Neutral Axis Sensor Installation Instructions For Rear End Axle Housings

VULCAN®
ON-BOARD SCALES
www.vulcanscales.com

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Table of Contents

1.0 INTRODUCTION

Function

The weigh system measures weight carried by the rear axles. This rear axle weight is constantly monitored and displayed on the V320 meter installed in the cab. This information can be used by the driver to limit loading of the vehicle in order to avoid overweight conditions.

System Components

- A single neutral axis sensor is installed on each of the two rear axle housings.
- A V320 weight display meter is installed in the truck cab and runs off 12 Vdc truck power.
- A 2 lead Vulcoder connects the two sensors with the display meter in the cab.

How the System Works

The basic measurement component of the weigh system is the neutral axis sensor. This sensor is bolted to mounting studs that are welded to the truck's two rear axle housings. As payload is added, the axle housing deflects a slight amount. The neutral axis sensor mounted on this axle housing will deflect along with the axle housing. The sensor sends an electrical signal to the Vulcoder, which provides weight information to the meter in the truck cab. The strength of the neutral axis sensor's electrical signal is determined by the amount the sensor deflects. As the payload on the vehicle's rear suspension is increased, the axle housing deflects more causing the sensor to deflect more. This causes an increase in the sensor's output and results in a higher weight being displayed on the meter.

To read the truck weight:

To obtain the best weight reading, have the truck come to a slow, rolling stop on flat ground with the steering wheel pointed straight ahead.

It is recommended to preview this entire installation manual before starting the installation process.

2.0 SYSTEM CONFIGURATION

1. One sensor will be installed on the front axle housing, the other on the rear axle housing.
2. Each sensor will be installed on the side of the axle housing where there are no brake cans.
3. Each sensor will be installed on the longer side of the axle housings.
4. One sensor will be installed on an axle housing to the right of truck center, the other sensor will be installed to the left of truck center.
5. Each sensor will be installed on the centerline of the axle housing which is located by the axle housing weld seam, the mounting brackets are designed to straddle the weld seam.

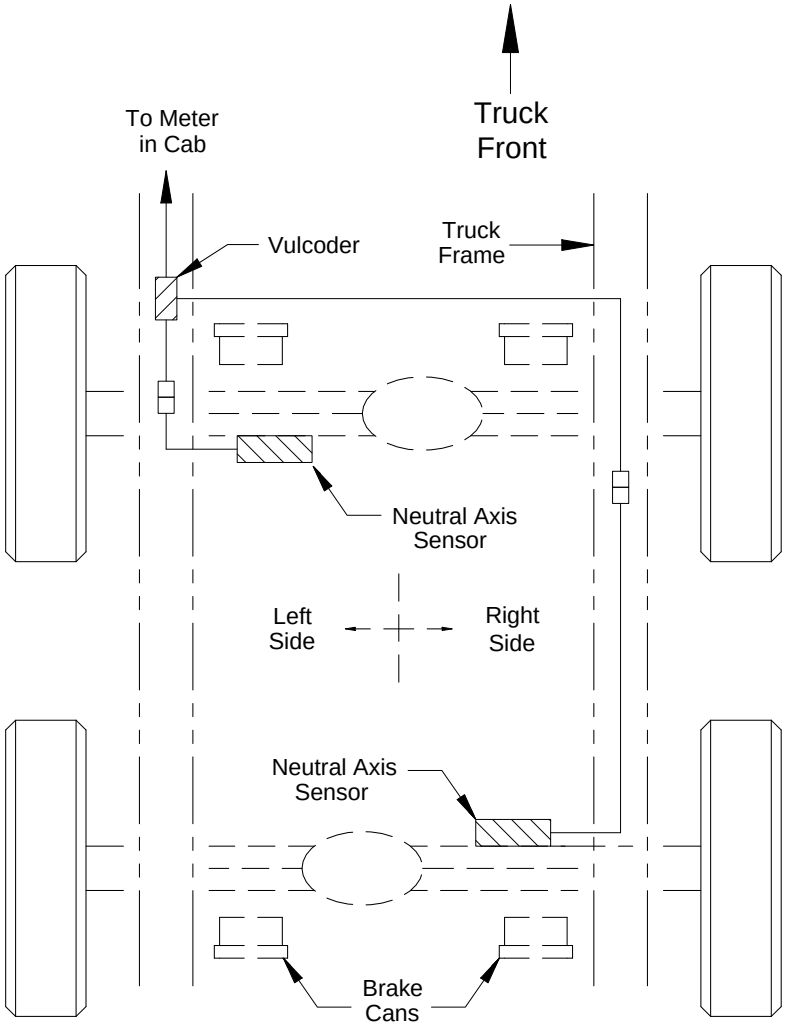


Figure 2-1: System Configuration

3.0 FASTEN BRACKETS TO INSTALLATION TOOL

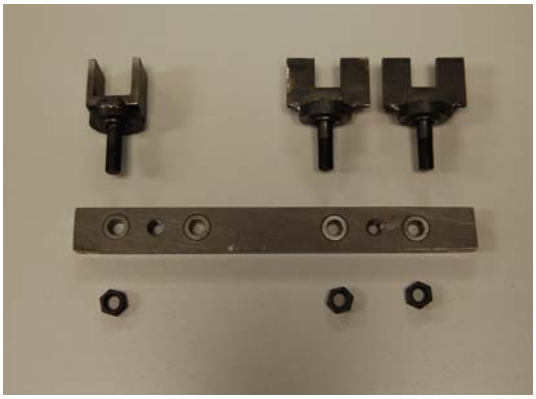


Figure 3-1: Sensor weld stud installation tool, weld studs and fasteners.

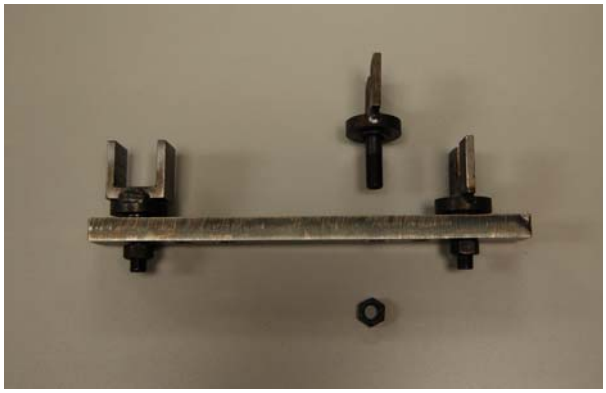


Figure 3-2: Assembly of weld studs and fasteners to the installation tool.

Fasten the sensor weld studs and 3/8-24 nuts to the installation tool as shown. Tighten the nuts until snug. The mounting hole next to the channel style of weld bracket will not be used for this installation, see Figure 3-3.

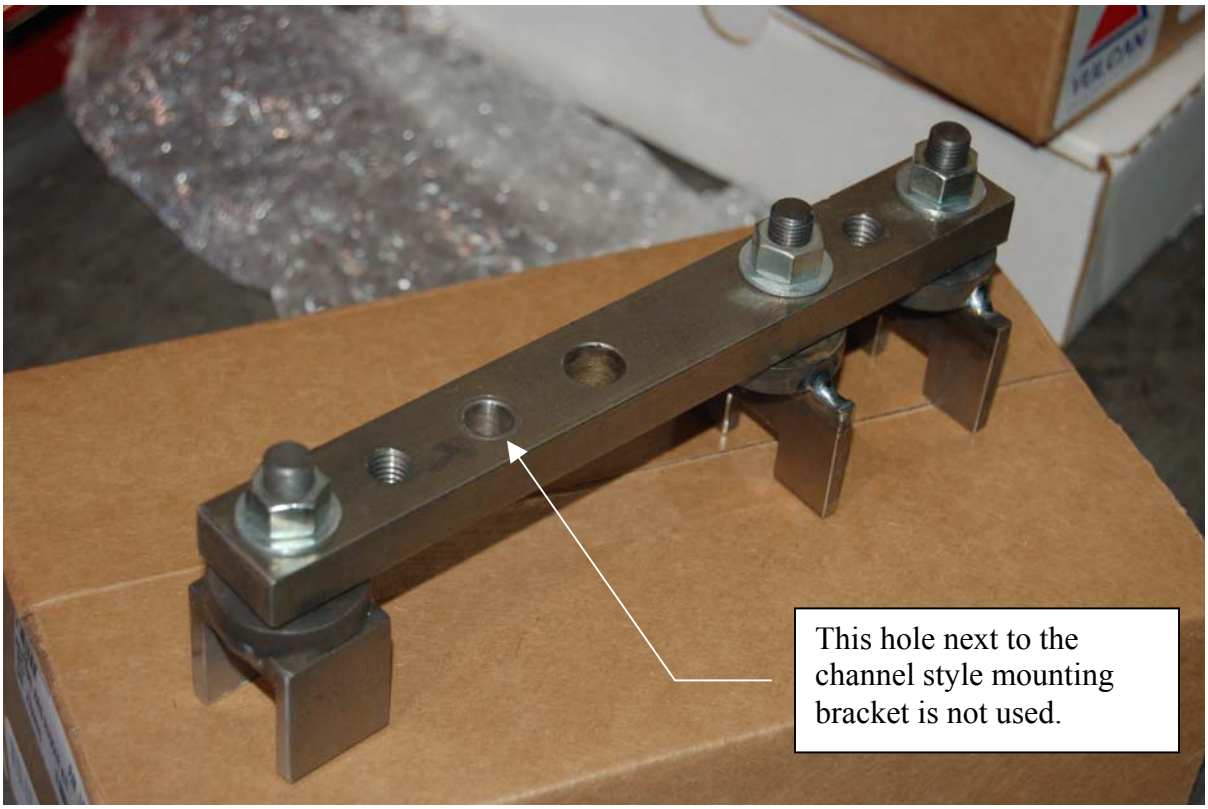
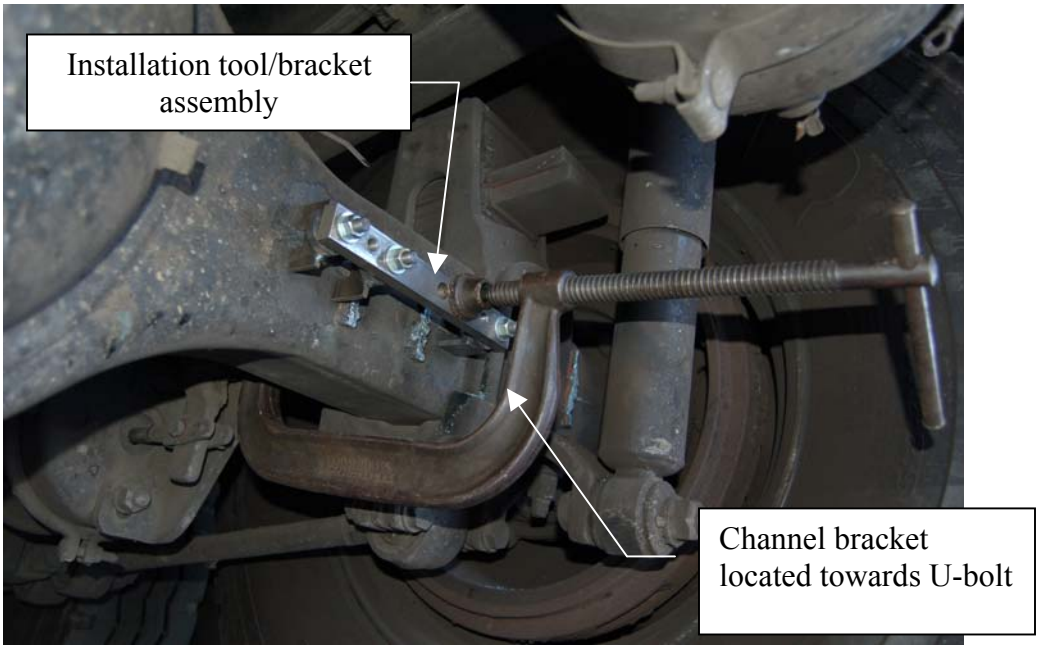
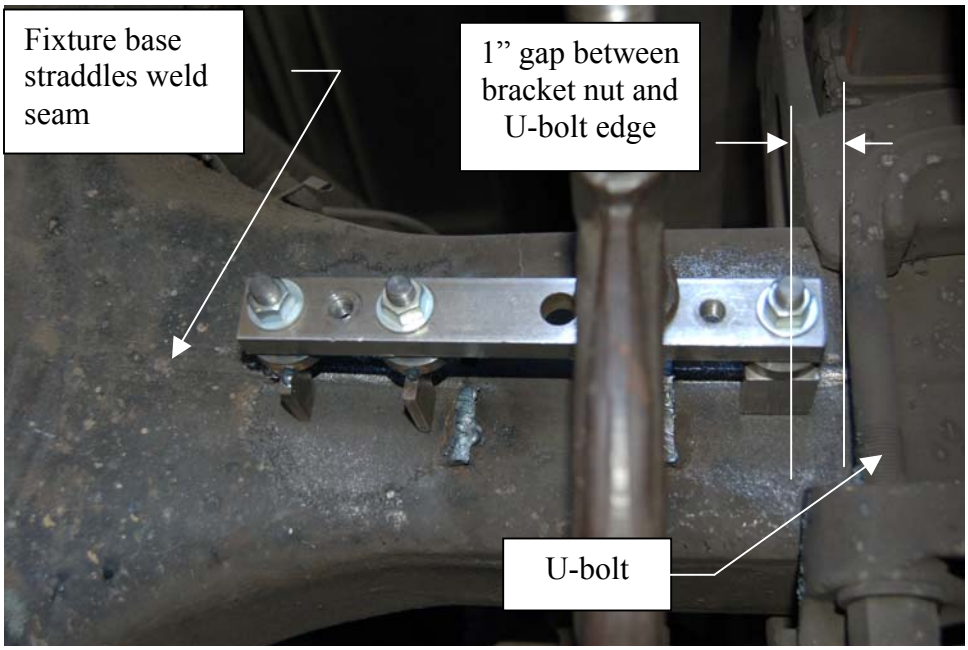


Figure 3-3: Assembled installation tool and brackets.

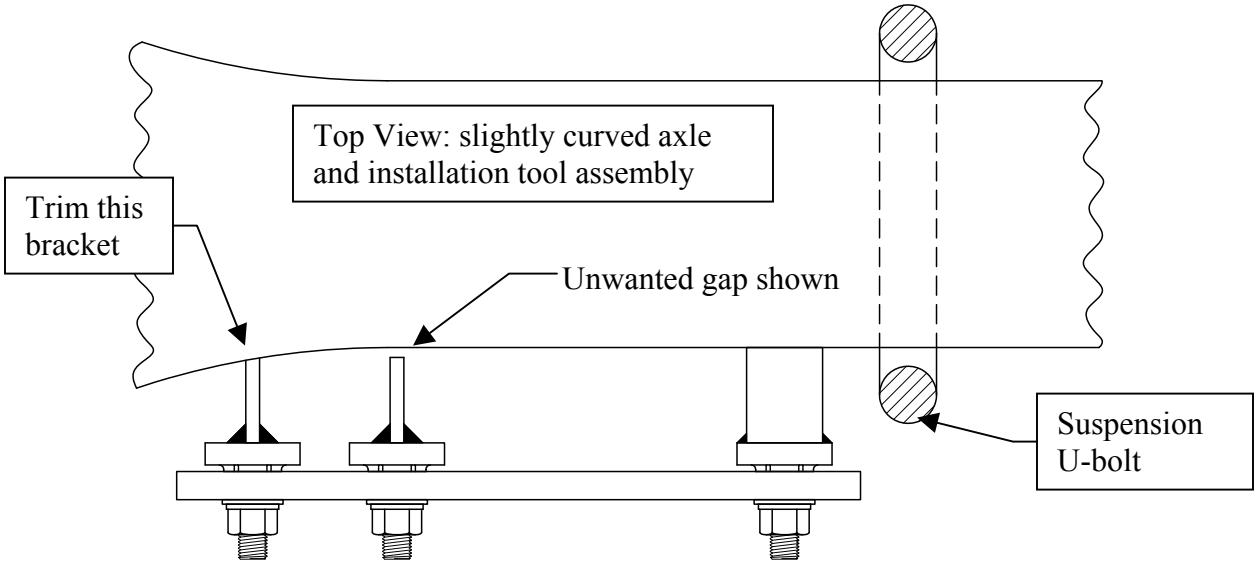
4.0 LOCATING INSTALLATION TOOL ASSEMBLY ON REAR AXLE

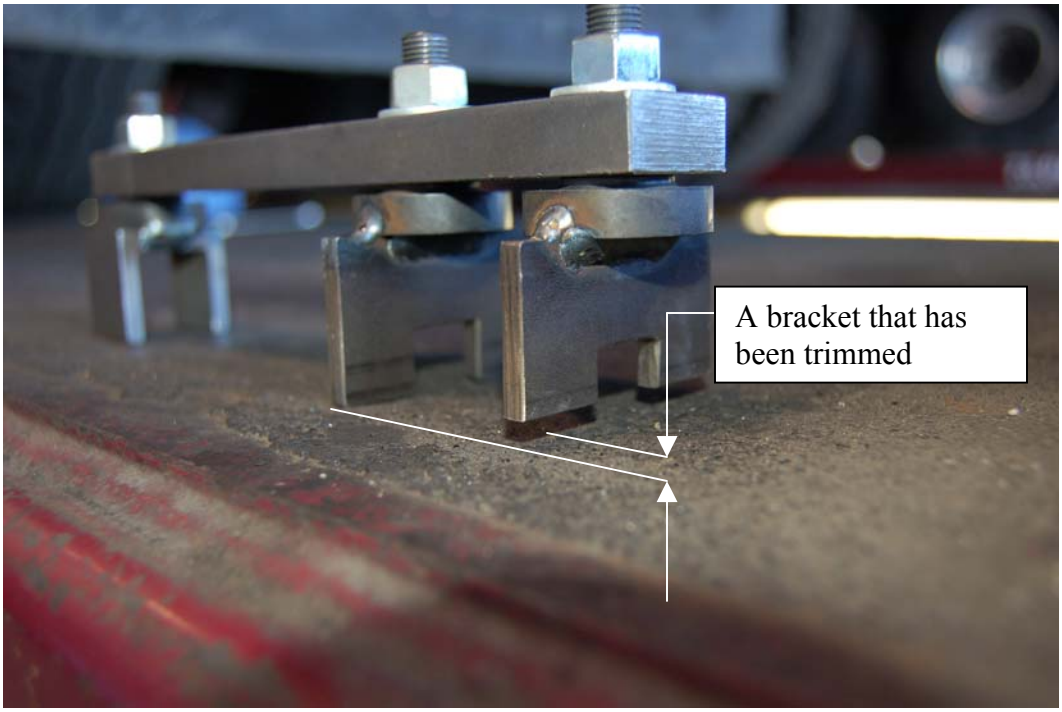
- The channel style bracket is mounted next to the suspension U-bolt.
- All three mounting brackets straddle the axle weld seam.
- If required, trim the middle mounting bracket so there is no gap greater than 1/16" between bracket and axle.
- Clean and prep the axle surface for welding the brackets.
- Clamp the assembly to the axle for welding.





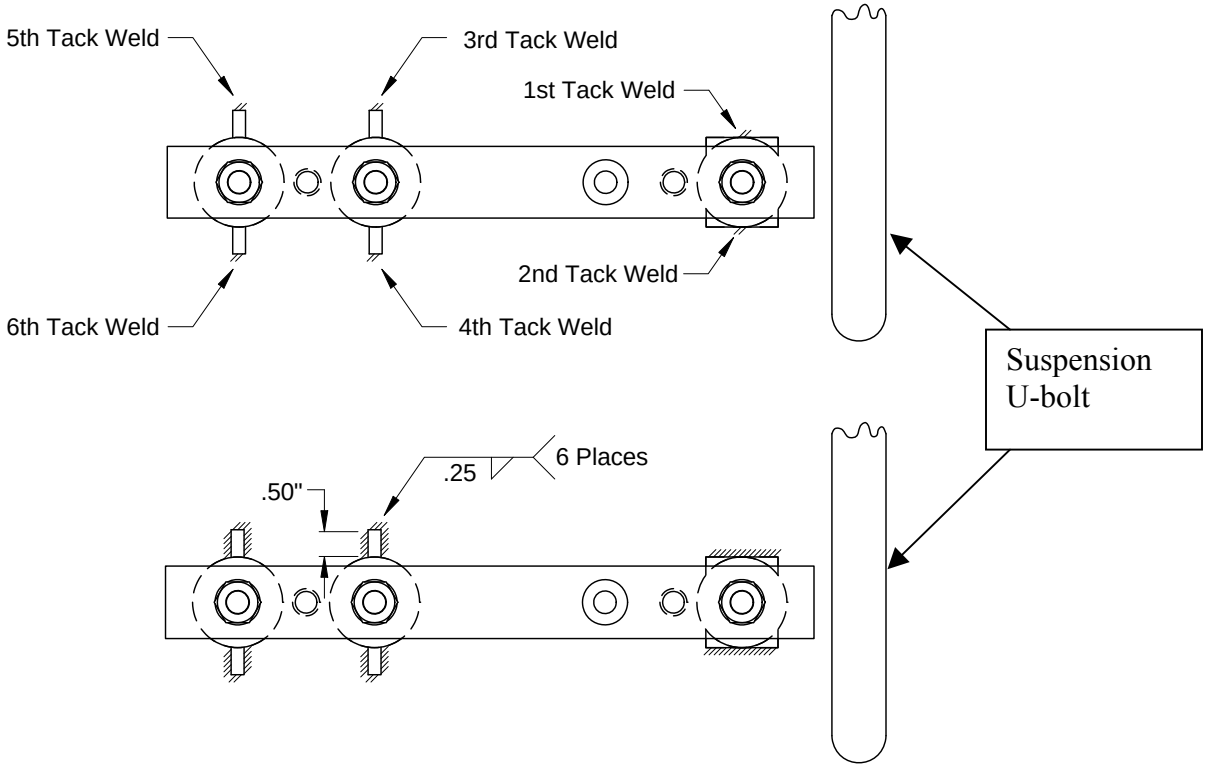
If the axle is not perfectly flat, there will be a gap (usually) under the middle bracket. In this case, trim the bracket closest to the center of the axle to have a gap no bigger than 1/16".





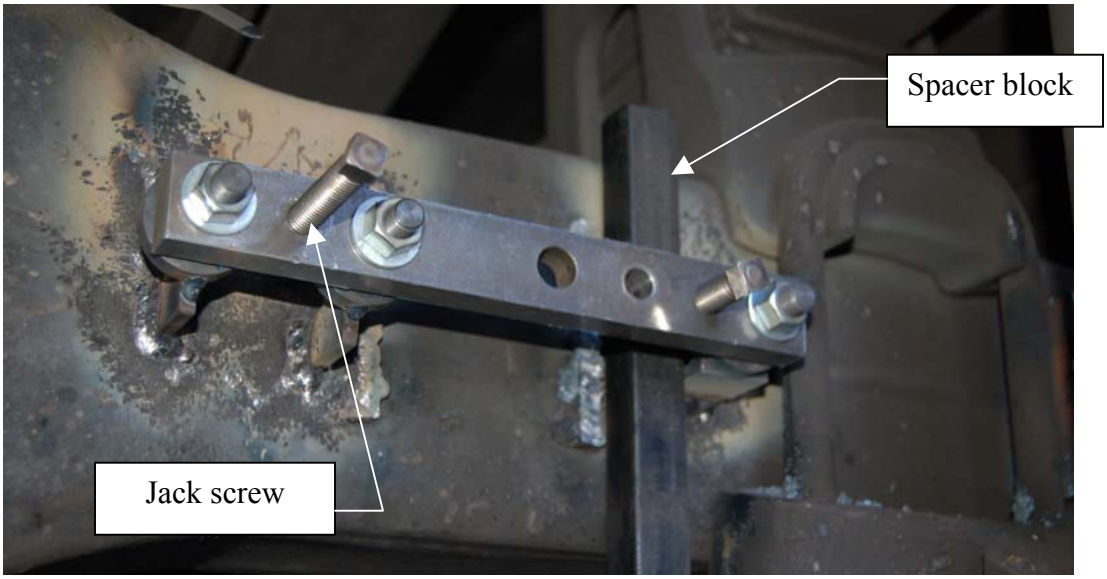
5.0 WELDING THE SENSOR BRACKETS TO THE AXLE

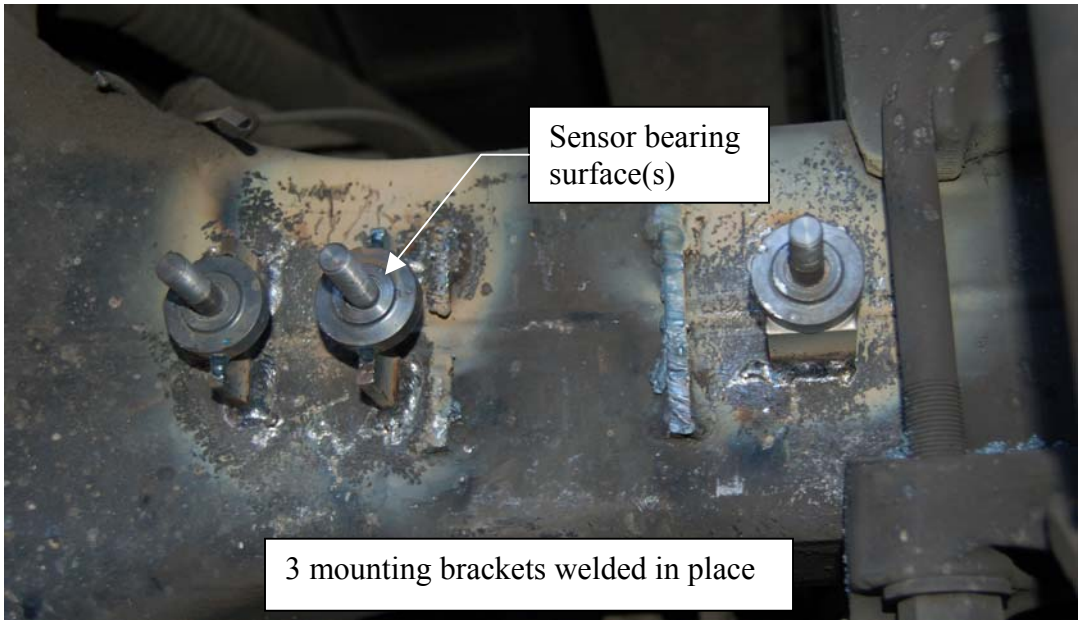
- Tack weld each of the three brackets in place.
- Make the full welds on all three brackets with the installation tool in place.
- The weld stud material is cold finish 1018 steel. Follow AWS codes and specifications for welding this stud to the parent material of the rear axle housing.



6.0 REMOVE INSTALLATION TOOL

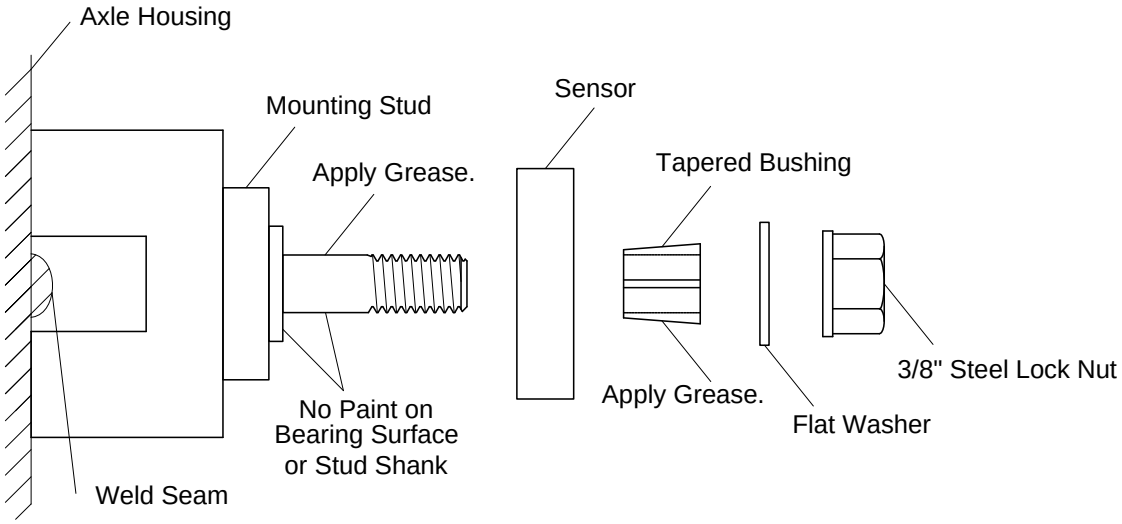
- Remove the 3/8-24 nuts holding the welded mounting studs to the installation tool.
- Install the 3/8-16 jacking screws to remove the installation tool from the welded studs. Use a spacer under the screw to increase effective length.
- Turn each screw one revolution at a time to evenly lift off the installation tool without damaging the mounting stud threads.
- If threads get damaged, use a 3/8-24 die to clean them up.
- Paint the weld area with a high quality rust preventative paint. Do not get paint on the stud shank, threads or sensor mount bearing surface. Mask off as required.





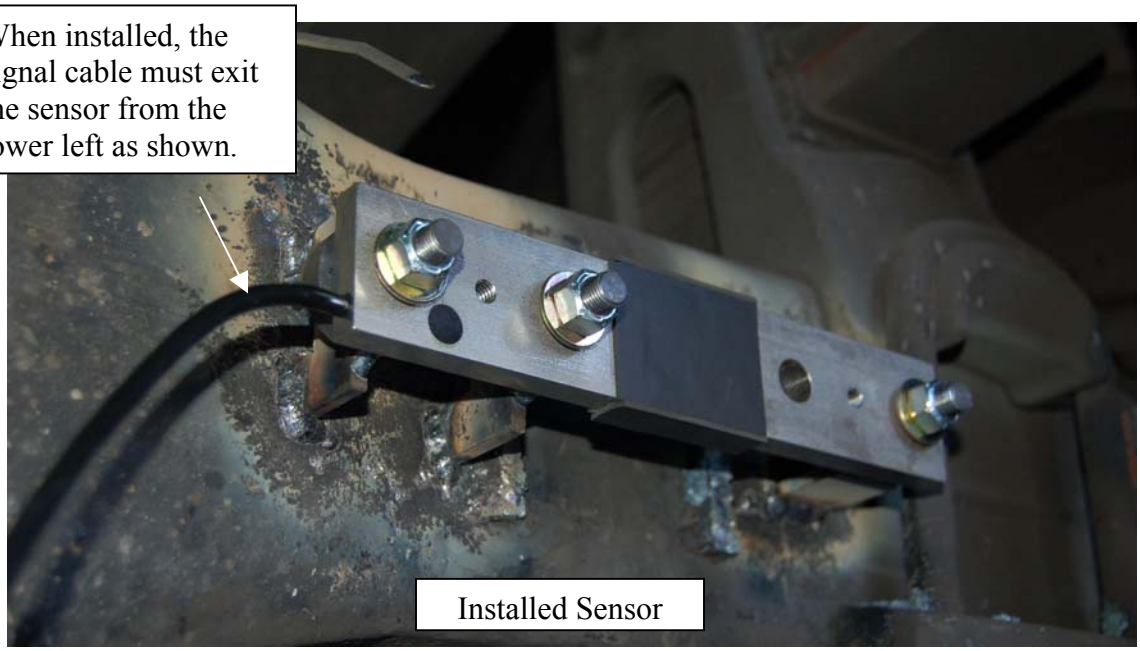
7.0 INSTALL THE NEUTRAL AXIS SENSOR

- The sensor must be positioned so the signal cable exits from the lower left part of the sensor body.
- Apply grease and slide the sensor onto the 3 mounting studs.
- Insert the three tapered bushings followed by the flat washers and lock nuts.
- Tighten the 3 nuts evenly. Slowly torque the lock nuts to 300 in-lb (25 ft-lb) applying small amounts of torque to each nut until all nuts are completely torqued.



Parts for Sensor Installation

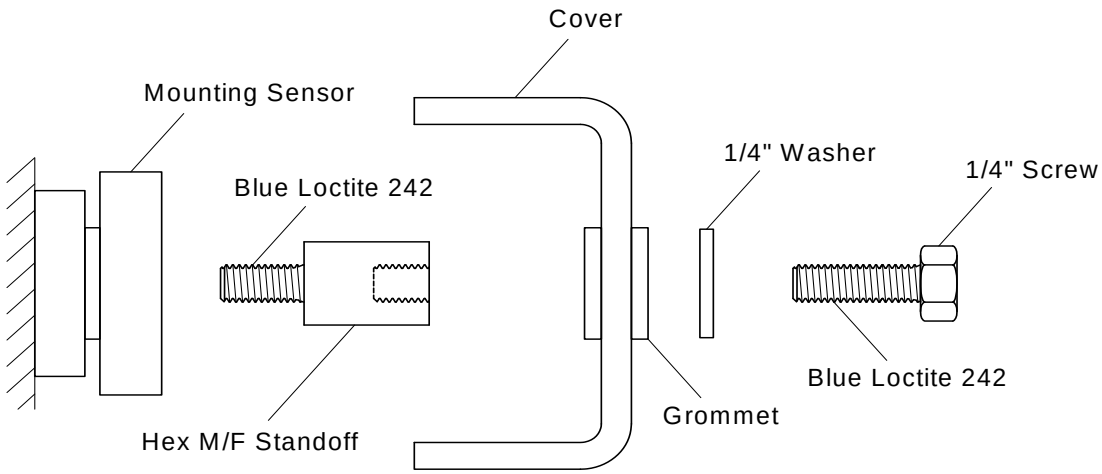
When installed, the signal cable must exit the sensor from the lower left as shown.



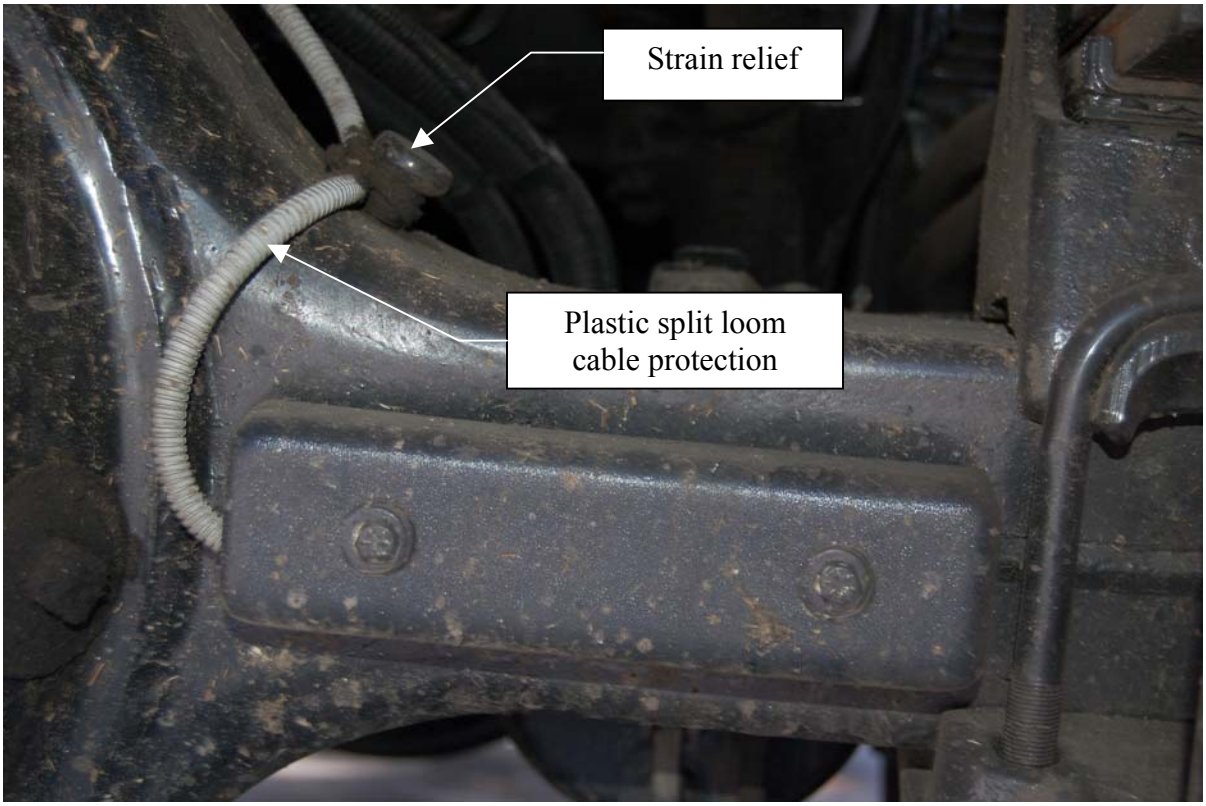
Installed Sensor

8.0 INSTALLING SENSOR COVER

- Orient the cover so the cable slot aligns with the sensor's pigtail cable.
- Use blue loctite to install the 2 hex standoffs in the 1/4-20 tapped holes located between the mounting studs on the sensor.
- Insert the rubber grommet into the cover and secure in place using the 1/4" flat washer and 1/4-20 X 3/4" long bolts provided. Use blue loctite on the bolts.



Parts for Cover Installation



Use split loom to protect cables from road debris.

Install the Second Sensor

Install the second sensor on the other walking beam following this same procedure. One sensor must be mounted on each of the two rear axle housings. One sensor on the right side of center, the other on the left. Review Figure 2-1: System Configuration, to make sure the second sensor is located correctly.

9.0 ELECTRONICS INSTALLATION

9.1 Install Vulcoder and Route Black Cable

- Tape the VSL Vulcoder connector ends prior to routing the cabling to avoid contamination.
- Mount the VSL Vulcoder near the sensors on the inside of the truck frame rail or next to a structural member. The VSL Vulcoder mounting surface must be in an area protected from road and hauling debris.
- Route the black cables to the sensors. (**Do not** trim the black cable to length). Route cables to include proper strain relief to prevent damage from suspension travel.

Important: Check the sensor pigtail connectors to make sure they are clean and dry. **Do not** allow moisture, contact cleaner, grease or any other substance inside of the connectors.

9.2 Connect Vulcoder to the sensors

- Verify the sensor connector coming from the VSL Vulcoder has an O-ring inside the connector shell. There are two types of O-rings, a flat style and a standard round style. Either type is OK, never use more than one.
- Attach the black cable connectors to the pigtail connectors coming from the sensors. Make sure they are finger tight plus an additional 1/8 of a turn more, use channel lock pliers. The additional tightening is necessary to compress the O-ring. This prevents scale errors, which can occur from moisture entering into the sensor's connector. **Caution:** Do not over tighten the connectors as this can damage them.

9.3 Vulcoder Black Wire Loop

- The VSL Vulcoder has a black wire loop that must remain uncut. The meter uses the uncut loop for channel assignment. This system will have a single channel assigned, channel A.

Vulcoder

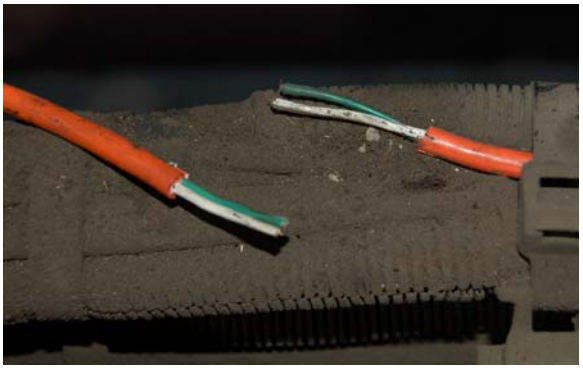
9.4 Mount Meter in Cab and Route Cable

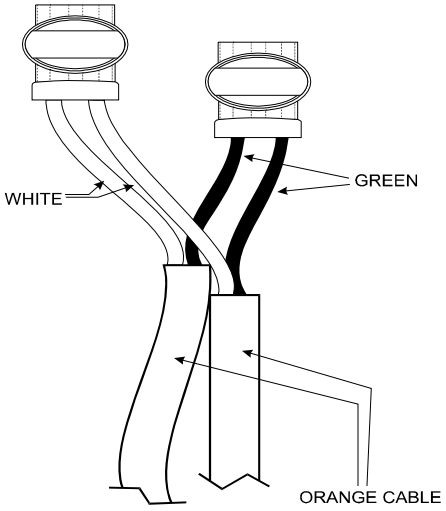
- Find a suitable location for the meter in the cab and install the mounting bracket.
- Route the 2-wire orange VSL Vulcoder cable from the meter location in the cab to the VSL Vulcoder near the rear suspension. If the cab is a front tilt model, route the orange cable through the hinge point.
- Route the cable to the meter but **do not** trim any excess orange cable off at the meter at this time.
- Where the orange cable meets the VSL Vulcoder, trim off the excess cable leaving approximately 1' - 2' of extra orange cable to allow for splicing these cables together.

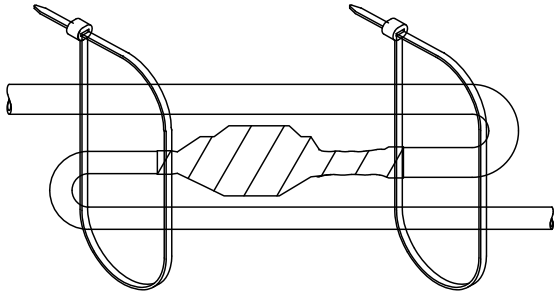
Figure 9-1: Meter located on a revolving console in the truck cab.

9.5 Splice Orange Vulcoder Cables Together

- Splice the orange cables together from the meter and Vulcoder. Use the 3M displacement connectors supplied.
- When using the Vulcan supplied 3M connector, **do not** strip the insulation from each wire.
- Be sure to insert wires **completely** into the connector and check their position by looking through the translucent connector body.
- Crimp the connector cap down flush with the top edge of the connector body, ensuring a good connection.
- Tape the connection and all of the wires with the orange insulation stripped off to help seal and prevent wire chaffing that can cause a wire to short.
- Wire tie the splice as shown below for strain relief.







9.6 Secure Cab Wires and Connect Meter Terminal Block

- In the truck cab, secure the orange cable so it does not obstruct other in cab equipment and allow for strain relief.
- Unplug the terminal block from the back of the meter, strip the wires, and connect the VSL Vulcoder wires to the terminal block (refer to Figures 9-2 and 9-3).
- Secure the power cable so it does not obstruct other in cab equipment. Strain relieve the power cable and **cut** to length.
- Strip the wires and make all wire connections to the terminal block as shown on the back of the meter. **Do not** plug the terminal block into the meter at this time.

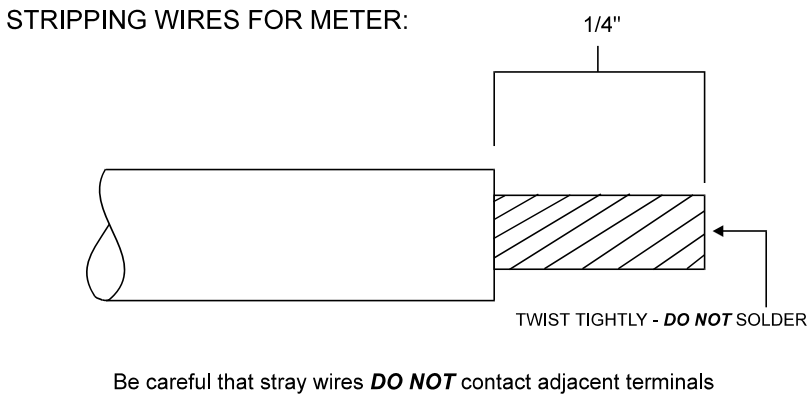


Figure 9-2: Stripping Wires for the Meter

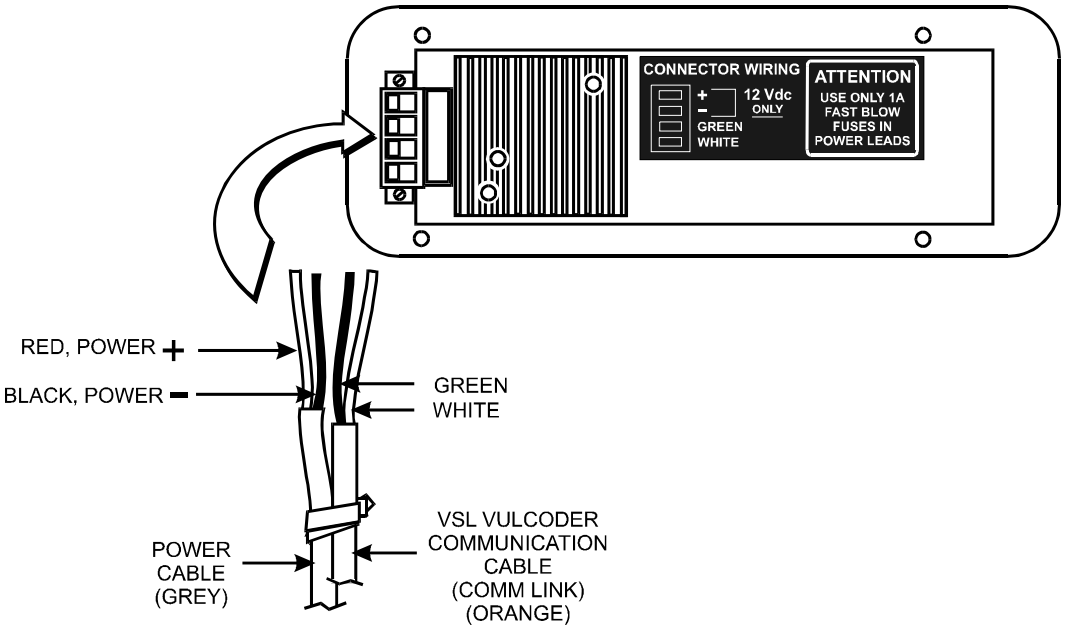


Figure 9-3: V300 Series Wire Connections to the Meter

9.7 Connect Meter to Battery Power

- Disassemble the positive fuse holder, (red wire).
- Apply grease to the positive connector at the battery post to inhibit corrosion.
- Connect fused power leads directly to battery posts **12 Vdc only**. **Do not** connect the power cable to a power source activated by the key switch; power **must** be supplied at all times.

9.8 Review sections 9.6 and 9.7 before connecting the terminal block to the back of the meter.

10.0 V300 METER SET UP

Enter (or change) "Tare" weight (Do this only when the truck is empty and on level ground!)

Press the **PWR / MENU** button to turn on the meter.

Press and release the **TARE** button. The **TARE** and **LOCK** LED's are illuminated.

Use the ▲ or ▼ buttons to increase or decrease the displayed Tare weight to match the actual truck weight. Starting tare weight is in pounds.

Press and *release* the **TARE** button to return to normal operating mode.

Enter (or change) starting "Calibration" number

Press the **PWR / MENU** button to turn on the meter.

Press and *release* the **CAL** button. The **LOCK** and **CAL** LED 's are illuminated. The flashing LED below the channel designation indicates which channel(s) is selected.

Use the ▲ or ▼ buttons to make the starting calibration number read 5000.

Press the **CAL** button until the **CAL** LED is no longer illuminated. (The **CAL** button may need to be pressed once or twice for this to occur).

Assigning Other Meter Setup Functions

Press the **PWR/MENU** button once to turn the meter on. (The meter will go through its startup routine and then into normal weighing mode.)

Press the **PWR/MENU** button to enter program menu (The meter will display… "PSr" for program sequence.)

Press the **CYCLE** button until program units ("**PU**") is displayed. Use the ▲or▼ buttons to select tons. (The meter will display **"PU ton")**

Press the **CYCLE** button until program grad ("**PG**") is displayed. Use the ▲or▼ buttons to select 100.

Press the **CYCLE** button until program lock ("**PL**") is displayed. Use the ▲or▼ buttons to activate the Driver Lock feature.
"PL OFF"= deactivated "PL ON"= activated

Press the **PWR/MENU** button to exit program menu and return to normal weighing mode.

Note: After the truck has been working in the field for one week, fine tune adjustment of the Calibration number and Tare weight can be done if desired. See the back section of this manual for Fine Tuning Calibration instructions and techniques.

11.0 INSTALLATION CHECKLIST

1. Make sure electrical connectors are tight.
2. Provide proper slack in load cell sensor pigtail cables and Vulcoder wires to prevent cable damage from suspension travel.
3. Verify Vulcoder is secure and clear of potential damage from road debris.
4. Paint transducer weld area and mounting surfaces with a high quality rust preventative paint.
5. Make sure meter power is hot at all times when truck's battery switch is on.
6. Verify there is adequate strain relief for the cables in the truck cab.
7. Verify meter placement is in clear view for the driver but not obstructing his vision.
8. Verify the Calibration number, Tare weight and other meter settings are installed.
9. Verify meter is in driver lockout mode.

12.0 FOR FINE TUNING CALIBRATION OF VULCAN SCALE SYSTEM

DATA COLLECTION SHEET Truck #_____

Make copies of this sheet for repeated use as needed.

1. Record all weight readings with truck stopped on the platform scale.
2. When the sheet is complete, contact Fleet Services so that they can determine new CAL numbers and enter them into the meter.

Note: Do not use a pre-recorded empty (Tare) weight. For best scale accuracy, empty weights must be measured each time leaving the transfer station.

		Truck Fully Loaded		Truck Empty	
No.	**Date**	**Meter Display**	**Platform**	**Meter Display**	**Platform**
1					
2					
3					
4					
5					
SUM COLUMNS HERE →		BOX 1	BOX 2	BOX 3	BOX 4

FINE TUNING CALIBRATION

Calibration consists of setting the appropriate Tare weight and Calibration number.

If additional assistance is needed to fine tune your scale system, contact Stress-Tek's Customer Service at 1-800-237-0022, Ext. 2

Calibration Procedure:

The tare weight is set to the trucks actual tare weight.

Numbers from the Data Collection Sheet must be used for fine tuning a specific trucks calibration settings.

There must be the same number of readings for each of the 4 columns in the Data Collection Sheet.

Negative numbers in the columns are treated as negatives, so they subtract from totals.

On the Data Collection Sheet for the specific truck number, add the four columns of numbers separately and write the values in the boxes provided on the last horizontal line noted "SUM COLUMNS".

Subtract box 4 from box 2 to get the platform scale net weight (Total 1).

Box 2	-	Box 4	=	Total 1

Subtract box 3 from box 1 to get the display meter net weight (Total 2).

Box 1	-	Box 3	=	Total 2

To find new calibration number (trucks current Cal number is required).

Divide Total 1 by Total 2 and multiply by the trucks current Cal number.

Total 1	÷	Total 2	x	current Cal #	=	new Cal #

Enter new Cal number into meter and change tare number if required.
(See Vulcan Meter Setup sheet for instructions on changing these numbers.)

Record new Cal numbers along with truck # for future reference on the Vulcan Scale Calibration Log sheet.

13.0 VULCAN SCALE CALIBRATION LOG

Truck #	Old CAL #	New CAL #	Date Changed	Mechanic

14.0 DAILY DRIVER OPERATING GUIDE

This quick reference card is to be used by the driver as a reminder of how to operate the weigh system once a driver is familiar with it.

What to do:

1. Copy this page.
2. Cut the copied page on the dashed line.
3. Laminate the half page.
4. Put in the truck cab for easy driver reference.

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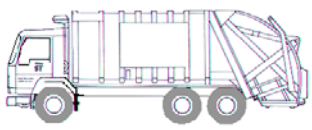
DAILY DRIVER OPERATING GUIDE: OVERWEIGHT SYSTEM

GUIDELINES TO MAXIMIZE WEIGHT ACCURACY



To turn meter on, press the Power/Menu button. (The meter will complete its startup routine then display the truck's weight.)

To obtain the most accurate weight readings the following criteria must be met.

1. Come to a slow easy stop on a level surface.

2. For side loaders, stow the grabber arm.

3. Move the packing blade into the transport mode.

The numbers on the display may bounce for a moment until the truck and payload has completely stopped moving.

Once the numbers become stable, the number displayed will represent the trucks net weight.