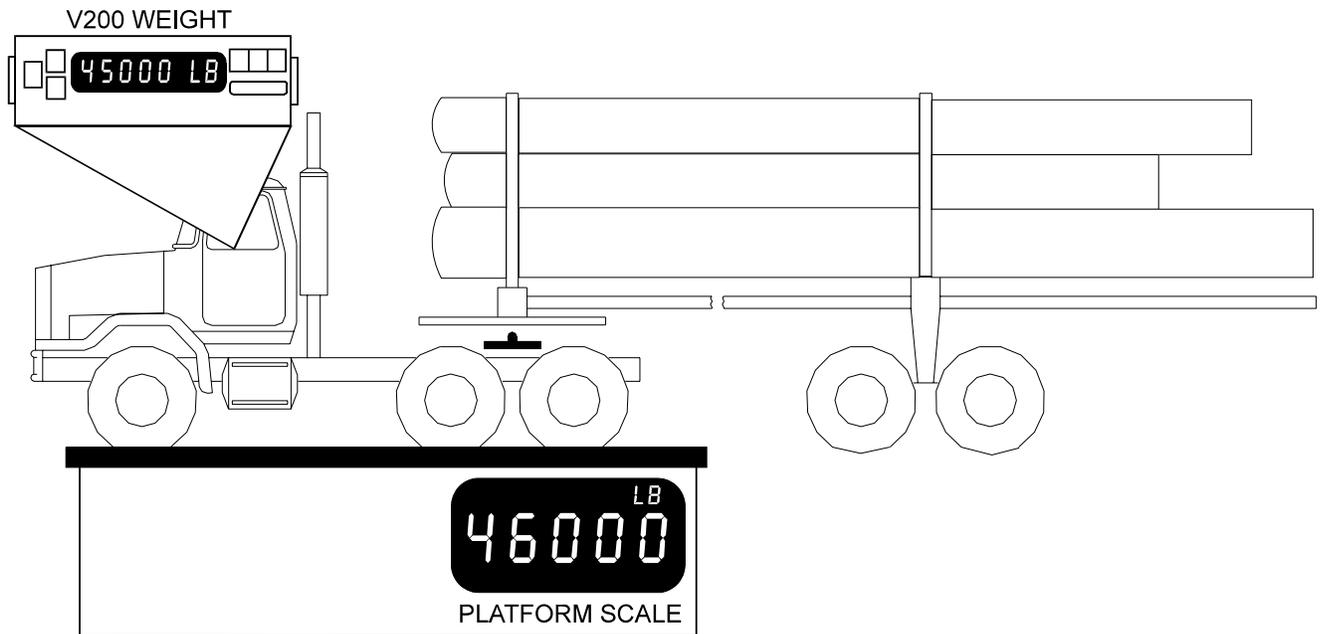


Figure 4-A: Truck Gross Weight (Channel A) in Relation to a Certified Platform Scale

** With in 1% of gross vehicle weight. It is common for operators to calibrate better than 1%.

If additional assistance is needed to fine tune your scale system, please follow the instructions shown in Section 7.3 “Fine Tuning Your Scale System”.

4.4 VERIFYING TARE WEIGHTS

1. Unload truck.
2. Park on level ground.
3. Lock meter on Channel A using the **Cycle** button to display Tare Weight.

If displayed Tare Weight **matches** (+/- 400 lb) Channel A Tare Weight originally set into meter, you have successfully calibrated this channel. Go to Step 4.

If displayed Tare Weight **does not match** (+/- 400 lb) Channel A Tare Weight originally set into meter, continue to fine tune the calibration by repeating the process beginning at Section 4.3.

4. Lock meter on Channel B using the **Cycle** button to display Tare Weight.

If displayed Tare Weight **matches** (+/- 400 lb) Channel B Tare Weight originally set into meter, you have successfully calibrated this channel.

If displayed Tare Weight **does not match** (+/- 100 lb) Channel B Tare Weight originally set into meter, continue to fine tune the calibration by repeating the process beginning at section 4.3.

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

4.5 KEEPING RECORDS

1. Lock meter on Channel A using **Cycle** button.
2. Read displayed Tare Weight shown on meter display, write below.
3. Press and hold the **Cal** button to display Cal Number, write below.
4. Lock meter on Channel B using the **Cycle** button.
5. Read displayed Tare Weight shown on meter display, write below.
6. Press and hold **Cal** button to display Cal Number, write below.

CALIBRATION NUMBERS - QUICK REFERENCE

Channel A Tare Number: _____

Final Channel A Cal Number: _____

Channel B Tare Number: _____

Final Channel B Cal Number: _____

Most Important:

- Adjust the Tare Number only when **empty**.
- Adjust the Cal Number only when **loaded**.

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.

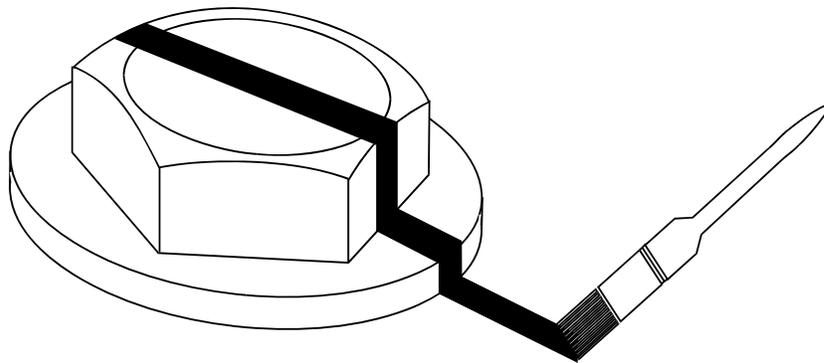


Figure 5-A: Painting a Torque Stripe

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-F.

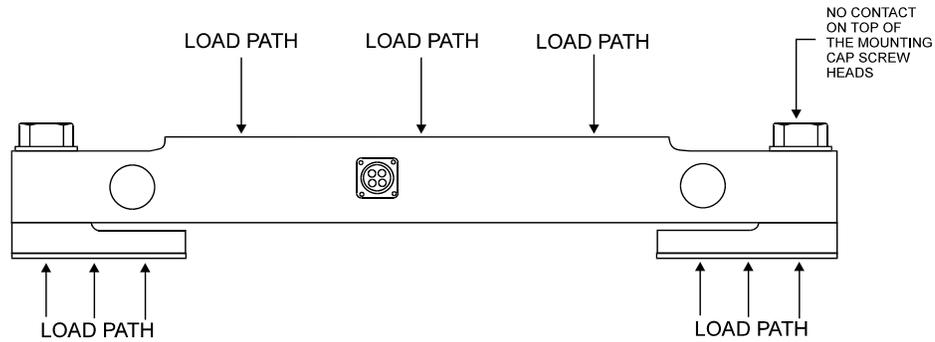


Figure 5-B: Load Path Diagram

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.

5.2 PREVENTIVE MAINTENANCE AND VULCAN TORQUE SPECIFICATIONS

The following simple, but important, preventive maintenance steps must 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-F.
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 must be checked once a week for 2 weeks. Vulcan On-Board Scales recommended torque values are shown on Figures 5-C through 5-F and general torque values shown below. 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:	5/8"	3/4"	7/8"	1"	1-1/8"
lb-ft	210-240	400-500	400-590	650-890	1000-1400

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. Check welds on load cell brackets. **IMPORTANT: If a weld repair is required, either remove the load cell or do not exceed 140 degrees Fahrenheit (60 degrees Celsius) on the load cell. Arcing on the body of the load cell may seriously damage the load cell’s structural integrity and must NOT be installed if this occurs. This also voids the manufacturer’s warranty.**
7. Check all wiring for condition, routing, and protection.
8. Check meter for secure mounting and strain relief of wires.
9. Check system for functionality.
10. Review and address any driver concerns.

Typical Western Logger Mounting

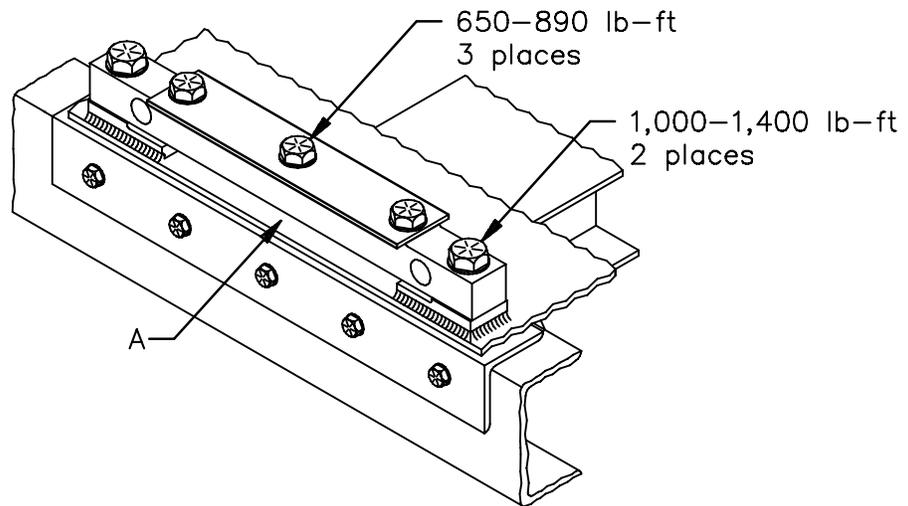


Figure 5-C

Typical Hutch or Transpro Center Hanger Mounting

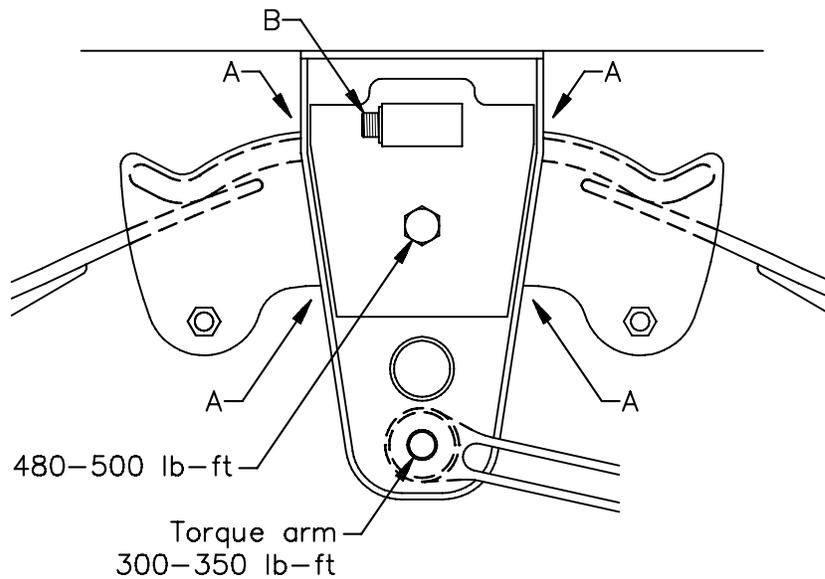


Figure 5-D

Typical Single Point Mounting

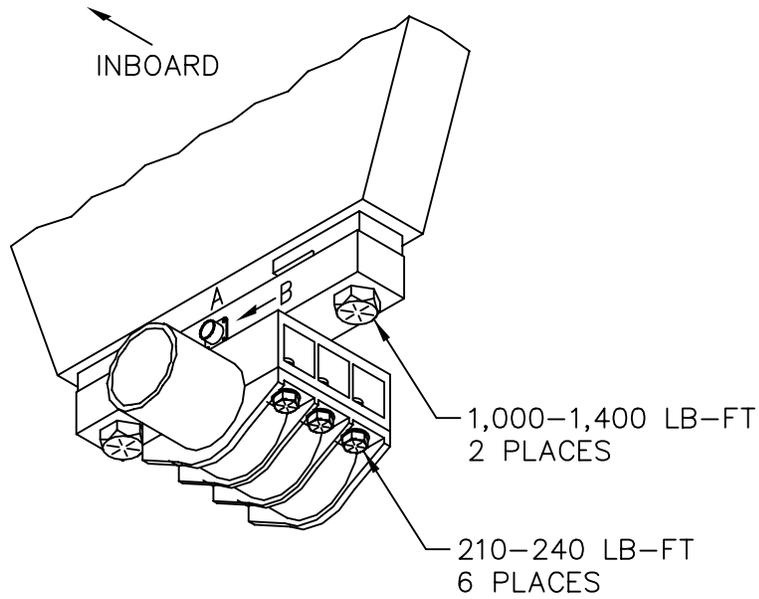


Figure 5-E

Typical Holland 5th Wheel Mounting

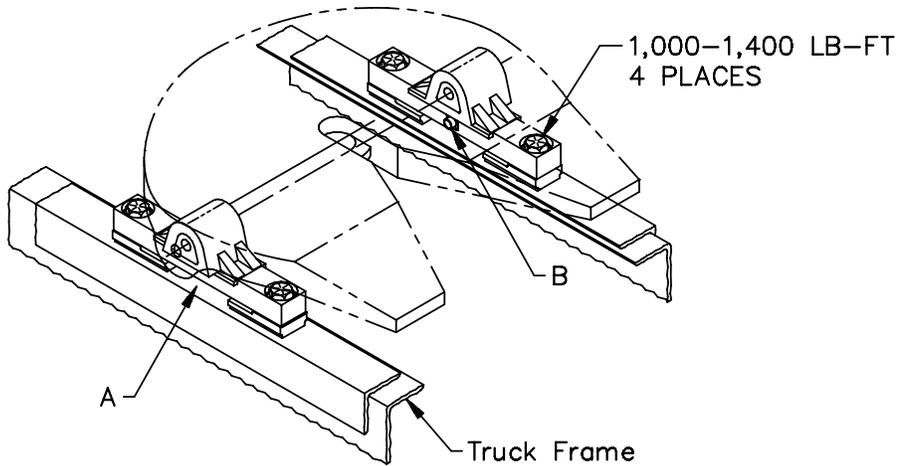


Figure 5-F

5.3 METER BUTTON REPLACEMENT AND CLEANING

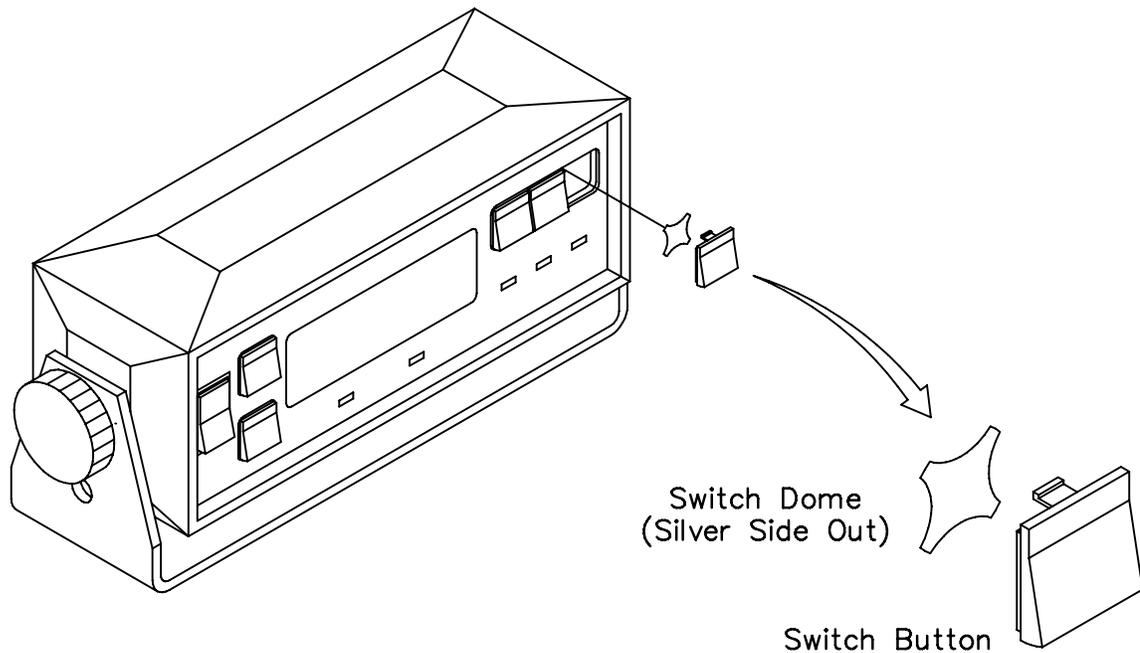


Figure 5-G

5.3.1 DISASSEMBLE PROCEDURE

1. First remove meter from truck.
2. Remove defective or dirty button using a small screwdriver. Place the blade under the lip of the button and gently pry up. **Note:** It is not necessary to disassemble meter to remove buttons.
3. Lift out metal dome switch from switch base as shown in Figure 5-G. **Caution:** Care must be taken not to drop the switch dome inside the meter. If the switch dome does get inside, it will have to be removed before the meter is plugged into the power source.
4. Clean out any dirt that may be in the switch base. Clean the center contact. This can be done by lightly scraping or by using a pencil eraser.

5.3.2 RE-ASSEMBLE PROCEDURE

1. Place the silver and gold switch dome in the switch base with the gold side towards the meter and the silver raised dome facing out.
2. Snap the new plastic button into position by using a small screwdriver (place the blade against the lip of the button and gently press in). The taper surface face needs to be installed as shown in Figure 5-G.
3. Re-install the meter, turn it on, and check the function of the buttons.

NOTE: If button starts sticking, disassemble the switch as described. Clean both the center contact in the base and switch dome. Re-assemble.

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. Do not 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 V200 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 12 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 “V200 Meter Error Codes”.

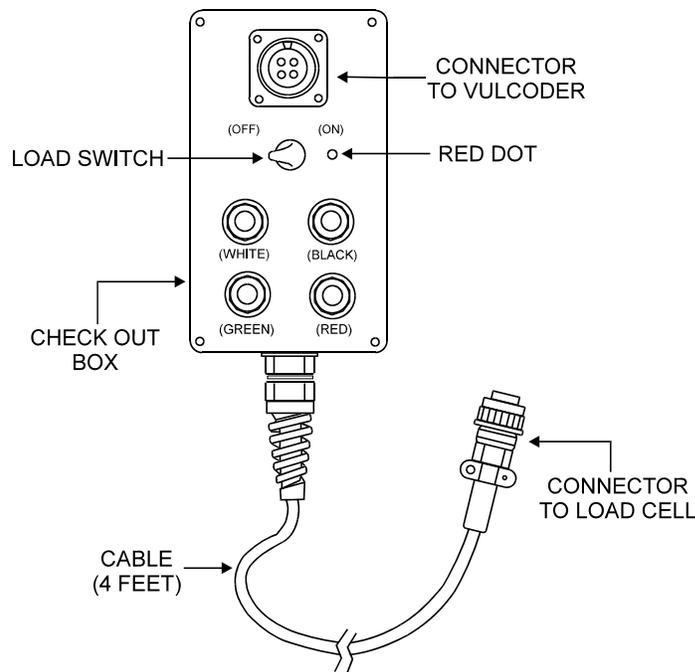


Figure 6-A: Vulcan Check-Out Box

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

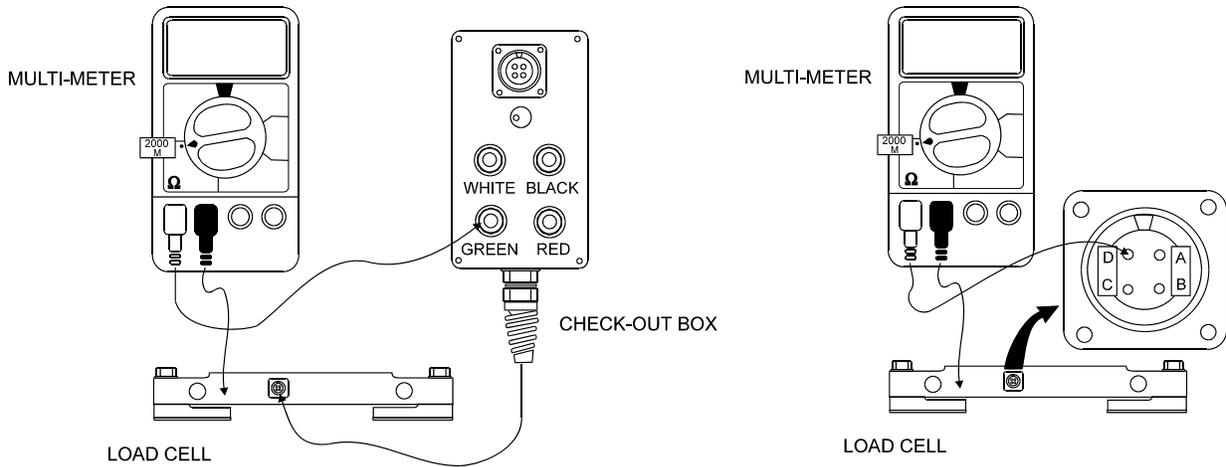
The Leakage Test Procedure detects the presence of moisture that could cause erratic meter readings. The way to measure leakage is to use a digital multi-meter that has a conductivity scale. Electrical isolation is measured between any pin and an unpainted clean surface on the load cell or the connector body. Electrical isolation must 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 than 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.

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



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.

Figure 6-B: Leakage Test

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

6.2.2 TARE TEST PROCEDURE

Required Equipment: **Vulcan V200 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. Record the current Tare Weight.

Current Tare Weight _____

4. Press and hold the **Tare** button. Use the **Up** or **Down Arrow** buttons to change the display to read zero.
5. Press and hold the **Cal** button. Write down the current Cal Number.

Current Cal Number _____

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

6. 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 fall between +12,000 to -12,000 counts.

If the Preload Number exceeds +12,000 to -12,000 counts, proceed with steps 6-a to 6-f.

- 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 **+12,000 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.
7. Measure the Preload Number of the remaining load cells one at a time.
 8. 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

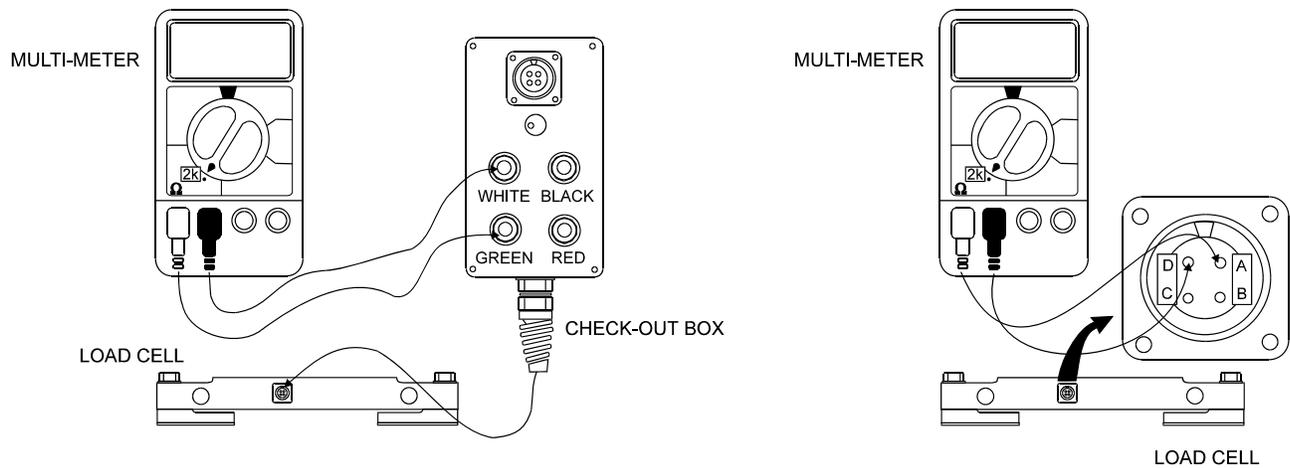


Figure 6-C Resistance Test

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

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 V200 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. Refer to section 7.2 to identify V200 Vulcoders. Set the Calibration Number to **2050** on the channel being tested (for 2 mV/V Vulcoders, set to **4100**, for 3 mV/V Vulcoders, set to **6150**). Set the Tare Reference Number for that channel to zero using the following procedure. Disconnect all load cells from Vulcoder on the channel being tested. While depressing the **Tare** button, use the **Up** or **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 must read zero (+/- 200 lb). If the Tare Reference Number is not zeroed, the cabling is damaged. Move the load switch to “ON” indicated by the red dot. The V200 meter must display 38,200 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 V200 METER ERROR CODES

The V200 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-F.

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 (or that a very large over range signal is being sent to the meter).

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 7.4 "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 7.4 “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 1.

6.3.5 Err 5

This error code is not used.

6.3.6 Err 6

Indicates a malfunctioning Vulcoder circuit. Err 6 may also appear briefly as an over-ranged signal comes within range.

Possible Causes:

1. Moisture problem at load cell connector.
2. Faulty Vulcoder.

What To Do:

1. Perform checks on page 38, section 6.4.3.

Note: When both load cells are disconnected from the Vulcoder, the meter does not necessarily display an error message. Often, the meter will display a steady number (e.g. 79100) or it may display a number that jumps around.

6.4 SYSTEM MALFUNCTIONS

6.4.1 No Indicator Display or Functioning 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 must not change more than .5 Vdc. If the meter still does not work, proceed to step 2.
2. Check the fuses for both negative and positive leads. Use 3 amp fast blow fuses only.
3. Check that the power supply wires are attached correctly at the 12 Vdc 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 change 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 does not, 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 does not 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 Unable To Enter Tare or Calibration Numbers

Possible Causes:

1. Meter may have dirty button connections.
2. Faulty buttons.

What to Do:

1. Check to see if any buttons are defective. (You need to be on Channel A or B, but not A + B).
 - A. Press and hold **Tare** button to display Tare Reference Number. If it does not, then the Tare button is faulty. (Refer to the maintenance section 5.3, page 27)
 - B. Press the **Up** button. The number displayed will increase. If it does not, then the **Up** button is faulty. Check for a dirty or bad connection. (Refer to the maintenance section 5.3, page 27)
 - C. Press the **Down** button. The number displayed will increase. If it does not, then check the **Down** button is faulty. Check for a dirty or bad connection. (Refer to the maintenance section 5.3, page 27).
 - D. Press and hold **Cal** button to display Cal Number. If it doesn't then the Cal button is faulty. (Refer to the maintenance section 5.3, page 27)

6.4.3 Meter Reading Drifts or Wanders With Time

Possible Causes:

1. Voltage to meter or Vulcoder is less than 12.3 Vdc.
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 7.4 “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 7.5 Vdc (+/- .5 Vdc), 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 is not 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 steps, 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 Sections 6.2.1 and 6.2.3). If both of the load cells wander 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 steps, 5c and 5f.

- 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.
- e. 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.
- f. 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 wander 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 Meter Reading Does Not Change When Truck Is Being Loaded

Possible Causes:

1. Voltage to meter is below 12.3 Vdc.
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.

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 7.4 “System Specifications”. If the voltage is below 12 Vdc, the problem could be in the power source (battery, meter power cable, and / or fuses).
2. Reset the meter 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 within range.
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).

6.5 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.	V01 (1mV/V)	V04 (2mV/V)	V03 (3mV/V)	V22 (1mV/V)
15" SUPER-BEAM	L01, L02	2050/930*	4100/1860	6150/2790	2050/930
15" SUPER-BEAM IN MODULAR CENTER HANGER	L01, L02	2050/930*	4100/1860	6150/2790	2050/930
17" SHEAR BEAM SINGLE POINT	L03	2100/955n/r	4200/1910*	6300/2865	2100/955
26" SUPER-BEAM	L08, L09, L18, L19	2050/930*	4100/1860	6150/2790	2050/930
26" HEAVY DUTY SUPER-BEAM	L11	3075/1395n/r	6150/2790*	9225/4185	3075/1395
19" FIFTH WHEEL	L04, L05, L31	2050/930n/r	4100/1860*	6150/2790	N/R
AIR SENSOR	L20, L21,	6150/2790	6150/2790	6150/2790	61502790*
28" SHEAR-BEAM, EXTRA HD	L27	3650/1660n/r	7300/3320*	N/R	N/R
4" TRUNNION LOAD CELL	L32, L33	N/R	N/R	N/R	8200

* - Factory recommended Vulcoder for this load cell.

n/r- Not recommended for this load cell

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. V02, (Designed for 7-Pin Connectors), use Cal Number 6150.

7.2 IDENTIFY V200 VULCODERS

The Vulcoder's Serial number is stamped on the case. Use the serial number to identify its part number. Use the table in Section 7.1 to find the starting calibration number for each channel.

Example: Vulcoder serial number 96451C used with Tandem Center Hanger load cells, in the "lbs" mode. Vulcoder part number would be V04. Calibration number for that Channel would be 3900.

SERIAL NUMBER	PART NUMBER	RANGE
___ ___	V01	1 mv/V
___ ___ C	V04	2 mv/V
___ ___ V	V03	3mv/V
___ ___ A	V02	7 pin (use Cal Number of 6150/2790).

7.3 FINE TUNING YOUR SCALE SYSTEM

- Using the **Cycle** button, lock the meter on Channel A+B and be sure that “Tare” is not flashing.
- 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

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

- 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 = _____

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

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

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)

7.4 SYSTEM SPECIFICATIONS

Load Cells

Electrical:	350 Ohms nominal impedance.
Connector:	4 pin bulkhead, military type.
Voltage Required:	7.5 +/- .5 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 jacket with drain wire, 5 ft. lengths (standard).
2-Wire Cable, Orange:	Custom polyurethane jacket, 45 ft length.
Connectors:	4 pin, military type.
Voltage Input Required:	12.3 to 16.0 Vdc.
Voltage Output Required:	7.5 +/- .5 Vdc.
Signal Input Range:	1 to 3 mV/V.

Meter

Display:	Automatically backlit liquid crystal display.
Cycle Speed:	Variable cycle speed, 1 - 9 seconds.
Graduation:	100 lb increments in lb mode, 50 kg in kg mode.
Display Range:	-99,900 to 320,000 lb or kg.
Voltage Required:	12.5 to 16.0 Vdc.
Current Draw:	150 mA to 350 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.

NOTES