

V300S SERIES OWNER'S MANUAL

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CHAPTER 1.0

VULCAN SINGLE LINE (VSL) TECHNOLOGY

V300S SERIES ELECTRONICS SYSTEM

Vulcan On-Board Scales can be installed on all types of vehicles including, hook lifts, logging trucks, flatbed trailers, chip trailers, front loaders, rear loaders, side loaders, roll-offs, transfer trailers, and many other commercial vehicles requiring scales. Axle group weights, payload weights, and gross vehicle weights can be measured using the Vulcan On-Board Scale System. The V300S Series consists of two models: the V320S two-channel meter and the V340S four-channel meter.

The Vulcan On-Board Scale System consists of:

- **Load Cells, Pressure, or Transducer Sensors** - to sense load, air, hydraulic, or deflection pressure.
- **VSL Vulcoders** - to convert the signals from the sensors to weight and communicate with the meter.
- **V300S Series Meter** - to display the weights and run the scale system.

The number of VSL Vulcoders and the model of V300S Series Meter needed depends on the number of channels required. The number and type of load cells or sensors needed depends on the truck's configuration, such as length, type of suspension, load capacity, etc. Only one V300S Series Meter is required per truck.

The new **Vulcan Single Line (VSL)** technology is a revolutionary way that the V300S Series Meter communicates with each VSL Vulcoder. The VSL technology uses a single 2-wire communication cable to distribute power and send set-up data to each VSL Vulcoder while receiving weight data from each VSL Vulcoder.

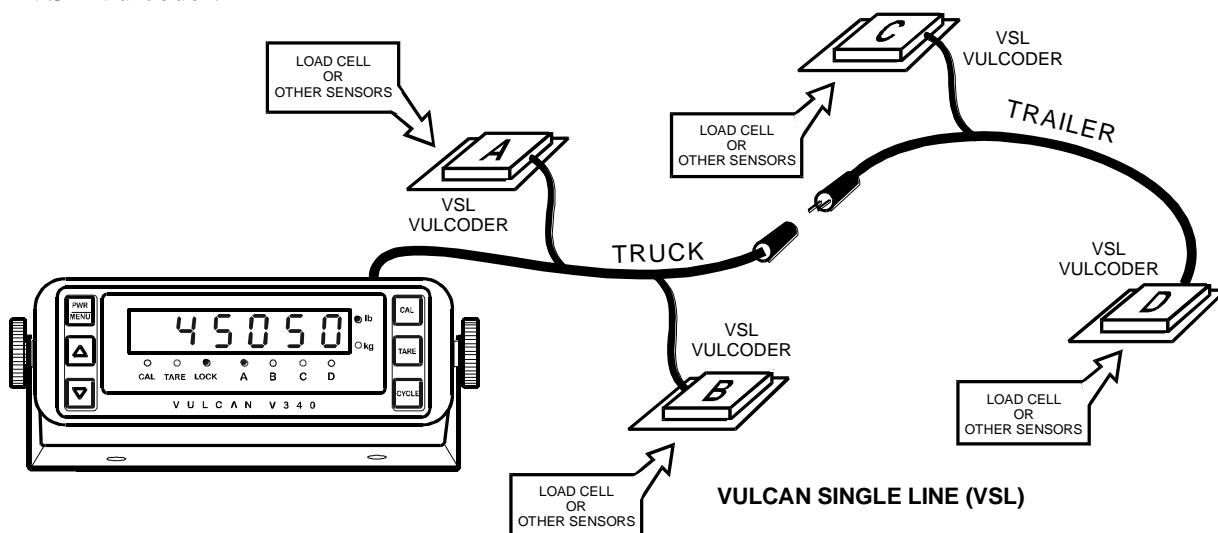


Figure 1-A: V340S VSL Single Line (VSL)
System Shown 4-Channel System Example

2-Channel System Example

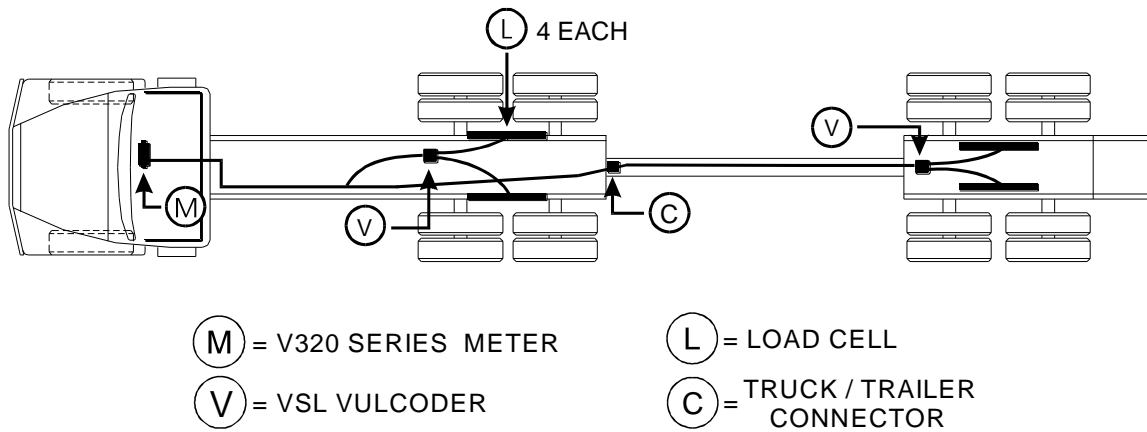


Figure 1-B: Example – V320S Series VSL Long Logger System Shown
(Truck: 1-channel, Trailer: 1-channel)

4-Channel System Example

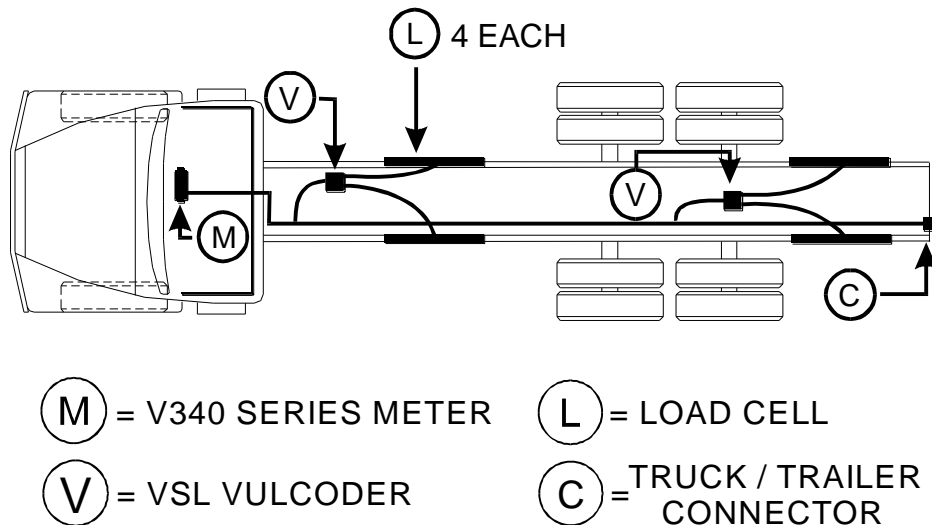
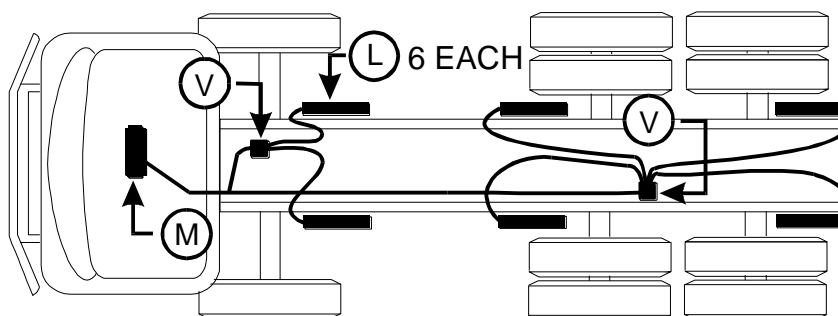


Figure 1-C: Example – V340S Series VSL Short Logger System Shown
(Truck: 2-channels, Trailer (not shown): 2-channels)

2-Channel System Example



(M) = V320 SERIES METER (L) = LOAD CELL
(V) = VSL VULCODER

Figure 1-D. Example – V320S Series VSL Refuse System
6 Load Cells Shown (Truck: 2-channels)

1.1 LOAD CELLS AND PRESSURE SENSORS

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. This signal voltage is measured by the VSL Vulcoder and then used to determine weight.

Example: Vulcan Super - Beam Load Cell

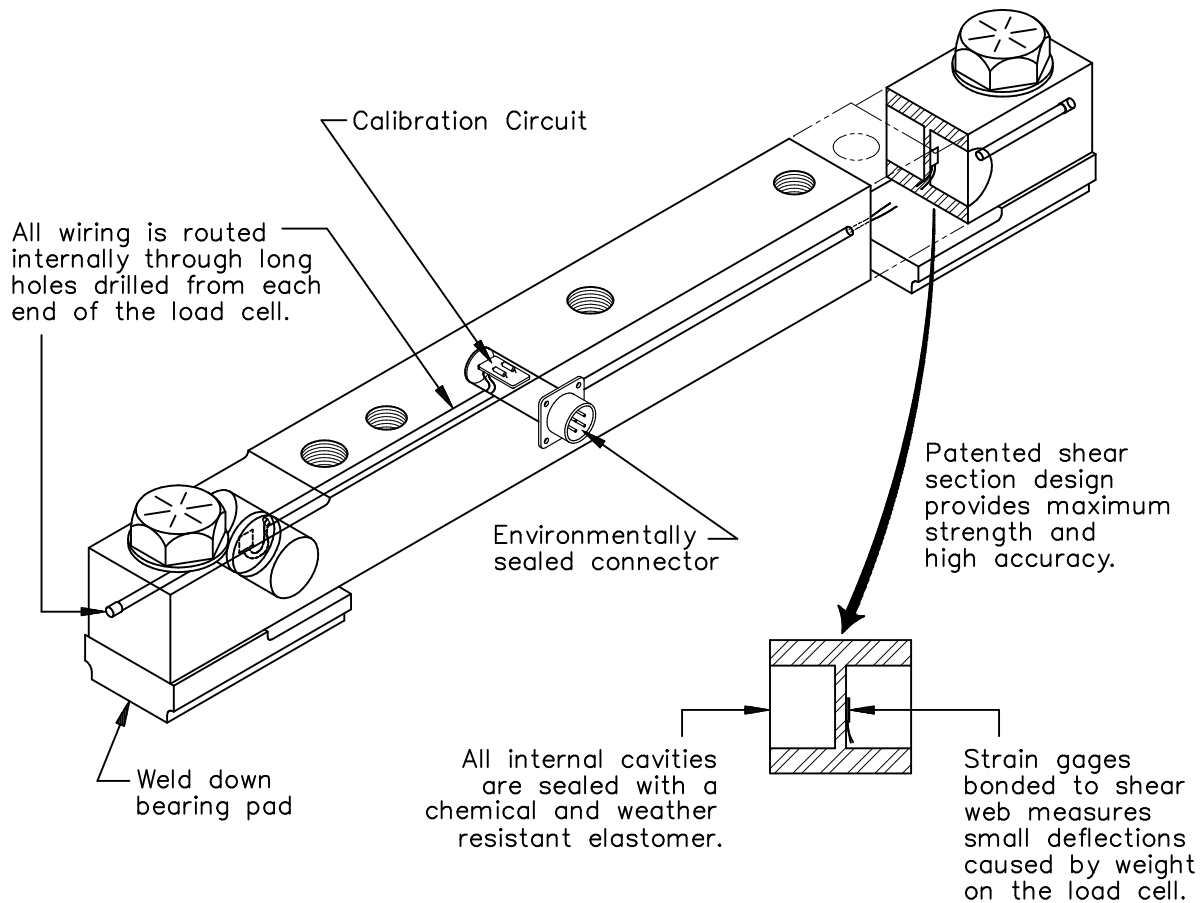


Figure 1-E: Vulcan Super - Beam Load Cell
(Covered by one or more of the following patents:
US Patent RE. 35,301, 4,459,863
Canadian Patent 1,245,677)

1.2 VSL VULCODERS

The VSL Vulcoder is specifically designed to be used with the V300S Series Meter. The functions of the VSL Vulcoder are to supply power to the load cells or other sensors and receive the analog voltage signal back from them. A computer inside the VSL Vulcoder then calculates the weight based on the calibration values, the “Tare Weight”, and the “Cal” number for that particular channel, which are stored in its memory. When the meter requests weight from a channel, the proper VSL Vulcoder will respond and send the weight information back to the meter. All VSL Vulcoders connect to the same **single 2-wire** cable. Any VSL equipped trailer can be plugged into any truck with a V300S Series Meter and be immediately identified and read properly.

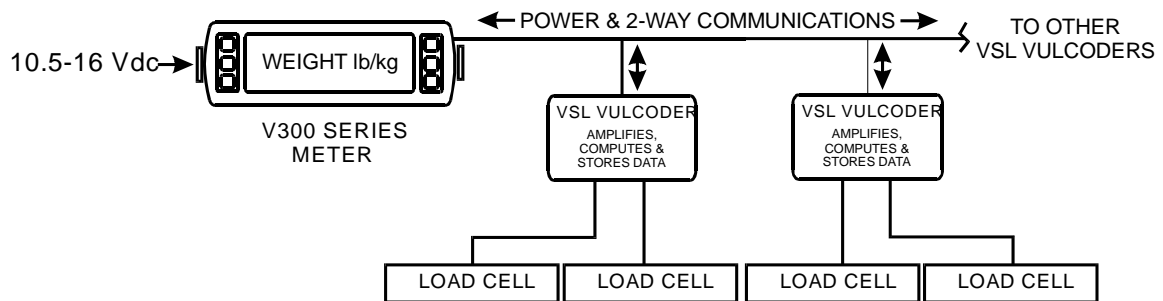


Figure 1-F: V300S Series Vulcan Electronics System Diagram Shown

1.3 V300S SERIES METER

Application: For vehicle combinations with one to four channels of weight sensing. The V300S Series Meter provides a high visibility display and the ability to easily read different trailers. The V300S Series Meter is available in two channel (V320S) and four channel (V340S) configurations.

The V300S Series Meter uses VSL technology to power and communicate with VSL Vulcoders on a single 2-wire cable. The meter requests weight information from the different Vulcoders. It then displays individual channel weights and total weight as requested by the operator. The weight can be displayed in pounds or kilograms. The meter also transfers all setup and calibration information for up to four independent channels (A, B, C, and D) into the VSL Vulcoder, where it is stored.

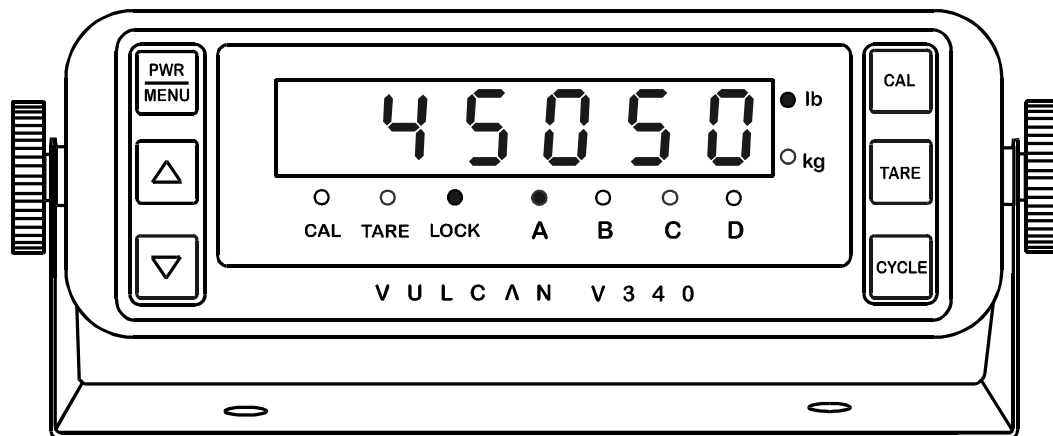


Figure 1-G: V340S 4-Channel Meter Shown

1.4 EXPLANATION OF METER CHANNELS

The V300S Series Meter can display information on up to four channels: A, B, C, and D. There is a VSL Vulcoder for each channel. The number of channels is based on the number of load cells and their grouping. For example, a trailer could have as many as four load cells per channel. The display code tells the meter which channels to display. For more information on how to select the meter display code, refer to Section 2.3 “Set Display Code”.

Refuse or Logging Truck Applications:

Typically, a refuse or logging truck application usually requires only one or two channels, A or A and B. Channel A usually represents the truck or front load cells regardless of the number of load cells connected to the VSL Vulcoder. Channel B usually represents the trailer or rear load cells. The total weight for both the front and rear load cells is represented on Channel A+B.

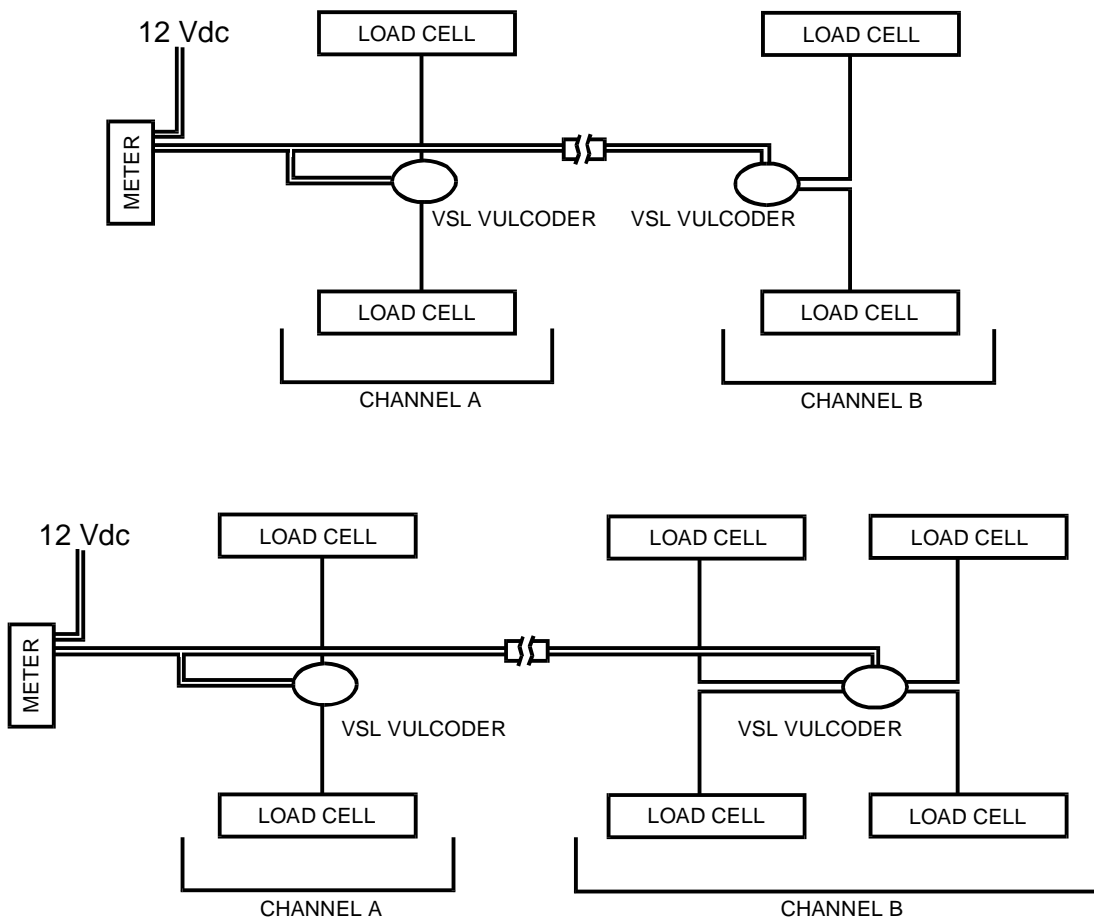


Figure 1-H: Vulcan 4 and 6 Cell System Configurations

1.5 ELECTRONICS INSTALLATION

1. Tape the VSL Vulcoder connectors prior to routing the cabling to avoid contamination. Mount the VSL Vulcoders 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.
2. Route the black cable to the load cells. (**Do not** trim the black cable to length).
3. **Important:** Check the connectors to make sure they are clean and dry. **Do not** get moisture, contact cleaner or any other substance inside of the connectors.
4. Check the load cell connector coming from the VSL Vulcoder for an O-ring. Attach the black cable connectors to the bulkhead connectors on the load cells. Make sure they are finger tight plus an additional 1/8 of a turn more with 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 load cell connector. **Caution:** Do not over tighten the connectors as this can damage them.
5. Route the single 2-wire orange VSL Vulcoder cable from the meter in the cab to the last VSL Vulcoder in the system. Be sure to route the cable to the meter and **do not** trim any excess wire off at the meter. Trim off the excess cable to approximately 1' - 2' of extra orange cable at the location of the VSL Vulcoder splice to allow for the splice. **Note:** On a truck-to-trailer connection, these wires may be routed using the existing truck-to-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. If using the separate connector, for the best and most reliable connection, connect each color wire to two pin connections. For example, connect the green wire to the top two pins of a 4-pin truck-to-trailer connector, and the white wires to the bottom two pins.
6. Connect the first VSL Vulcoder in the system to the 2-wire cable by splicing each color-coded wire from the communication cable and the VSL Vulcoder cable, (refer to Figure 1-J). 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 so that the connection is strain relieved.
7. Find a suitable location for each additional VSL Vulcoder needed in the system. Connect additional VSL Vulcoders in the system to the 2-wire cable by splicing each color-coded wire from the communication cable and the VSL Vulcoder cable (refer to Figure 1-J). 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. Then 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 so that the connection is strain relieved.

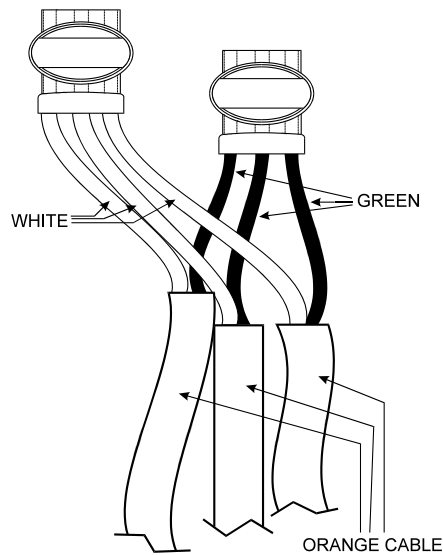


Figure 1-J: VSL Vulcoder Communication Connection

8. Once all of the Vulcoders have been installed, the Vulcoders must have either the wire loop cut or uncut. Cutting the loop wire will designate the Vulcoder as a **Front** Vulcoder (refer to Figure 1-K) and not cutting the Vulcoder designates the Vulcoder as a **Rear** Vulcoder (refer to Figure 1-L). Following this procedure will enable the meter to properly assign channels. For example, on a 2-channel system with the truck having a **Front** Vulcoder, and the trailer having a **Rear** Vulcoder, the meter will sequence the Front Vulcoder as channel A, and the Rear Vulcoder as channel B.

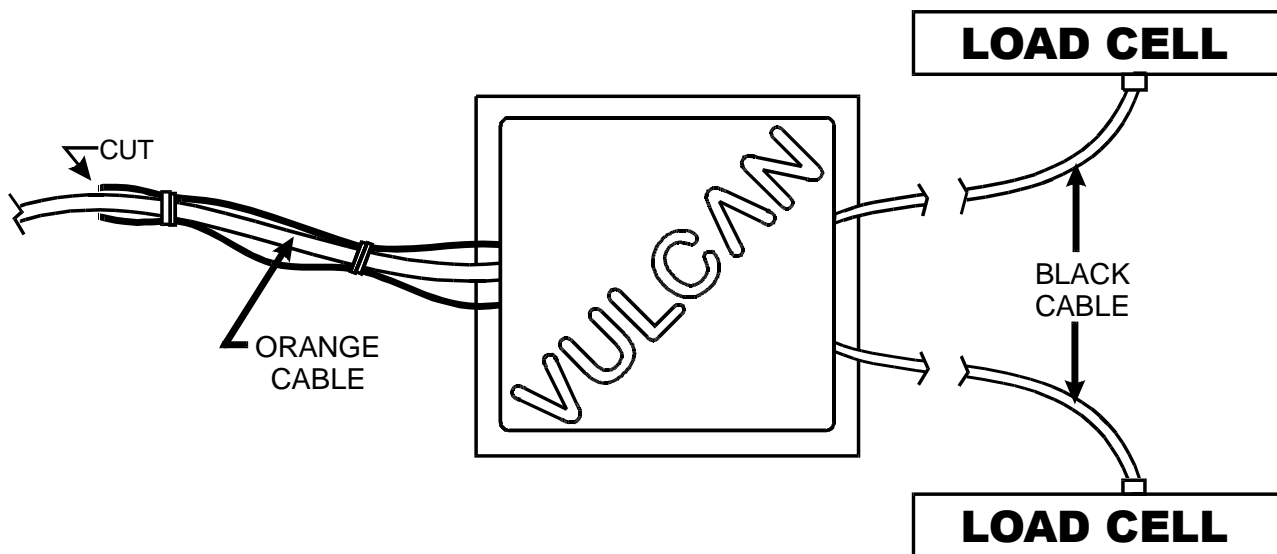


Figure 1-K: **Front** VSL Vulcoder Configuration

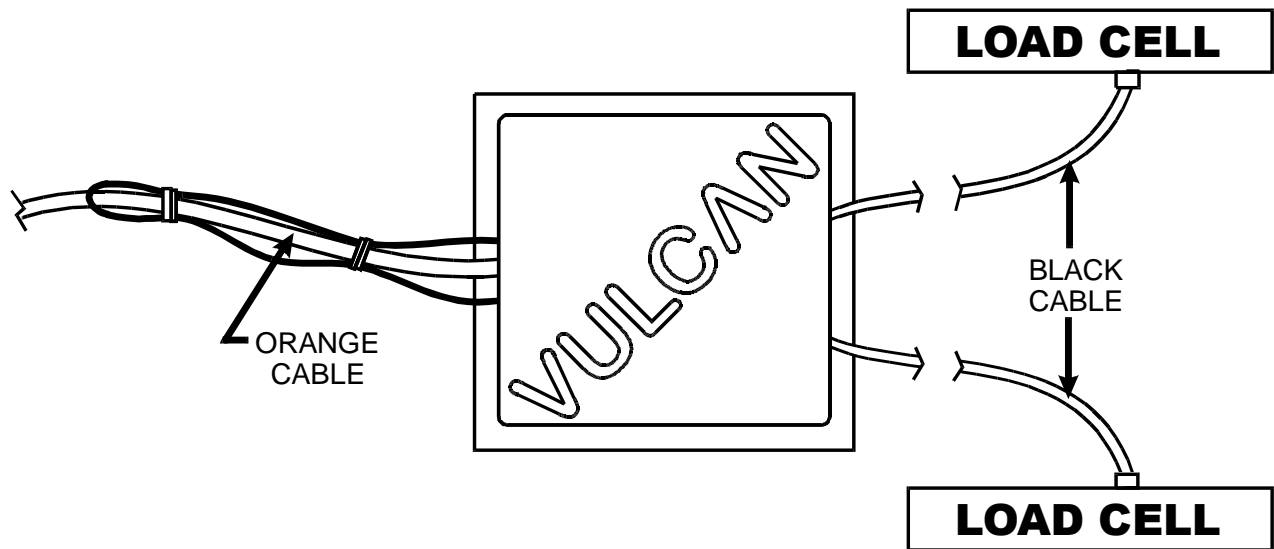
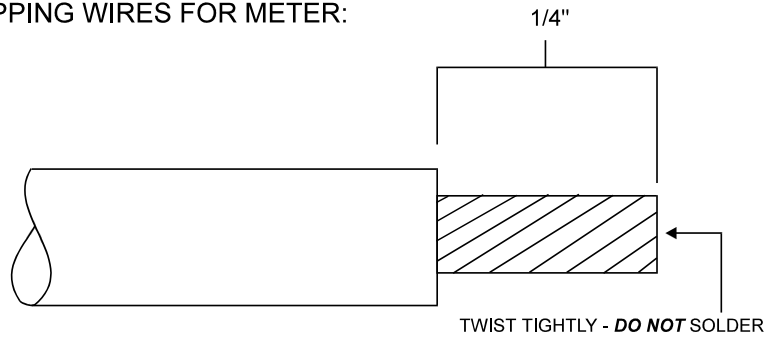


Figure 1-L: **Rear** VSL Vulcoder Configuration

9. Find a suitable location for the meter and install the mounting bracket. Secure the VSL Vulcoder cable so it does not obstruct other in cab equipment and strain relieve. 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 1-M and 1-N). 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 (refer to Figures 1-M and 1-N). **Do not** plug the terminal block into the meter at this time.
10. 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**. Refer to Section B.2 “System Specifications”. **Do not** connect the power cable to a power source activated by the key switch; power **must** be supplied at all times.

STRIPPING WIRES FOR METER:



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

Figure 1-M: Stripping Wires for the Meter

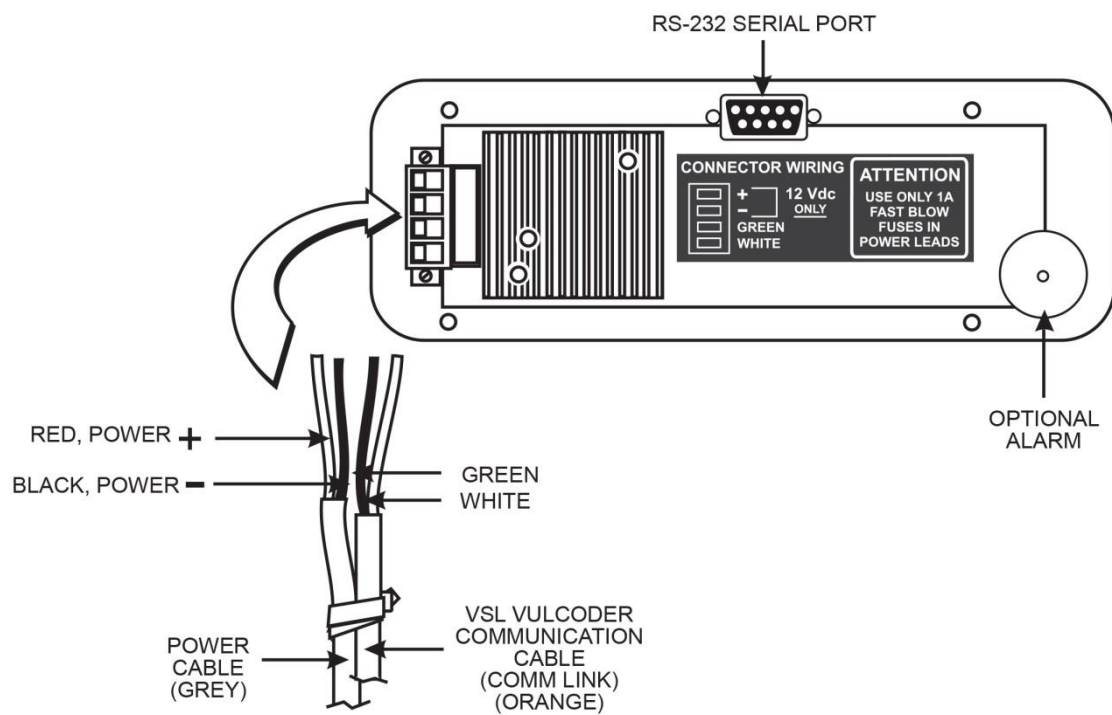


Figure 1-N: V300S Series Wire Connections to the Meter

11. Review steps 1 to 10 before connecting the terminal block to the back of the meter.

CHAPTER 2.0

V300S SERIES - PROGRAM MENU (SYSTEM SETUP)**2.1 ENTERING THE PROGRAM MENU**

The V300S Series Meter program menu enables the user to:

- **Program Sequence (PS)** – Assigns the proper sequence to the Vulcoders in the system (Section 2.2, page 16).
- **Program Axle Mode (PA)** – Allows the meter to display individual axle weights for dump trucks and roll-offs (Section 2.3, page 17).
- **Program Code (PC)** – By selecting a program code, the user tells the meter what channels and combination of channels to display (Section 2.4, page 17).
- **Program Units (PU)** – Selects the units of measure, either pounds or kilograms (Section 2.5, page 19).
- **Program Graduation (PG)** – Selects the graduation size for displaying weight (Section 2.6, page 20).
- **Program Cycle Time (PCt)** – Selects the channel cycle time (Section 2.7, page 20).
- **Program Filter (PF)** – Allows you to provide additional filtering for weight data (Section 2.8, page 21).
- **Program Port (PP)** – Determines serial port configuration (Section 2.9, page 21).
- **Program Scale ID (Pid)** – Allows a user to set a scale ID which can be transmitted as part of a serial port output (Section 2.10, page 22).
- **Program Lock (PL)** – The lock must be in the **Off** position to adjust the Tare or Calibration settings for the scale. Turning the lock to the **On** position will prevent changes to the system's calibration (Section 2.11, page 22).
- **Program Relay (Pr)** – Used to enter “set point” values to trigger external relay signals (Section 2.13, page 23).
- **Program RF Frequency (PrF)** – Used to set the RF Frequency for a V44 Remote Transmitter (Section 2.14, page 25).

To Enter the Meter Program Menu:

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

After the meter has completed its startup routine and is running, press the **PWR/MENU** button to enter the program menu.



Press the **CYCLE** button to go through the different programming options.

Note: If the **PWR/MENU** button is held too long, the meter display will show all 8's and the meter will turn off.

2.2 SEQUENCING CHANNELS

The V300S Series electronics makes it possible for a truck to haul various types of Vulcan VSL equipped trailers with “plug in and go” ease. To do this, the VSL Vulcoders need to be assigned their position (channel A, B, C, or D) in the scale system. Once a Vulcoder has been assigned its position, it will remember it and the process of sequencing does not need to be repeated, unless the position of the Vulcoder changes. Sequencing is the process in which the meter determines the order of each VSL Vulcoder or groups of load cells. For example, on a long logger, the meter reads the Front VSL Vulcoder and assigns it as channel A, and then reads the next VSL Vulcoder as a Rear and assigns this VSL Vulcoder as channel B.

After entering the Program Menu, the first mode displayed will be Program Sequence (PS). If a combination of “F” and “r” appears on the display, then the meter has detected the VSL Vulcoders. For example, “PS FrFr” would indicate that four Vulcoders were detected, where “F” indicates a front VSL Vulcoder and “r” indicates a rear VSL Vulcoder. The associated channel LEDs will also be illuminated.

Note: On new installations, the system will attempt to automatically sequence the Vulcoders. If the attempt is **not** successful, (i.e. more than one Front or Rear Vulcoder is hooked up when the meter is turned on) an Error code will be displayed (i.e. Err 03, Err 07, Err 08, or Err 09). If this happens, the system will have to be **Manually Sequenced**.

2.2.1 MANUAL SEQUENCING

Manually disconnect all trailer VSL Vulcoders as shown in figure 2-A, and confirm that if the truck has two Vulcoders, that one is set up as a Front and one as a Rear per installation instructions, section 1.5.

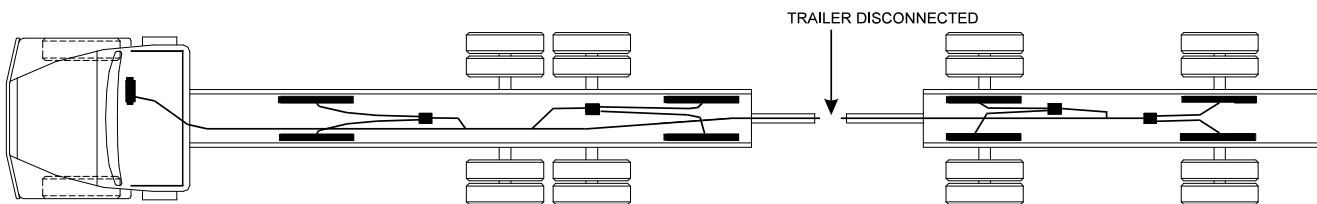


Figure 2-A: Disconnected Trailer



With the meter in the Program Sequence (PS) mode, press and release the **CAL** button to start the sequencing mode. The meter will find and sequence the truck Vulcoders in a few seconds and will display their front (F) or rear (r) designators. Manually connect each trailer, starting with the most forward trailer connection. As each connection is made, the meter will verify each connection with either an “F” indicating a front VSL Vulcoder, or an “r” indicating a rear VSL Vulcoder.

If the “PS - - -” (“PS - -” on a V320S Series Meter) appears on the display, no VSL Vulcoders are detected.



Press the **CYCLE** or **PWR/MENU** button to store the sequencing information. The meter will then advance to the next programming function. Press **PWR/MENU** to return to normal weight display mode.

2.3 SETTING AXLE MODE

“Axle Mode” has been created for use with roll-off and dump trucks to provide individual axle weights. This system is designed to work with six load sensors attached to three Vulcoder channels. It will also work with three or four load sensors attached to two Vulcoder channels. In addition, the V340 meter allows you to monitor weight on one or two “pup” channels, although axle weights are only displayed for the truck channels.

Axle weights are determined using the Center of Gravity (CG) principle. Some distances must be measured and entered into the V320S or V340S meter, along with starting calibration numbers. Additional programming/menu items have been provided to allow the user to enter these values.

Because of its unique nature, calibration of a system in Axle Mode is different from a normal scale system. Calibration and operation instructions for use in Axle Mode are detailed in Appendix A (see page 77).

To place the meter in “axle mode”, first determine the type of axle mode you are using – either a 2-channel (three or four load sensors) or a 3-channel (V340S only with six load sensors).



Place the meter in menu mode (press PWR/MENU when the weight appears on the display).



Press the **CYCLE** button until Program Axle (“PA On”– or “PA Off”) appears in the display. To turn “axle mode” on, use the ▲ or ▼ button to make the display read “PA On”.



Press the **CYCLE** button to begin entering distance measurements.

2.4 SETTING THE DISPLAY CODE

The number of VSL Vulcoders connected to the Vulcan system corresponds to the number of channels. The first number in the display code is the number of channels. The next two numbers or letters determine how the channels will be displayed. When code “000” is selected, the meter **automatically** selects the display code depending on how many VSL Vulcoders are communicating with the meter at power up. The meter display code allows the user to display a combination of one or more of the available channels.

Table of Display Codes (The first number in the display code refers to the number of channels in the system):

Display Code	Displayed Channels						
000	Automatically selects codes 101, or 201, or 301, or 402, depending on the number of VSL Vulcoders communicating with the meter.						
101	A						
201	A	B	A+B				
202	A	B					
Note: Display Codes below this line are available in the V340 Series Meter only.							
300	Consists of the following special grouping codes (3c1, 3c2, 3c3, 3c4) that can be quickly selected using the CYCLE button without going into the Program Menu. In normal operation, press and hold the CYCLE button down, then use the ▲ or ▼ buttons to select the group desired.						
3c1	A	B	A+B				
3c2	B	C	B+C				
3c3				A+B+C			
3c4	A	B	C	A+B+C			
301	A	B	C	A+B+C			
302	A	B	A+B	C	A+B+C		
303	A	B	C	B+C	A+B+C		
304	A	B	C				
400	Consists of the following special grouping codes (4c1, 4c2, 4c3, 4c4, 4c5) that can be quickly selected using the CYCLE button without going into the Program Menu. In normal operation, press and hold the CYCLE button down, then use the ▲ or ▼ buttons to select the group desired.						
4c1	A	B	A+B				
4c2	B	C	B+C				
4c3	C	D	C+D				
4c4					A+B+C+D		
4c5	A	B	A+B	C	D	C+D	A+B+C+D
401	A	B	C	D	A+B+C+D		
402	A	B	A+B	C	D	C+D	A+B+C+D
403	A	B	C	B+C	D	A+D	A+B+C+D
404	A	B	A+B	C	D	C+D	
405	A	B	D	A+B+D			
406	A	B	C	D			

Figure 2-B: Display Codes - V300S Series Meter



Press the **CYCLE** button until the **PROGRAM CODE (“PC”)** is displayed.

Example:



Use the ▲ or ▼ buttons to select the desired channel display code shown above.



Press the **CYCLE** or **PWR/MENU** button to store the display code information. Press the **CYCLE** button and the meter will then advance to the next programming function. Press the **PWR/MENU** button to return to normal weight display mode.

2.5 SETTING THE UNITS (LB OR KG)

The V300S Series Meter allows the user to display the weight in either pounds or kilograms. The LED illuminated by either pounds or kilograms, shows the unit of measurement selected. To change the unit of measurement, refer to the procedure below.



Press the **CYCLE** button until the **PROGRAM UNITS (“PU”)** appears on the display. The LED light by lb or kg will be flashing or “PU tons” will appear in the display, indicating the unit of measurement selected.



Use the ▲ or ▼ buttons to switch between lb, kg, or tons.



Press the **CYCLE** or **PWR/MENU** button to store units selected. If you press **CYCLE**, the meter will then advance to the next programming function. If you press **PWR/MENU** it will return to normal weight display mode.

2.6 SETTING THE GRAD SIZE

The grad or graduation size for the V300S Series Meter allows the meter to display the weight in 5, 10, 20, 50, 100, or 200 lb or kg increments depending on the application. The procedure to change the grad size is listed below.



Press the **CYCLE** button until the **PROGRAM GRAD (“PG”)** is displayed.

PG 100



OR



Use the ▲ or ▼ button to select the desired the Grad Size. The Grad Size settings are: 5, 10, 20, 50, 100, and 200 depending on the application.



Press the **CYCLE** or **PWR/MENU** button to store the grad size selected. Press the **CYCLE** button and the meter will then advance to the next programming function. Press the **PWR/MENU** to return to normal weight display mode.

2.7 SETTING THE CHANNEL CYCLE TIME

The V300S Series Meter allows the user to change the Cycle Time or the amount of time a channel is displayed. The user can adjust this Cycle Time from a minimum of 1 second, up to a maximum of 9 seconds. To change the Cycle Time, refer to the procedure shown below.



Press the **CYCLE** button until the **PROGRAM CYCLE TIME (“Pct”)** appears on the display.

Pct 2

To Increase the Cycle Time:



Press the ▲ button to increase the Cycle Time. Maximum Cycle Time is 9 seconds. Release the ▲ button when the desired Cycle Time is reached.

To Decrease the Cycle Time:



Press the ▼ button to decrease the Cycle Time. Minimum Cycle Time is 1 second. Release the ▼ button when the desired Cycle Time is reached.



Press the **CYCLE** button to store the Cycle Time selected. The meter will then advance to the next programming function, or press **PWR/MENU** to return to normal weight display mode.

2.8 PROGRAM FILTER

The Program Filter can be used to adjust how “heavy” the filtering is. The heavier the filtering, the longer it will take for the weight to change (and the longer before one of the relays is triggered).

To set the Filter value:



Press the **PWR/MENU** button.



Press the **CYCLE** button until “PF xx” appears (the “xx” is the current filter value – the default setting is 1). Press the ▲ or ▼ buttons to adjust this value. Values count in powers of 2, that is, if the current reading is 16, the ▼ button will cause it to read 8, while the ▲ button will cause it to change to 32. A setting of 1 turns the filtering off.

2.9 PROGRAM THE SERIAL PORT

The V320S can communicate with external devices through its optional serial port. If the meter has the serial port installed, you can program this port using the “PP” menu for the following types of output (See Appendix C for detailed specifications of these output formats):

- **PP off** – no serial port output.
- **PP obc** – used for sending weight data to an On-board Computer (similar to “OBC” output from a Vulcan V600 Meter – see page 89).
- **PP GPS** – used for sending weight data to a GPS device using NMEA 0183HS protocol (page 91).
- **PP ALL** – transmits individual channel weight data (similar to “WEIGHT” output from a Vulcan V600 Meter – see page 92).
- **PP sb3** – sends weight data to a three digit scoreboard (similar to “SCRBD3” output from a Vulcan V600 Meter – see page 93).
- **PP sb6** – sends weight data to a six digit scoreboard (similar to “SCRBD6” output from a Vulcan V600 Meter – see page 94).
- **PP sb** – sends weight data for each channel as well as the total of all channels to six digit scoreboards. See page 95.
- **PP SCA** – sends specially formatted output to a “Serial to 4-20 mA” converter (similar to “SCADA” output from a Vulcan V600 Meter – see page 95).



Press the **CYCLE** button until **PROGRAM PORT (“PP”)** appears on the screen. **Note:** If the optional serial port has not been installed on the meter, this menu item will not appear.



Use the ▲ or ▼ button to choose one of the output formats listed above.



Press the **CYCLE** or **PWR/MENU** button to store the serial output format selected. Press the **CYCLE** button to advance to the next programming function. Press the **PWR/MENU** button to return to normal weight display mode.

2.10 SETTING THE SCALE ID

The **PROGRAM ID** (“Pid”) menu item is used to set the scale ID. To enter or change the scale ID, with “Pid” on the display, press the **CAL** button. The meter will display the current ID. You may change this using the ▲ or ▼ buttons. Press **CYCLE** to store the scale ID and advance to the next programming function, or press the **PWR/MENU** button to return to normal weight display mode.

2.11 SETTING THE LOCK (TARE AND CAL LOCKOUT)

The Lock option prevents drivers or other personnel from accidentally changing the calibration settings on the scale system. If the Lock is “on”, the Tare and Calibration values cannot be changed. Below is a procedure to turn Lock feature “on” or “off”.



Press the **CYCLE** button until the **PROGRAM LOCK** (“PL OFF” or “PL On”) is displayed.



Use the ▲ or ▼ buttons to activate or deactivate the Lock feature.

PL OFF

“PL OFF” Lockout deactivated.

PL On

“PL On” Lockout activated.



Press the **CYCLE** or **PWR/MENU** button to store the lock information. Press the **CYCLE** button to advance to the next programming function. Press the **PWR/MENU** button to return to normal weight display mode.

2.12 ENABLING THE PASSCODE FEATURE

The Passcode Feature prevents access to ALL menu items (except “Program RF Frequency”, if a V44 Remote Transmitter is detected, see Section 2.14, page 25) until the proper passcode is entered. You may enable this feature and assign the passcode (any number from 1 to 999) from the Program Lock menu.



With either “PL On” or “PL Off” displayed, press the **CAL** button. The display will change to “PL 000”.

PL 000

“PL 000” – Passcode Feature disabled



Use the ▲ or ▼ buttons to set the passcode from “001” to “999”. If the value is set to “000”, the Passcode Feature is disabled.

Setting the Passcode Feature automatically “locks” the meter. From this point on, whenever the **PWR/MENU** button is pressed, instead of the first menu item, “PL 000” will be displayed. Use the **▲** or **▼** buttons to set the value to the correct passcode and press the **CYCLE** button to access the menus. Note that once you exit from menu mode, the Passcode Feature will be reengaged. Entering the wrong passcode will return the meter to Display Weight Mode.

WARNING: If you forget the passcode, you may be locked out of the meter. Contact Vulcan On-board Scales Service Department (1-800-237-0022).

To disable the Passcode Feature permanently, enter the Menu Mode by pressing the **PWR/MENU** button. “PL 000” will be displayed. Enter the proper passcode and press **CYCLE**. Continue to press the **CYCLE** button until “PL On” is displayed. Press the **CAL** button. “PL” followed by the current passcode will be displayed. Press BOTH the **▲** and **▼** buttons simultaneously to set the passcode to “000”. Press **PWR/MENU** to return to “PL On”. You may leave the “Program Lock” active or use the **▲** or **▼** to change this setting to “PL OFF”. Press **PWR/MENU** to return to Display Weight Mode.

2.13 PROGRAM RELAYS

The V320S and the V340S can be used to operate the VSL Set Point Relay Controller. This controller is attached to the VSL line like a standard Vulcoder. Its outputs, however, can be used to control lights, motors, or even send signals to other devices. The VSL Set Point Relay Controller comes standard with two relays which can operate independently.

The user-specified set point limits can be used to let the driver or loader operator know when the weight on the vehicle has exceeded those specified amounts.

The easiest way to describe the normal operation of this system is to use an example. Suppose we have a two-channel V320S. We program (see below) Relay 1 of the VSL Set Point Module to monitor the weight on Channel A and trigger at 20,000 pounds. In order to prevent “chatter”, we also want to assure the relay stays on until the weight drops below 19,000 pounds. Now suppose we load our truck so that 21,000 pounds is registered on Channel A. As soon as the V320 meter detects that the weight on Channel A has risen above 20,000 pounds – *and remains there for 2 seconds* – Relay 1 will close. The meter will indicate that a set point has been triggered by alternating the display between “OL r1” and “21000” and the Channel A LED will flash. “OL” means “Over Limit” and “r1” refers to Relay 1. The flashing LED indicates which channel (in our example Channel A) or combination of channels has caused the over limit, and the weight shows the current weight on the channel combination. Relay 1 will remain closed until the weight drops below 19,000 pounds.

Note: To return the meter display to normal operation, press the **CYCLE** button on the V320S/V340S Meter. The relay, however, will remain closed until the weight drops below the low point threshold *and remains there for 2 seconds*.

To program Relay 1

1. Before programming a set point, the V320S/V340S must be “locked” on the channel or channel combination you wish to monitor, unless you only have a single channel system. To do this, press the **CYCLE** button until the channel-LED’s indicate the combination you want and the Lock LED is lit. Remember, the channels that are monitored for set point operation are independent of the channels the meter is displaying. You may program the meter to monitor any valid combination of channels.
2. Press the **PWR/MENU** button. The display will show “PSxx “ or “PSxxxx”, where xxxx is a combination of “f”, “r” or “-”. For example, if you had a two-channel system, the meter would normally display, “PSfr ”, indicating one “Front” and one “Rear” Vulcoder.
3. Press the **CYCLE** button until the display shows “Pr1 Hi”. If “Pr1 Hi” does not appear in the display, you are not properly “locked” on a channel combination. In that event, press **PWR/MENU** to return to normal operation, and then return to step 1 above.
4. Press **CAL** or **TARE** to save the channel combination to be monitored. The channel-LED will flash with the channel combination you selected. The upper display will show the current set point threshold.
5. Use ▲ and/or ▼ to set this value to the desired set point threshold. Note, if you set this value to 0, the relay is disabled. You may set the value to 0 quickly by pressing ▲ and ▼ simultaneously. In the example described above, this value would be set to “20,000”.
6. Press **PWR/MENU** to return the display to “Pr1 Hi”.
7. Press **CYCLE**. The display will show “Pr1 Lo”. Using this setting allows you to specify the low point threshold. That is, the weight below which the relay will open. If you do not specify a low point, the relay will open after the weight drops below the high point threshold and remains there for 2 seconds. In the example described above, this value would be set to 19,000.
8. Press **PWR/MENU** to return the display to “Pr1 Lo”.
9. Press **CYCLE**. The display will show “Pr2 Hi”.
10. Return to step 4, if you wish to program Relay 2 using the same channel combination as Relay 1 or
11. Press **PWR/MENU** again to return to normal operation.

To program Relay 2

Proceed as shown above for Relay 1, beginning with step 1. In step 3, press the **CYCLE** button until the display shows, “Pr2 Hi”.

2.14 PROGRAM RF CHANNEL

The “PrF” menu selection will only appear if the V320S/V340S detects a V44 RF Vulcoder on the VSL line. This menu selection allows you to choose an RF frequency for the V44. There are seven possible frequencies (“PrF 1” through “PrF 7”) and “off”. Since the V44 is meant to be used with a V700 Remote Display, you must set the both the V44 and the V700 to the same RF frequency.



Use the ▲ or ▼ buttons to change the RF Frequency of the V44.

2.15 EXITING THE PROGRAM MENU

To Exit the Meter Program Menu:



Press the **PWR / MENU** button to exit from the program menu at any time to return to the normal operating mode.

Note: If the **PWR / MENU** button is held too long the meter will display all 8's and the meter will turn off.

CHAPTER 3.0

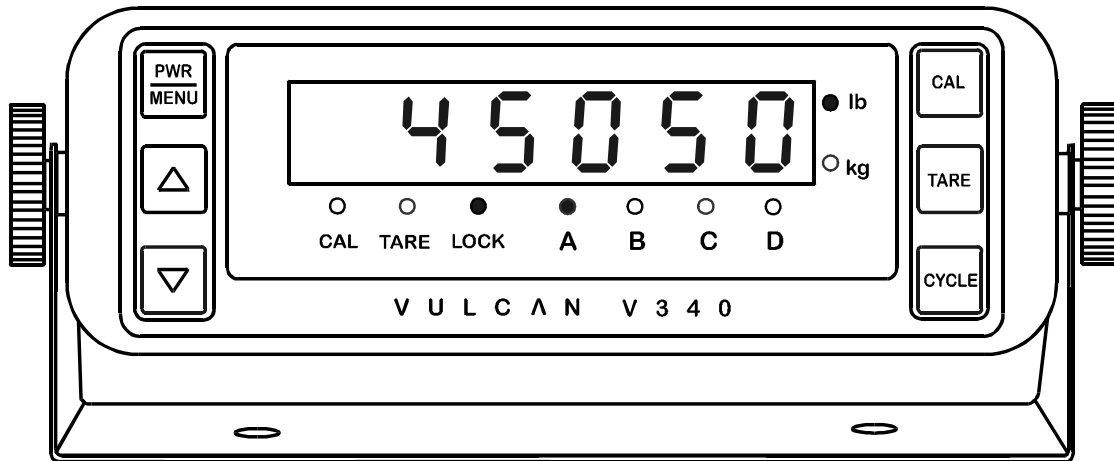
V300S SERIES METER OPERATION**3.1 TURNING THE METER ON AND OFF**

Figure 3-A: V340S Meter Shown

To Turn the Meter On:

Press the **PWR / MENU** button for less than 2 seconds.

To Turn the Meter Off:

Press and *hold* the **PWR / MENU** button until the meter display goes blank.

3.2 CHANGING DISPLAY INTENSITY

There are four levels of display intensity to choose from.

To Increase the Display Intensity:

Press the **▲** button while in the normal operating mode.

To Decrease the Display Intensity:



Press the ▼ button while in the normal operating mode.

Note: Upon the next power up the meter will start up where the intensity was last set.

3.3 LOCKING THE METER ON A PARTICULAR CHANNEL

The illuminated LED light below the channel designation indicates the channel or group of channels currently being displayed. The meter will automatically cycle through the channels and groups of channels as determined by the display code setting.

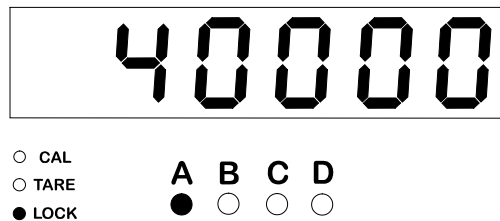
If two or more LEDs are illuminated, this represents the sum of the weights on those channels. For example, if A, and B are both illuminated, the meter is displaying the total weight on A and B, (A+B).

To Lock on a Channel:



When the desired channel or group of channels is being displayed, press the **CYCLE** button to stop the automatic advance.

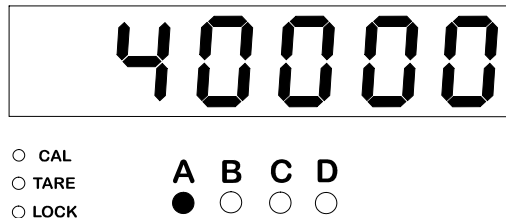
The **LOCK** LED is turned on and the meter is locked on that particular channel(s).



To Unlock the Channel:



Press the **CYCLE** button again. The **LOCK** LED will be turned off and the meter will continue to cycle through the channels.



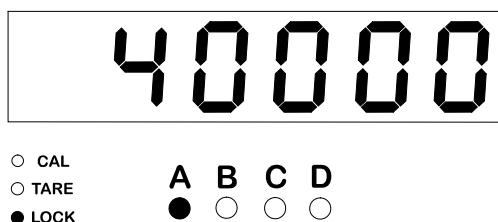
Note: Upon the next power up, the meter will start up where it was last set, either locked on a channel(s) or in the cycling mode.

3.4 DISPLAYING TARE WEIGHT

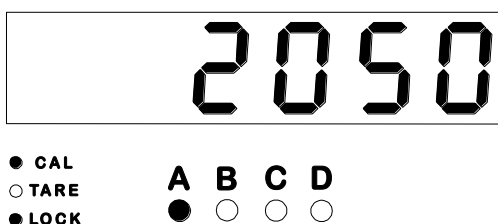
Lock the meter on Channel A, B, C, or D. The Tare weight is the **displayed** reading when the vehicle is **empty**. For setting the Tare weight, refer to Chapter 4.0 “V300S Series Calibration”.

3.5 DISPLAYING CALIBRATION NUMBERS

Lock the meter on Channel A, B, C, or D. The **LOCK** LED will be illuminated.



Press and release the **CAL** button. The **CAL** LED will be illuminated and the meter channel will flash.



To View the Cal Number on Other Meter Channels:



Press the **CYCLE** button until the meter is locked on the desired channel, either A, B, C, or D.

To Exit - Displaying Cal Numbers:



Press and release 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).

3.6 VULCODER UPDATING

After adjustments have been made to the meter's set-up, tare or calibration values, the meter will update the Vulcoders with the new information while displaying “-----”. **Note:** Do **not** power off the meter while it is updating the Vulcoders.

CHAPTER 4.0

V300S SERIES CALIBRATION

Calibration is fine-tuning a system to maximum accuracy in reference to a specific certified platform scale. It is important to calibrate the scales for high accuracy to achieve the maximum hauling payload. Calibration consists of setting the appropriate **Tare weight** and **Calibration number** for each channel.

It is important that conditions remain as constant as possible throughout the calibration process. Inaccuracies may result from differences in fuel load, ice, or mud build-up, number of people in the vehicle, 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 repeatedly do not closely match the certified platform scale weights.

4.1 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. In addition to these methods, Vulcan Scales can be used to determine Axle Weight on certain on-board scale configurations.

Important Notice for Front Loader Refuse 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.

AXLE WEIGHT

Vulcan Scales can be used to reduce overweight fines by measuring a vehicle's axle weight. For some vehicle configurations, such as many logging trucks and trailers, the channel weights will be the axle group weight.

For other configurations, the channel weight may not be the actual axle group weights because other axles are sharing some of the load. For short log and refuse trucks, the scales can indicate a weight on an axle group 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 the channel of the meter corresponding to the axle group 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 the steering axle weight when fully loaded.

4.1.1 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 each channel 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. For a V320S 2-channel system (A and B) the total Gross Vehicle weight is displayed on Channel A+B. For a V340S 4-channel system, the total Gross Vehicle weight is displayed as Channel A+B+C+D.

4.1.2 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 for each channel. The weight displayed at all times is the Net Payload weight.

4.2 PROCEDURE FOR ENTERING TARE WEIGHTS

GROSS VEHICLE & NET PAYLOAD WEIGHT METHODS

To properly calibrate a V300S Series system, all channels in use need to be calibrated. Listed below is a procedure for entering the Tare weights. The Tare weights must be entered for each channel.

IMPORTANT: The truck and trailer must not be in a twist or turn while entering the Tare weights.

4.2.1 Entering Tare Weight for a Typical 2 - Channel, Truck & Trailer System

Weigh the entire empty truck with full fuel tanks and driver (both front and rear axles) using a certified platform scale. This is the truck's Tare Weight. Enter this number in the space provided on the next page. For the Net Payload Weight Method the Tare weight must be set to zero. **Note:** If your truck will be hauling different trailers, weigh the entire empty truck with the trailer disconnected, and with full fuel tanks and driver (both front and rear axles) using a certified platform scale.

Tare weight of entire empty truck: _____

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

Tare weight of entire empty trailer: _____

Stop the empty truck and trailer on level ground.



Press and release the **TARE** button. The **TARE** and **LOCK** LEDs are illuminated. The flashing LED below the channel designation indicates which channel is selected. In addition, the unit of measurement, either **lb** or **kg** is also flashing.



Use the **CYCLE** button to select a channel or to advance to the next channel while remaining in the set Tare mode.



OR

Use the ▲ or ▼ buttons to increase or decrease the displayed Tare weight to match the actual Tare weight for each channel.

If the Tare Number, Channel, and Weight Indicators are Flashing:

The Lock option is activated. The ▲ and ▼ buttons have no effect. Refer to Section 2.11 (page 22) to deactivate the Lock feature.

To Return to Normal Operating Mode:



Press and release the **TARE** button.

4.2.2 Entering Tare Weight for a Typical Short Logger System

Weigh the entire empty truck with full fuel tanks and driver (both front and rear axles) using a certified platform scale. This is the truck's Tare weight. Enter this number in the space provided. For the Net Payload weight method the Tare weight must be set to zero.

Tare weight of entire empty truck: _____

Divide the empty truck weight by 2 and enter in the space provided.

Tare Weight of entire empty truck divided by 2: _____

Weigh the front axle group of the empty trailer.

Tare Weight of front axle group of the empty trailer: _____

Weigh the rear axle group of the empty trailer.

Tare Weight of rear axle group of the empty trailer: _____

Stop the empty truck and trailer on level ground.



Press and release the **TARE** button. The **TARE** and **LOCK** LEDs are illuminated. The flashing LED below the channel designation indicates which channel is selected. In addition, the unit of measurement, either lb or kg is also flashing.



Use the **CYCLE** button to select a channel or to advance to the next channel while remaining in the set Tare mode.



Use the ▲ or ▼ buttons to increase or decrease the displayed Tare Weight to match the actual Tare Weight for each channel.

Note: To quickly set the Tare Weight to zero, press the ▲ and ▼ buttons at the same time.

If the Tare Number, Channel, and Weight Indicators are Flashing:

The Lock option is activated. The **UP** and **DOWN ARROW** buttons have no effect. Refer to Section 2.7 to deactivate the Lock feature.

To Return to Normal Operating Mode:



Press and release the **TARE** button.

4.2.3 Entering Tare Weight for a Typical 2-Channel Refuse System

Weigh the entire empty truck with full fuel tanks and driver (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: _____

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 (Channel B): _____

Subtract the Tare weight of the Rear Axle Group from the Tare weight of the entire truck and enter this number in the space provide below.

Tare weight of Front Axle (Channel A): _____

Stop the empty truck on level ground.



Press and *release* the **TARE** button. The **TARE** and **LOCK** LEDs are illuminated. The flashing LED below the channel designation indicates which channel is selected. In addition, the unit of measurement, either lb or Kg is also flashing.



Use the **CYCLE** button to select a channel or to advance to the next channel while remaining in the set Tare mode.



OR Enter the Tare weight of the Rear Axle Group as Channel B using the ▲ or ▼ buttons to increase or decrease the displayed Tare weight, to match the actual Tare weight for each channel.

Note: To quickly set the Tare Weight to zero, press the ▲ and ▼ buttons at the same time.

If the Tare Weight, Channel, and Weight Indicators are Flashing:

The Lock option is activated. The ▲ and ▼ buttons have no effect. Refer to Section 2.7 to deactivate the Lock feature.

To Return to Normal Operating Mode:



Press and *release* the **TARE** button.

4.3 PROCEDURE FOR ENTERING STARTING CALIBRATION NUMBERS

To properly calibrate a V300S Series system, all channels in use need to be calibrated. Listed below is a procedure for entering the starting calibration numbers. The starting calibration numbers must be entered for each channel.

Stop the empty truck on level ground.

Look up Cal Numbers for all active channels in Section B.1.

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

Starting Channel C Cal Number: _____ Starting Channel D Cal 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.



Press the **CYCLE** button to select a channel or to advance to the next desired channel A, B, C, or D to enter calibration numbers.



OR



Use the ▲ or ▼ buttons to increase or decrease the Cal Number to the above, recorded Cal Number for each channel.

If the Cal Number is flashing:

The Lock option is activated. The ▲ and ▼ buttons have no effect. Refer to Section 2.7 to deactivate the Lock feature.

To Exit the Calibration Mode:



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).

4.4 FINE TUNING THE CALIBRATION NUMBER FOR GROSS VEHICLE WEIGHT METHOD WHEN ONLY ONE CHANNEL PER TRUCK OR TRAILER IS USED

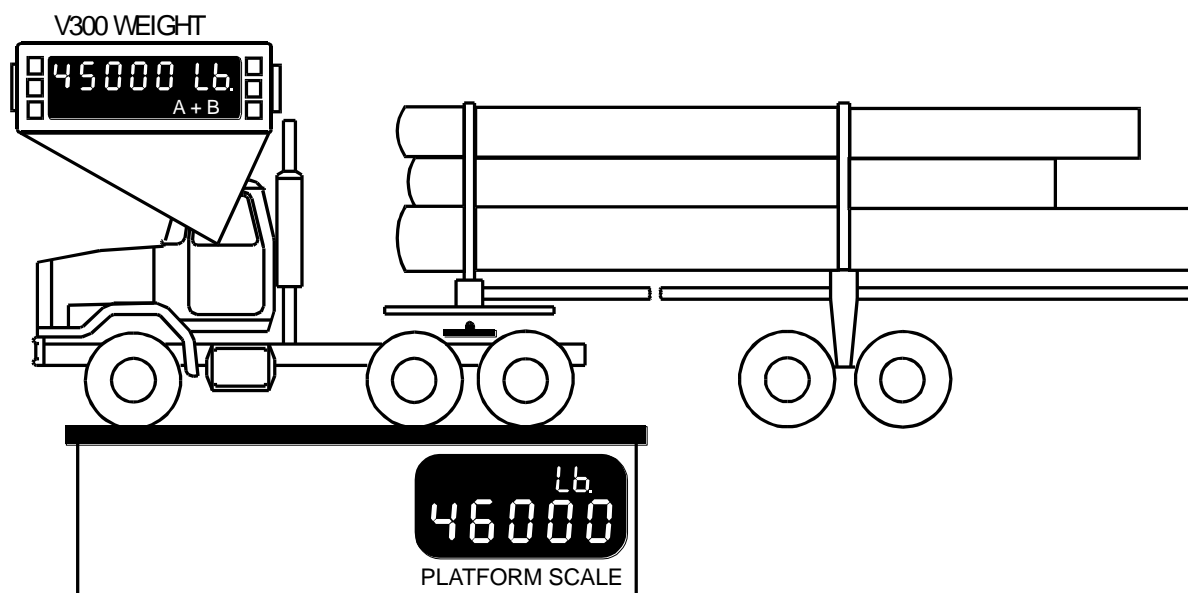


Figure 4-A: Calibration GVW - One Channel Used

To properly calibrate a V300S Series system, all channels used need to be calibrated. Adjusting the Cal Number or Cal Weight adjusts the system sensitivity as compared to a certified platform scale. The Cal Number is a reference number that is used to help the user keep track of the system calibration. The Cal Weight displays the full weight for a particular channel and is used to aid the user in properly adjusting the system calibration by verifying any adjustments made to the Cal Number. This feature however, **cannot** be used in all applications because of certain system configurations. At least **500 lb** of weight must be applied to the specific channel before the Cal Weight function is operable. Listed is a calibration procedure for the Gross Vehicle Weight Method. **Note:** Each channel in use must be properly calibrated (ex: A, B, C, and D). If additional assistance is needed to fine-tune your scale system, please follow the instructions shown in Section B.3 “Assistance in Fine Tuning Your Scale System”.

Calibration Procedure:

Fully load the truck close to the legal limit.

Weigh each channel individually on a platform scale and record the weight.

Channel A Loaded weight: _____

Channel B Loaded weight: _____

Channel C Loaded weight: _____

Channel D Loaded weight: _____

Park on level ground.



Press the **CYCLE** button until the desired channel A, B, C, or D and the **LOCK** LED is displayed.



Press the **CAL** button once to enter the Cal Number mode and the **CAL** LED is displayed.



Press the **CAL** button again to enter the **Cal Weight** mode. The units of measure (lb or kg) LED will be flashing.



Use the ▲ or ▼ buttons to adjust the displayed weight to match the actual **loaded** platform reading. (This will automatically adjust your Cal Number). You must exit the Calibration mode to save your new Calibration.

To Exit the Calibration Mode:

Press the **CAL** button until the **CAL** LED is no longer illuminated.

4.5 FINE TUNING THE CALIBRATION NUMBER FOR GROSS VEHICLE WEIGHT AND NET PAYLOAD WEIGHT METHODS WHEN MORE THAN ONE CHANNEL IS USED PER TRUCK OR TRAILER

To properly calibrate a V300S Series system, all channels used need to be calibrated. Listed below is a calibration procedure for the Gross Vehicle Weight and Net Payload Weight Methods when more than one channel is used per truck or trailer. If additional assistance is needed to fine-tune your scale system, please follow the instructions shown in Section B.3 “Assistance in Fine Tuning Your Scale System”. **Note:** When fine-tuning a trailer with the load cells positioned over an axle group, refer to section 4.4 for fine-tuning the Calibration number.

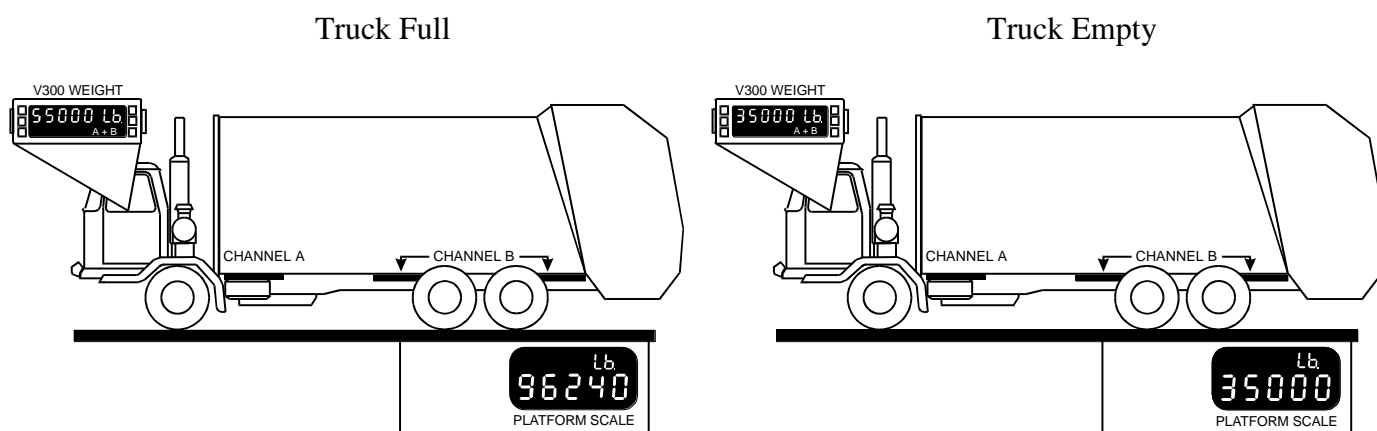


Figure 4-B: Calibration GVW and Net Payload - More than One Channel Used on 2-channel refuse system.

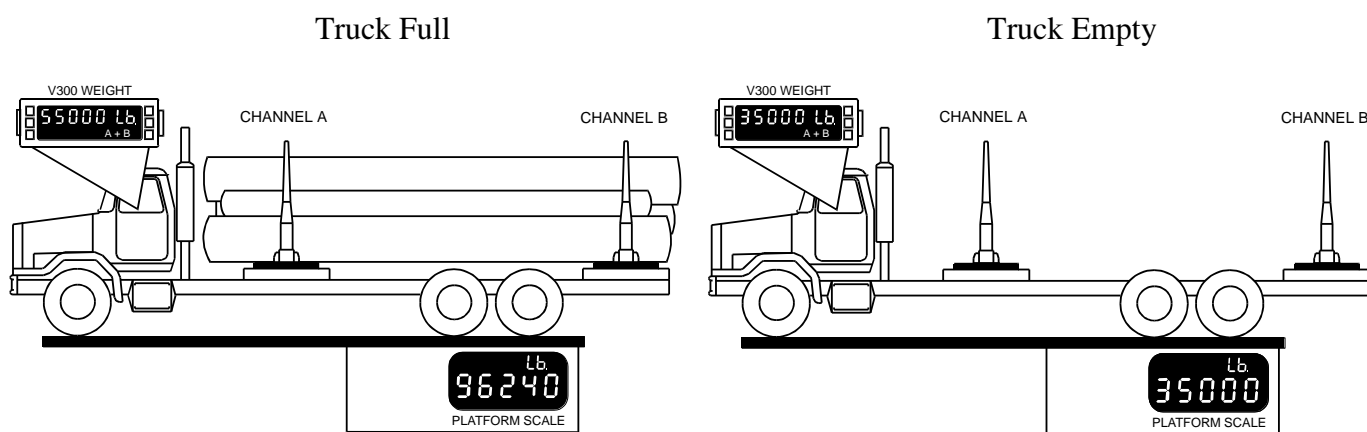


Figure 4-C: Calibration GVW and Net Payload - More than One Channel Used on 2-channel logger system.

Calibration Procedure:

1. Fully load the truck close to the legal limit.
2. Lock the meter on the two channels being calibrated. Example: 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 V300S Series Meter.
 - a) Weight Shown on Certified Scale (truck fully loaded)

(Example: 56,240 lb Certified Scale: truck fully loaded)
 - b) Weight Shown on V300S Series Meter (truck fully loaded for channels selected, Example: A+B)

(Example: 55,000 lb V300S Series Meter: truck fully loaded)
4. Dump the payload.
5. Weigh the empty truck on the same certified platform scale. Record the weight shown on the certified scale and the weight as shown on the V300S Series Meter for the channels selected (Example: A+B).
 - a) Weight Shown on Certified Scale (truck empty)

(Example: 35,000 lb Certified Scale: truck empty)
 - b) Weight Shown on V300S Series Meter (truck empty) for channels selected (Example: A+B)

(Example: 35,000 lb V300S Series Meter: truck empty)

6. Calculate the Net weight for both the Certified Scale Readings (P) and the V300S Series Meter reading (V) by subtracting the truck empty weight from the truck fully loaded weight.

$P = \text{Weight shown on Certified Scale (truck fully loaded)} - \text{Weight shown on Certified Scale (truck empty)}$

Example: $(P = 56,240 \text{ lb} - 35,000 \text{ lb} = 21,240 \text{ lb})$

$V = \text{Weight shown on V300S Series Meter (truck fully loaded)} - \text{Weight shown on V300S Series Meter (truck empty)}$.

Example: $(V = 55,000 \text{ lb} - 35,000 \text{ lb} = 20,000 \text{ lb})$

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 each Channel refer to the formula shown below:

$\text{New Channel Cal Number} = \text{Old Channel Cal Number} \times (P / V)$.

Example: Old Channel Number = 2050

$P = 21,240 \text{ lb}$ (Certified scale **net** weight).

$V = 20,000 \text{ lb}$ (Vulcan scale **net** weight).

$\text{New Channel Number} = 2050 \times (21,240 / 20,000) = 2177$

9. The Calibration Number for Channel B is the same as the Calibration Number for Channel A.
 $\text{Channel B New Cal Number} = \text{Channel A New Cal Number}$
(Example: Channel B New Cal Number = 2177)
10. Record the new Cal Numbers in Section B.4, "Keeping Records" located in the Appendix.
11. Repeat this procedure for other channels if they do not directly represent axle group weights.
(Example: C and D)

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.

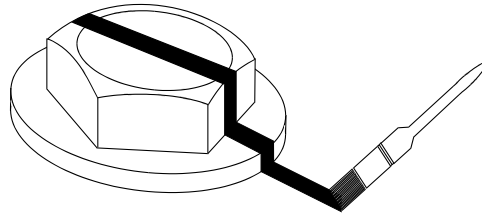


Figure 5-A: Painting a Torque Stripe

3. Check and remove any buildup of mud, ice, or other debris that may obstruct the load cell's deflection under load. Refer to the drawing below and Section A in Figures 5-C through 5-L.

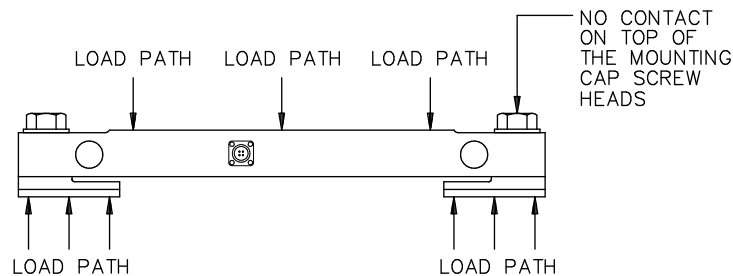


Figure 5-B: Load Path Diagram

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 body springs are intact and bolt locks are in place.
9. Tipper type trucks: Check the load cell 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 AND TORQUE SPECIFICATIONS

The following simple, but important, preventive maintenance steps must be performed periodically. For example, after the first 500 miles, then monthly, 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-L.
2. Check load cell connectors (refer to **location B** shown on Figures 5-D through 5-L); 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 VSL 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 VSL 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.

Note: In areas where salt is used on the roads, wrap the threads of the load cell connector with plumber tape, (Teflon tape). This will not allow salt to penetrate the threaded connection.

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-L 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:	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. Check welds on load cell brackets. **IMPORTANT:** If a weld repair is required, remove the load cell. **CAUTION! Do not exceed 140 degrees Fahrenheit (60 C) on the load cell. Arcing on the body of the load cell voids the manufacturer’s warranty and may seriously damage the load cell’s structural integrity. The load cell must NOT be installed if this occurs.**
7. Tipper Trucks: Keep bearing surfaces greased preferably with a Moly Disulfide type of grease.
8. Check and grease the rear hinge pin / pillow block assembly.
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

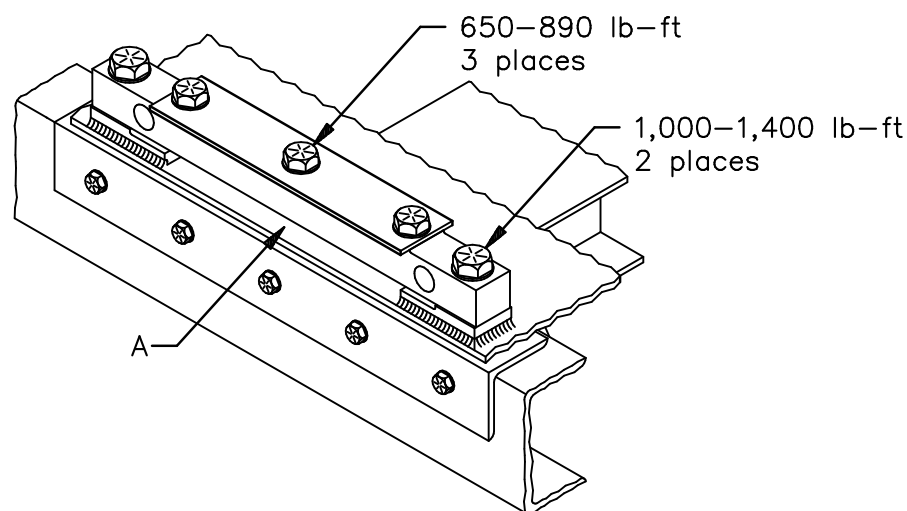


Figure 5-C

Hutch Modular Center Hanger Mounting

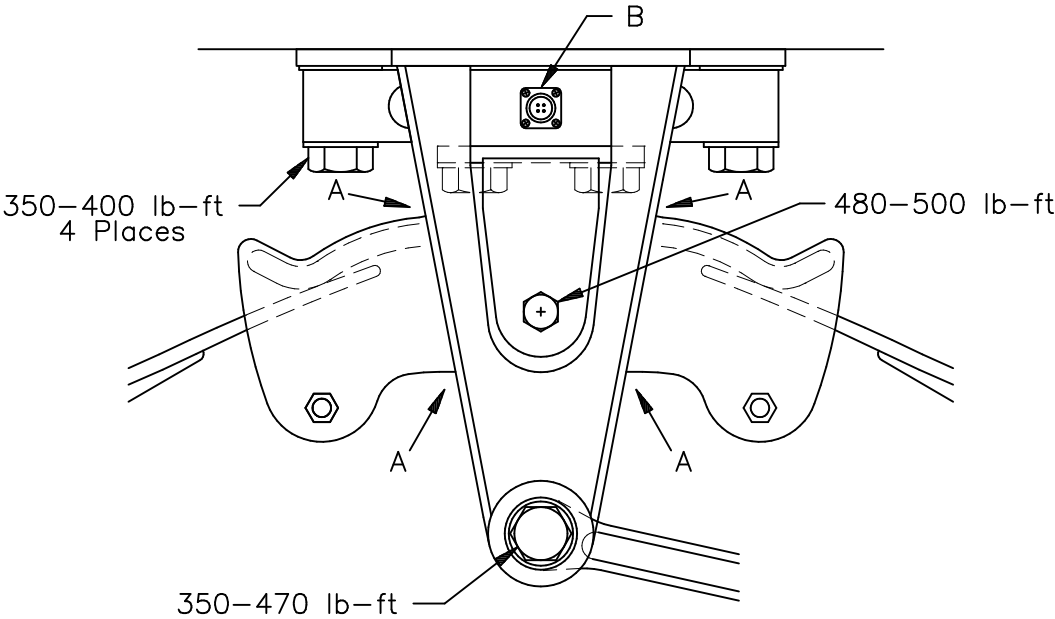


Figure 5-D

Typical Hutch or Transpro Center Hanger Mounting

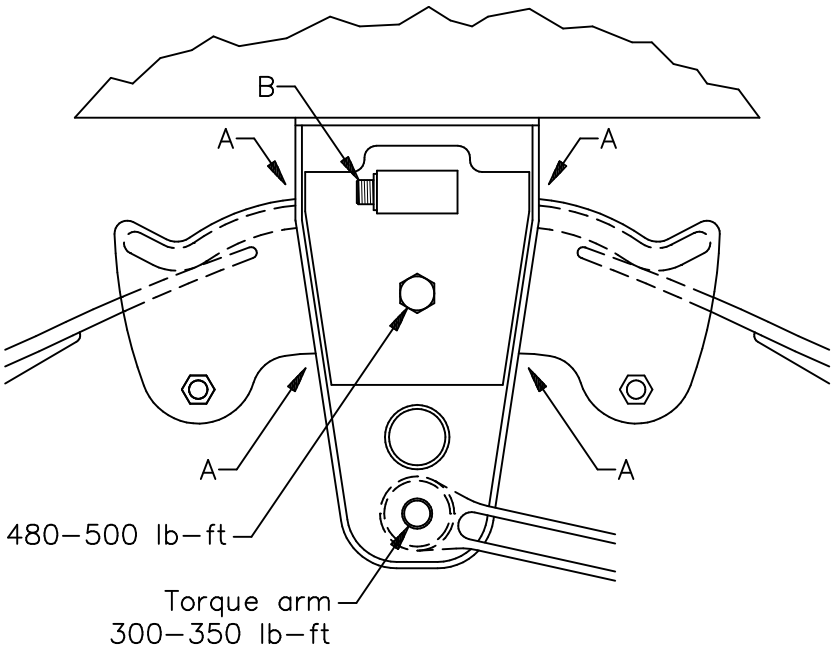


Figure 5-E

Typical Single Point Mounting

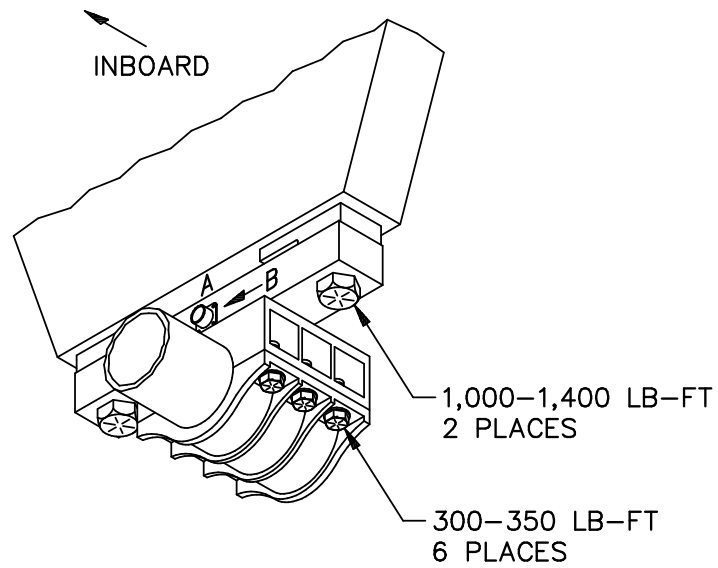


Figure 5-F

Typical Holland 5th Wheel Mounting

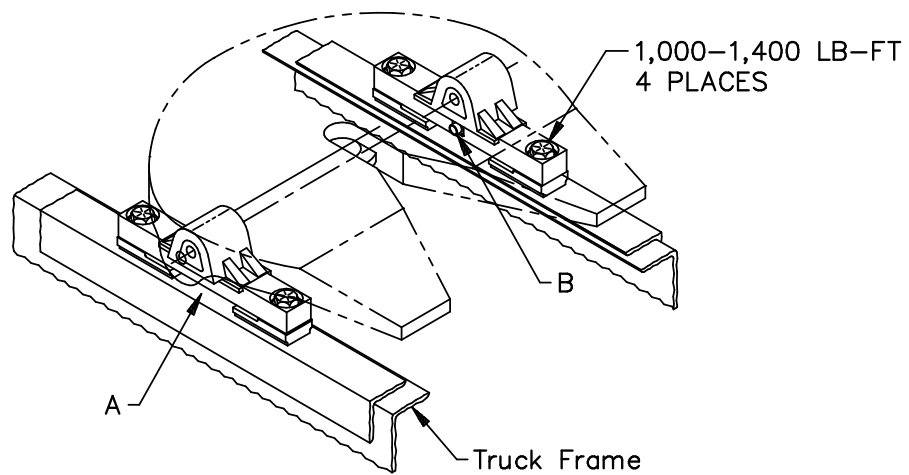


Figure 5-G

Typical Rear Hinge Mounting (Tipping Body)

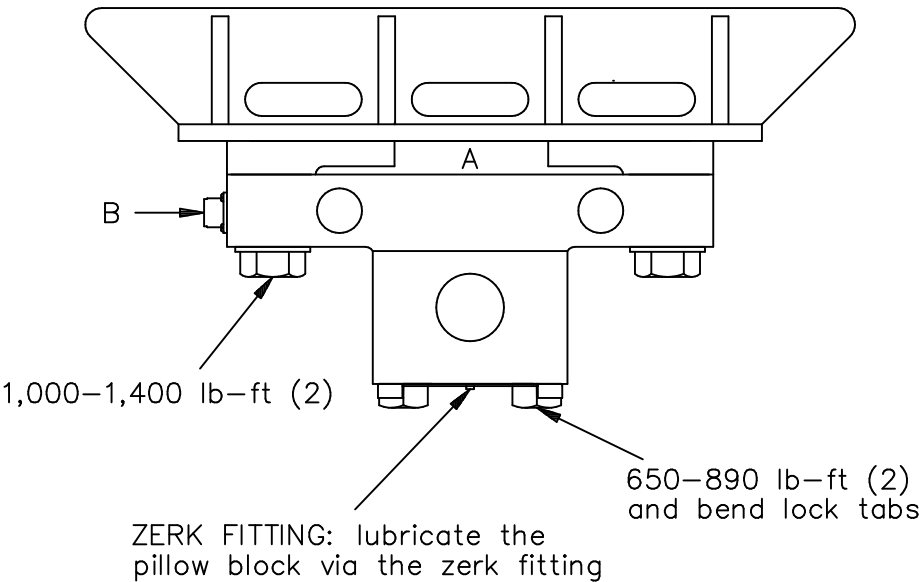


Figure 5-H

Typical Front & Middle Mountings (Tipping Body)

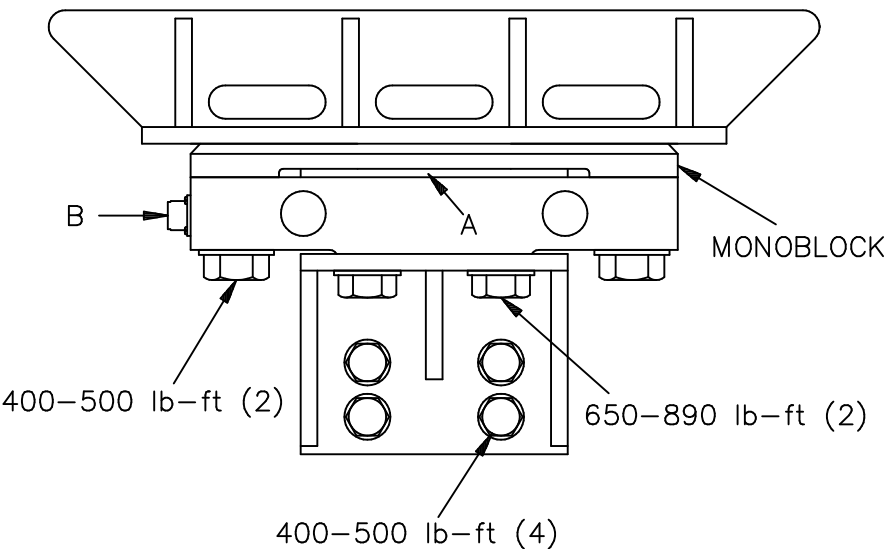


Figure 5-J

Typical Rear Mounting (Fixed Body)

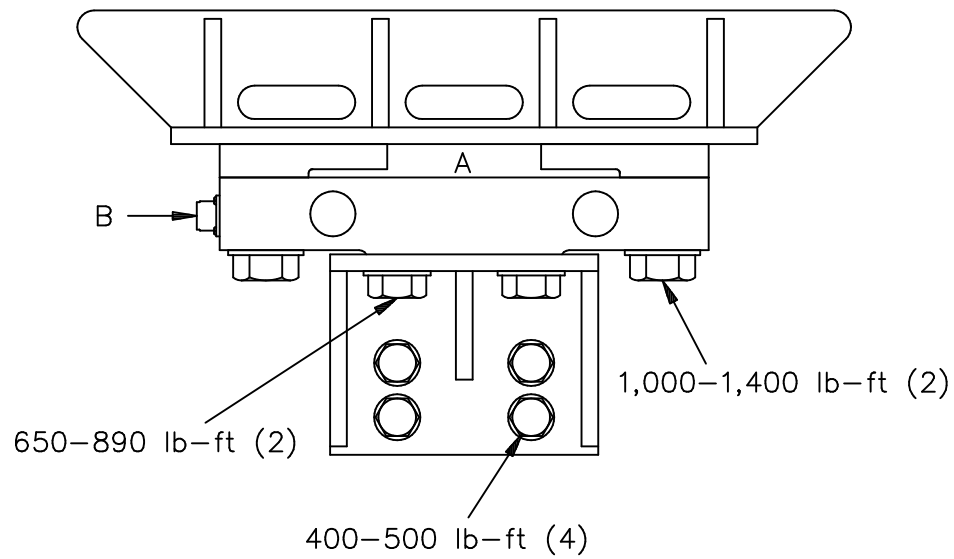


Figure 5-K

Typical Front & Middle Mountings (Fixed Body)

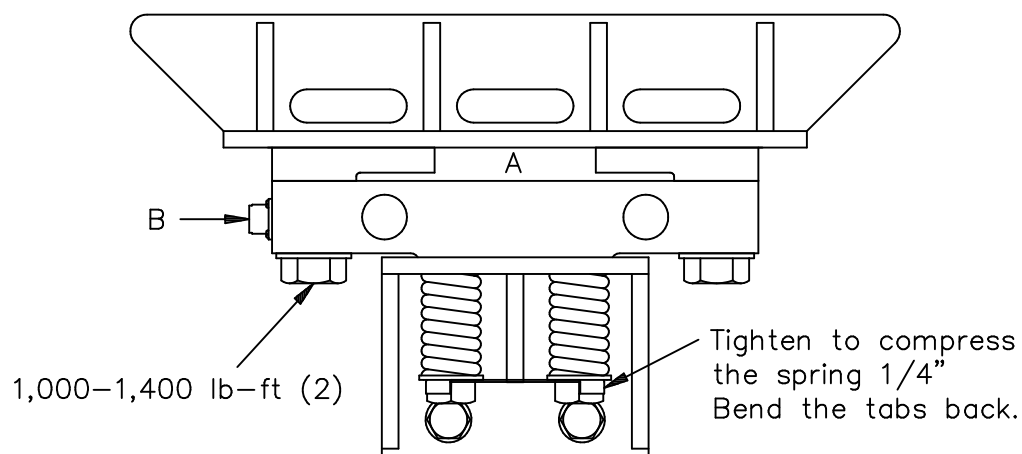


Figure 5-L

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. Repairing or replacing the faulty part can then fix the problem.

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 solve. 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 V300S Series Test Procedures, Load Cell Evaluation Test Procedures, and Vulcan V300S Series Error Codes. If a problem occurs and no Error Codes appear, use the V300S Series Meter to isolate the problem to the appropriate channel.

6.1 V300S SERIES METER TEST PROCEDURES

Six diagnostic tests are available for the Vulcan V300S Series Meter (seven if you have a VSL Set Point Controller attached). These can perform a thorough test of the display, keyboard, and the VSL communications. The tests are called Test 1, which performs the button test, Test 2, which performs the VSL communications test, Test 3, which performs the LED display test, Test 4, which displays the Vulcoder software version number, Test 5, which displays the load cell offsets. **Note:** This test will only appear if there is at least one SMT Vulcoder attached to the system. Test 6, activates the meter demonstration mode.

6.1.1 ENTERING AND EXITING THE TEST MODE

The Test Mode may only be entered during the power up sequence. To enter the Test Mode:



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



Press the **PWR / MENU** button while the software version number is being displayed. (The software version will be displayed as “rxx-x.x”, for example “r32-1.1”.)



Press the **CYCLE** button to select “tEst 1”, “tEst 2”, “tEst 3”, “tEst 4”, “tEst 5”, “tEst 6” or “tEst 7” (if you have a VSL Set Point Controller).



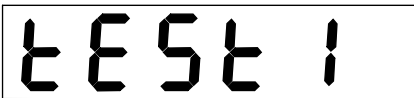
Use the ▲ or ▼ buttons to begin the selected test.



Press the **PWR / MENU** button while “tEst 1”, “tEst 2”, “tEst 3”, “tEst 4”, “tEst 5”, “tEst 6” or “tEst 7” is being displayed, to exit from the Test Mode.

6.1.2 TEST 1

Test 1, the button test, can be used to determine whether all of the buttons on the keyboard are operating properly.



Press either the ▲ or ▼ buttons to begin the selected test. A “0” will be displayed, indicating that no buttons are being pushed (a “2” or a “3” may be seen momentarily before releasing the arrow button as you start the test).

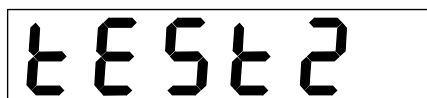
The buttons are labeled “1” through “6” with “1” being the **PWR / MENU** button and “6” being the **CYCLE** button. Press each button one at a time, the corresponding number should be displayed. This indicates proper button functioning.



Press the ▲ and ▼ buttons at the same time to exit from test 1.

6.1.3 TEST 2

Test 2, the communications test, can be used to determine if the electronics are communicating properly.



Use the ▲ or ▼ buttons to begin the selected communications test.
The channel LEDs indicate which channel you are presently looking at.



Press the **CYCLE** button to change to a different channel.

The display will show “n” in the left most position and you should see a number on the right hand side, which will be counting up. As you press the ▲ or ▼ buttons, you will cycle through the various readings listed below:

- n Number of transmission attempts
- e Number of communication errors
- t Number of time outs detected

Some errors are inherent in any communication system, and the VSL system is designed to recover from most error conditions. If the error rate becomes excessive (greater than 1% of the total transmissions), contact your Vulcan dealer.



Press the **TARE** or **CAL** button to exit from test 2.



6.1.4 TEST 3

Test 3, can be used to determine if the LED display is operating properly.




Use the ▲ or ▼ buttons to begin the selected LED display test.

This tests all the combinations of segment on/off conditions, which might produce an error in the display. There are several patterns, which are run. If you see any deviation from this pattern, contact your Vulcan dealer.

 OR  Press the **TARE** or **CAL** button to exit from test 3.

6.1.5 TEST 4


Test 4, displays the Vulcoder program version number.

 Press the **CYCLE** button to change to a different channel.


6.1.6 TEST 5

Test 5, displays the load cell offsets. This function will only appear if you have at least one SMT Vulcoder manufactured after May 2001.

The channel LED will flash indicating the Vulcoder channel being accessed. The display will alternate between the load cell number and the actual load cell offset. For example, the meter will display “LC 1” for about 1 second then “1210” for about two seconds with the channel A LED flashing. This indicates that load cell #1 on channel A Vulcoder has an offset of 1210.



 OR  Use the ▲ or ▼ buttons to change the load cell being read.

The load cell offset number should not exceed +12,000 lb to -12,000 lb.

 Press the **CYCLE** button to change to a different channel.

6.1.7 TEST 6

Test 6 activates the meter demonstration mode.

 OR  Use the ▲ or ▼ buttons to start the demo mode.

6.1.8 TEST 7

Test 7 is used to test the operation of the VSL Set Point Controller. This test will NOT appear if you do not have a VSL Set Point Controller attached to the VSL line of your system. Use the **CYCLE** button to change relays and the ▲ or ▼ to change the state of the relay. Press **PWR/MENU** to exit.

6.2 VULCAN CHECK-OUT BOX

The Vulcan Check-Out Box can be used to check load cells and the electronics. It works as an extension to bring load cell connector pins to the side of truck where readings can be conveniently made. It can also simulate an applied load to the VSL Vulcoder. The Check-Out Box is an optional equipment item for the Leakage and Resistance Tests (Section 6.3.1 and 6.3.3).

Before using the Check-Out Box, make sure the meter fuses are good. Use a multi-meter to ensure there is a minimum of 10.5 VDC at the back of the meter when the system is running. (Make sure the green plug is plugged in and the meter is turned on.) If there are any error messages displayed, refer to Section 6.4 “V300S Series Meter Error Codes”.

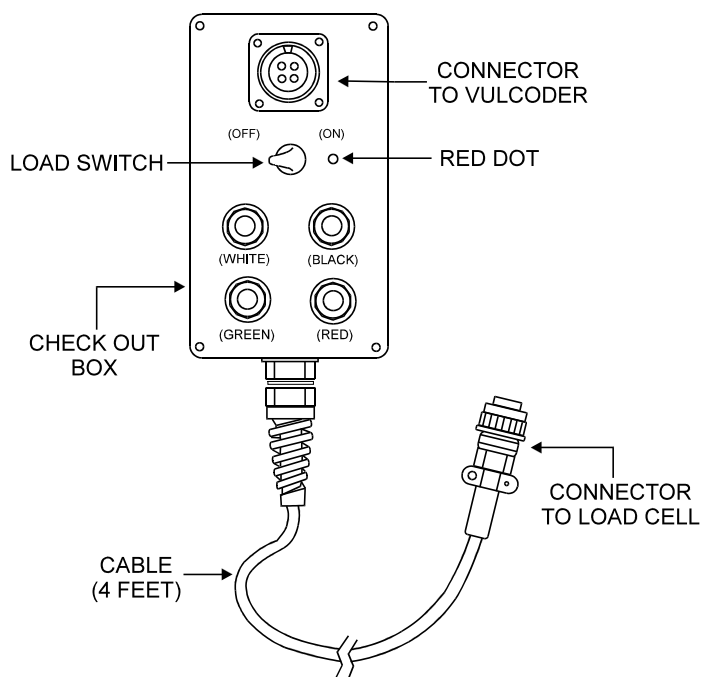


Figure 6-A: Vulcan Check-Out Box

To order a Check-Out Box (P/N: S22), contact your Vulcan dealer.

6.3 LOAD CELL EVALUATION TESTS

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

Leakage Test
Tare Test
Resistance Test

6.3.1 LEAKAGE TEST PROCEDURE

Required Equipment:	Digital Multi-Meter with Conductivity Scale 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 setup. If a Vulcan Check-Out Box is used, it is important that the VSL 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.

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.

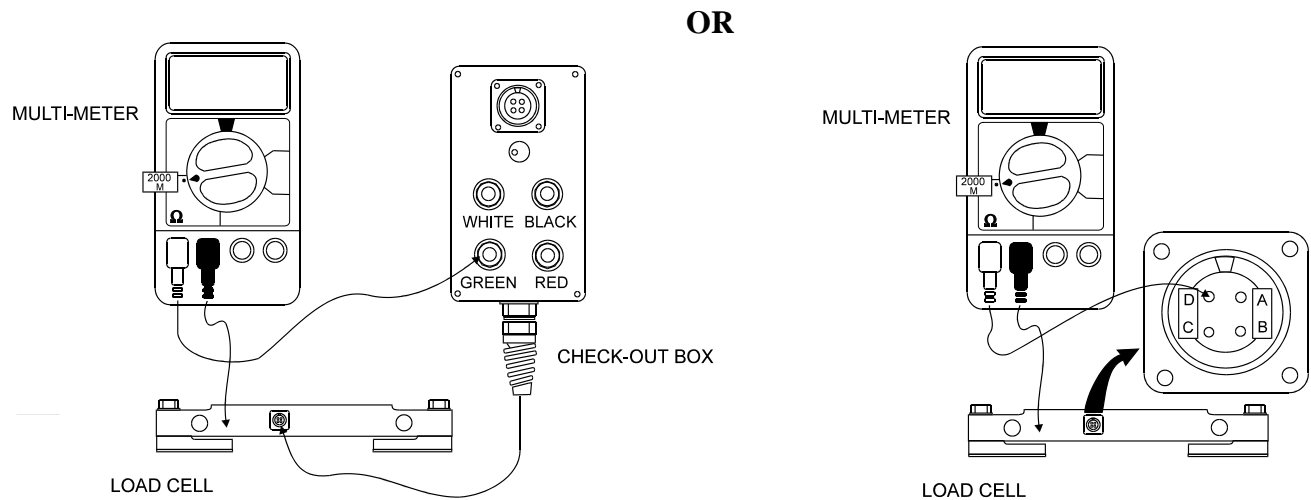


Figure 6-B: Leakage Test

Leakage Test Specifications:

Measure 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.

6.3.2 TARE TEST PROCEDURE

Required Equipment: Vulcan Check-Out Box

The Tare Test checks each load cell for a high Preload Number caused by mechanical damage or moisture.

Park the empty truck on level ground.





Use the **CYCLE** button to lock the meter on the Channel where the load cells will be tested A, B, C, or D.


Record the current Tare weight. The Tare weight is the weight displayed when the vehicle is empty.


Current Tare Weight: _____





Press and release the **TARE** button. The **TARE** and **LOCK** LEDs are illuminated.


 OR  Use the ▲ or ▼ buttons to change the display to read zero.

 Press and release the **TARE** button again.

 Press and release the **CAL** button. The **CAL** and **LOCK** LEDs are illuminated.
Record the current Cal Number.

Current Cal Number: _____

 OR  Change the Cal Number using the ▲ and ▼ buttons to display 2050.

 Press and release the **CAL** button again.

Disconnect one load cell from the VSL Vulcoder of the channel to be tested.

Plug that one lead into the connector on the Check-Out box. Make sure the load switch is pointing away from the red dot. **Note:** The Check-Out box is needed to properly zero the electronics. **Note:** If the Check-Out box is not used then you may receive incorrect readings. Disconnect the Check-Out box. Clean and re-connect the load cell to the VSL Vulcoder.

The meter will display the load cell preload number. The preload number should not exceed +12,000 lb to -12,000 lb.

If the preload number is within +12,000 lb to -12,000 lb, again using the Check-Out box to re-zero the meter, test the next load cell in the same manner. If the preload number is within specification for all load cells, reconnect and secure all load cell leads. Reset the current Cal Number then reset the current Tare weight. **Note:** If the preload number is out of specification, clean the load cell connector and cable connector with cotton swabs and isopropyl alcohol and dry thoroughly with a hair dryer and **DO NOT OVERHEAT** the connector.

Check the electrical isolation of the load cell by performing the Leakage Test, (Section 6.3.1). Reconnect the lead to the load cell. Reset Tare to "0" and repeat test for that load cell.

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, (Section 6.3.3).

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

6.3.3 RESISTANCE TEST PROCEDURE

Required Equipment: Digital Multi-Meter with Conductivity Scale

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

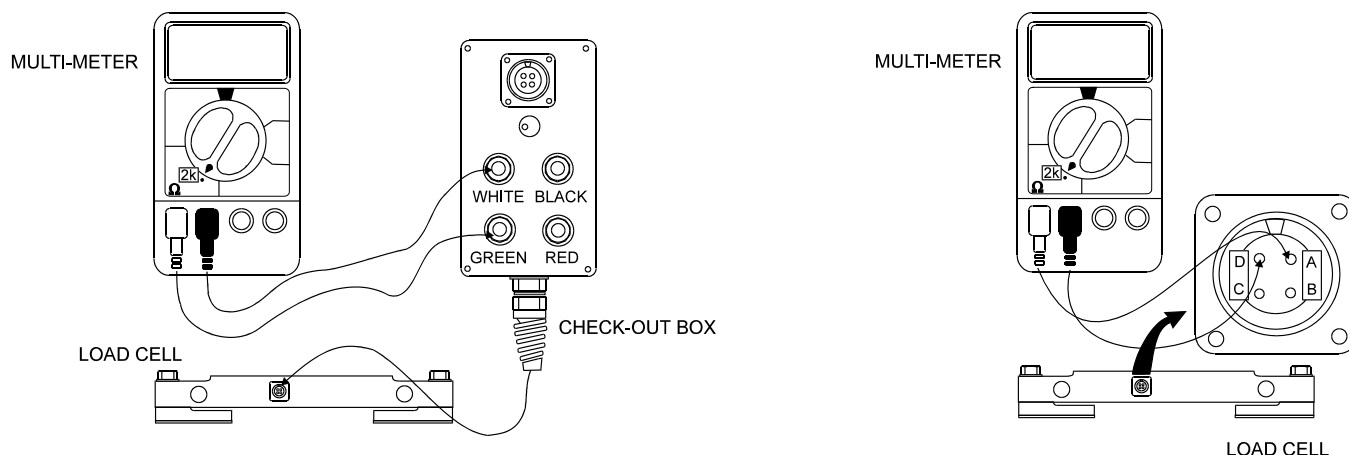


Figure 6-C: Resistance Test

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 For Air Sensors contact factory for specifications		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.

6.4 V300S SERIES METER ERROR CODES

6.4.1 Err 01

Indicates the VSL Vulcoder is processing an over-ranged signal. An over-ranged signal means that the load cell output is greater than the maximum that the VSL Vulcoder will accept.

Note: SMT Vulcoders manufactured after May 2001 send diagnostic information to the V300S Series Meter. This information contains the load cell number that is causing the problem. In this case, the meter display will alternate between “Err 01” and “LC X”, where X is the load cell in which the problem has been detected.

Possible Causes:

1. The load cells are being over-loaded.
2. There is moisture in a load cell connector.
3. A load cell is not connected to the VSL Vulcoder cable.
4. One of the VSL Vulcoder to load cell cables has been damaged.
5. A load cell has a large Preload Number.
6. A load cell is faulty.

What to Do:

1. Ensure the load cell is plugged into the VSL Vulcoder cable.
2. 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.
3. Perform the Leakage Test (refer to Section 6.3.1)
4. Perform the Tare Test (refer to Section 6.3.2)
5. Check mounting of the load cell per Section 5.2 “Preventive Maintenance and Vulcan Torque Specifications”.

6.4.2 Err 02

Indicates the reading to be displayed is beyond the limitations of the meter's display, (-99,990 to 999,990).

Possible Causes:

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

What to Do:

1. Check and reset the Cal Numbers and Tare weight.

6.4.3 Err 03

Indicates the meter is not receiving a weight from the VSL Vulcoder.

Possible Causes:

1. New Installation – Vulcoder must be **manually sequenced**.
2. Communication problem between Meter and VSL Vulcoder.
3. Dirty or worn truck to trailer connectors.
4. Cables have been disconnected or damaged.
5. Green and white leads reversed on VSL Vulcoder line.
6. Faulty VSL Vulcoder.

What to Do:

1. Verify if affected channel is still sequenced, **manually sequence** if necessary, section 2.2.1.
2. Reconnect any cables that have become disconnected.
3. Clean any dirt, mud, or ice out of 4-pin truck to trailer connectors.
4. Inspect VSL Vulcoder Communication line for cut or broken wires and proper connection of the green and white wires. To check for an open VSL line, ohm the VSL Vulcoder line by twisting the green and white wires together at the back of the meter and disconnect each Vulcoder from the VSL Vulcoder line. There should be no resistance detected when measuring between the green and white wires at the Vulcoder hook up point.
5. Inspect truck to trailer connecting plug and receptacles for good connection. Spread and clean pins in receptacle and plug if needed.
6. Run Test 2 from the V300S Series Meter Test Procedures, section 6.1.3.
7. VSL Vulcoder is damaged. Replace VSL Vulcoder.

6.4.4 Err 04

Indicates the VSL Vulcoder is not calibrated.

Possible Causes:

1. Cal or Tare Numbers are not entered.

What to Do:

2. Check and reset the Cal Numbers and Tare weight.

6.4.5 Err 05

Indicates the VSL Vulcoder has a hardware problem.

Possible Causes:

1. VSL Vulcoder hardware component is damaged.

What to do:

1. Press the **PWR / MENU** button to turn the meter off and then press **PWR / MENU** again to turn it on. This may reset the meter and eliminate the error.
2. VSL Vulcoder is damaged. Replace VSL Vulcoder.

6.4.6 Err 06

Indicates the VSL Vulcoder is processing an under-ranged signal. An under-ranged signal means that the load cell output is less than the minimum that the VSL Vulcoder will accept.

Note: SMT Vulcoders manufactured after May 2001 send diagnostic information to the V300S Series Meter. This information contains the load cell number that is causing the problem. In this case, the meter display will alternate between “Err 06” and “LC X”, where X is the load cell in which the problem has been detected.

Possible Causes:

1. There is moisture in a load cell connector.
2. One of the VSL Vulcoder-to load cell cables has been damaged.
3. No load cells are connected to the VSL Vulcoder.
4. A load cell is faulty.

What to Do:

1. Check to see that the load cells are properly connected to the VSL Vulcoder.
2. 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.
3. Perform the Leakage Test, section 6.3.1
4. Perform the Tare Test, section 6.3.2
5. Check mounting of the load cell per Section 5.2 “Preventive Maintenance and Vulcan Torque Specifications”.

6.4.7 Err 07

Indicates that a new VSL Vulcoder has been detected or multiple VSL Vulcoders with the same channel designation have been found.

Possible Causes:

1. Multiple VSL Vulcoders with the same channel ID have been found.
2. Line Noise.
3. Faulty VSL Vulcoder.

What to Do:

1. System needs to be **manually sequenced**, section 2.2.1. Be sure that on two or more channel systems, there is at least one **rear** VSL Vulcoder, and it is the last VSL Vulcoder in the system.
2. Turn the meter off and then on to cycle power in system.
3. Replace faulty VSL Vulcoder.

6.4.8 Err 08

Indicates the meter has found multiple **front** VSL Vulcoders during automatic or manual sequencing.

Possible Causes:

1. More than one front VSL Vulcoder is attached at the same time. (During sequencing or powering up the meter).
2. Line noise.
3. Faulty VSL Vulcoder.

What to Do:

1. System needs to be **manually sequenced**, section 2.2.1. Be sure that on two or more channel systems, there is at least one **front** VSL Vulcoder.
2. See electronics installation section for proper installation procedure, section 1.5. Verify that there is only one Vulcoder installed as a front Vulcoder.

6.4.9 Err 09

Indicates the meter has found multiple **rear** VSL Vulcoders during automatic or manual sequencing.

Possible Causes:

1. More than one rear VSL Vulcoder is attached at the same time. (During sequencing or powering up the meter).
2. Line noise.
3. Faulty VSL Vulcoder.

What to Do:

1. System needs to be **manually sequenced**, section 2.2.1. Be sure that on two or more channel systems, there is at least one **rear** VSL Vulcoder.
2. See electronics installation section for proper installation procedure, section 1.5. Verify that there is only one Vulcoder installed as a rear Vulcoder.

6.4.10 Err 10

Communication error between the meter and the VSL Vulcoder. The VSL Vulcoder is in a “locked” state.

Possible Causes:

1. Faulty VSL Vulcoder

What to Do:

1. Run Test 2 from the V300S Series Meter Test Procedures, section 6.1.3.
2. Replace VSL Vulcoder.

6.4.11 Err 11

The meter “watchdog” system is not running

Possible Causes:

1. New or recently repaired meter.

What to Do:

1. Turn the meter off and then on to cycle power in system.
2. If Err 11 is still displayed, replace meter.

Note: The following error codes should only appear if the system is using special application RF Vulcoders.

6.4.12 Err 12

Indicates that more than one Vulcoder has been detected in an RF (Radio Frequency) remote receive system.

Possible Causes:

1. More than one VSL Vulcoder is attached at the same time.
2. Line noise
3. Faulty VSL RF Vulcoder

What to Do:

1. Ensure that the RF Remote Vulcoder is the only Vulcoder attached to the remote meter.
2. Verify if affected channel is still sequenced and **manually sequence**, section 2.2.1.
3. Replace VSL RF Vulcoder.

6.4.13 Err 13

Indicates too many Vulcoders on the transmit side were detected in an RF (Radio Frequency) Remote System. **For example**, a V320 Meter on the transmit side may have up to one standard Vulcoder and an RF Remote Transmit Vulcoder attached. If the receive side is a V340 Meter, it can only have three standard Vulcoders on the transmit side. Therefore, the 2-channel V320 Meter cannot read all of the 4-channels of the V340 Meter.

Possible Causes:

1. Too many VSL Vulcoders attached to the VSL line.
2. Faulty VSL Vulcoder

What to Do:

1. Verify the number of VSL Vulcoders attached to system. The V320 Meter is limited to one standard Vulcoder and one RF Remote Receive Vulcoder. The V340 Meter is limited to three standard Vulcoders and one RF Remote Receive Vulcoder.
2. Verify sequencing, **manually sequence** if necessary, Section 2.2.1.
3. Replace VSL Vulcoder.

6.4.14 Err 14

Indicates a communications problem between the meter and the VSL Set Point Vulcoder. There are two situations where this problem can occur – during power-up and while operational. During normal operation, the V320S/V340S meter continually checks to see if a VSL Set Point Vulcoder is attached to the VSL line. If the meter detects a VSL Set Point Vulcoder, it periodically “talks” to that Vulcoder, even if it has not yet been programmed for operation (see Section 2.13 Program Relays, page 23). If the VSL Set Point Vulcoder does not respond to the meter, the meter will display “Err 14”. The error can be dismissed by pressing the **CYCLE** button

If a VSL Set Point Vulcoder is ever detected on the VSL line and Set Points are “programmed” (see Section 2.13, page 23), the V320S/V340S meter will check for the VSL Set Point Vulcoder on power-up. If the meter fails to find the VSL Set Point Vulcoder, it will display “Err 14”. The error can be dismissed by pressing the **CYCLE** button.

Possible Causes:

1. Communication problem between Meter and VSL Set Point Vulcoder.
2. Cables have been disconnected or damaged.
3. VSL Set Point Vulcoder has been removed from the VSL line.
4. Faulty VSL Set Point Vulcoder.

What to Do:

1. Reconnect any cables that have become disconnected.

2. Inspect VSL Vulcoder Communication line for cut or broken wires and proper connection of the green and white wires. To check for an open VSL line, ohm the VSL Vulcoder line by twisting the green and white wires together at the back of the meter and disconnect each Vulcoder from the VSL Vulcoder line. There should be no resistance detected when measuring between the green and white wires at the Vulcoder hook up point.
3. VSL Set Point Vulcoder is damaged. Replace VSL Set Point Vulcoder.

6.5 SYSTEM MALFUNCTIONS

6.5.1 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 10.5 Volts).
5. A fuse is blown in the power or ground cable.
6. Faulty power switch.
7. Reversed polarity
8. Faulty meter.

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 at the back of the meter. Turn off the meter 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 only 1 **amp** fast blow fuses for 12 VDC V300S Series systems 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, and 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.

6.5.2 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, Cal Number, or Cal weight to be changed.
2. Faulty meter.

What to Do:

1. The Lock feature may be enabled see Section 2.7 “Setting The Lock”.
2. 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.
3. Faulty meter. Call your Vulcan dealer for meter replacement. The meter contains no user serviceable parts.

6.5.3 CONDITION: Meter Reading Drifts Or Wanders With Time

Possible Causes:

1. Voltage to meter is less than 10.5 Volts.
2. Voltage out of the VSL Vulcoder is less than the Voltage Output required as stated in Section B.2 “System Specifications”.
3. Moisture in a load cell connector.
4. Damaged cable between VSL Vulcoder and load cell.
5. Bad connection on green connector or broken wire or cable between meter and the VSL 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 B.2 “System Specifications”.
2. Check the black 4-wire cabling between the load cells and the VSL Vulcoder. If the cabling is damaged, contact your Vulcan dealer for VSL Vulcoder repair or repair kit.
3. Measure the voltage between pins A and D of the VSL Vulcoder connector. If it measures less than 5 Volts, make sure the VSL Vulcoder cable is securely attached to the meter green plug. Also check any truck / trailer connectors in the VSL Vulcoder signal cable.
4. Before proceeding, clean the load cell connector and cable connector with isopropyl alcohol and cotton swabs, and then dry with a hair dryer. **Do not overheat.** Reconnect and operate the 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 VSL 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 Section 6.3.1 and 6.3.3). If both of the load cells wander more than 200 lb (100 kg), then the VSL Vulcoder may be faulty and needs to be checked (refer to Section 6.3.4 “VSL Vulcoder Check-Out Procedure”).

If four load cells are connected per VSL Vulcoder, follow steps 5c through 5f.

- c. For VSL 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 the 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 6.3.1 and 6.3.3). If all the load cells wander more than 200 lb (100 kg), then the VSL Vulcoder may be faulty and needs to be checked (refer to Section 6.3.4 “VSL Vulcoder Check-Out Procedure”).

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

Possible Causes:

1. Voltage to meter is below 10.5 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 a bad connection between the load cell and VSL Vulcoder.
6. Meter display is locked.

What to Do:

1. Using a voltmeter, check the power at the meter's green plug on the back of the meter. Refer to Section B.2 "System Specifications". If the voltage is below 10.5 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. Verify that the Cal Number is reasonable.
4. Check the black cables between the load cells and the VSL Vulcoder. If the cabling is damaged, the VSL Vulcoder needs to be repaired or replaced. Contact your Vulcan dealer.
5. Perform the Leakage, Tare, and Resistance Tests (refer to Sections 6.3.1 through 6.3.3).

6.5.5 CONDITION: Meter Stops Powering Up After Displaying All Digits

Possible Causes:

1. Voltage to meter is below 10.5 Volts.
2. Broken power wire or bad connection between the meter and the power source.
3. Shorted VSL Vulcoder line.
4. Vulcoder setup data is corrupted.
5. Vulcoder does not have any load cells connected.
6. Faulty Vulcoder.
7. Faulty meter.

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 B.2 "System Specifications". If the voltage is below 10.5 VDC, the problem could be in the power source (battery, meter power cable, and / or fuses).

2. Verify at least one load cell is connected to the VSL Vulcoder.
3. Check the fuses for both negative and positive leads. Use only 1 **amp** fast blow fuses for 12 VDC V300S Series systems only. Blown fuses could indicate a shorted VSL line. Isolate the short by disconnecting sections of the VSL line and checking for proper meter operation. Another way to check for a shorted line is to disconnect the green and white from the back of the meter. Measure the resistance between the green and white wire. It should be greater than 1000 ohms. This method can be used to check different sections of the VSL line to isolate the short circuit.
4. Inspect and replace any connection or 2-wire VSL cable that may show signs of being pinched or crushed as this could cause either open circuits or shorted lines.
5. To check for an open VSL line, ohm the VSL Vulcoder line by disconnecting and twisting the green and white wires together at the back of the meter. Disconnect each Vulcoder from the VSL Vulcoder line. There should be no resistance detected when measuring between the green and white wires at the Vulcoder hook up point.
6. To check for a bad Vulcoder, **disconnect** each Vulcoder from the VSL line and power up the meter. If the meter powers up, connect one Vulcoder at a time and manually resequence the Vulcoder before restarting the meter.
7. Replace meter.

6.5.6 CONDITION: Meter Displays "Lo-Lo"

If the meter encounters a low voltage situation, either on the power input lead or the VSL line, the meter will display "Lo-Lo" and then switch to "1 9.0", one meaning the input power is low and the 9.0 being the amount of voltage (9.0 VDC) being read by the meter. If the meter displays "Lo-Lo" and then switches to "2 0", two meaning the VSL line is low and the number being the amount of voltage being read by the meter.

Possible Causes for "Lo-Lo" and "1 X.X":

1. Corroded fuses or corroded or bad meter cable connections to the battery.
2. Battery is low (under 10.5 Volts).
3. Damaged power or ground cable.
4. Faulty meter.

What to Do:

1. Using a voltmeter, check the power at the back of the meter. When the meter is turned on and off, the power should not change more than 1/2 Volt. Turn off the meter 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 only 1 **amp** fast blow fuses for 12 VDC V300S Series systems only.

3. Check that the power supply wires are attached correctly at the 12 Volt power source for V300S Series systems. Check the wires are attached 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.

Possible Causes for "Lo-Lo" and "2 X.X":

Note: When the fault is detected, the V300S Series Meter will "shut down" power to the VSL line to avoid meter damage. The meter must be powered off and then on to clear the error condition.

1. VSL line (orange cable) is pinched or shorted.
2. VSL line incorrectly wired
3. Damaged VSL plug or receptacle.
4. Faulty meter.

What to Do:

1. Using a voltmeter, check the voltage at the back of the meter when the meter is turned on and off, the power should not change more than 1/2 Volt. Turn off the meter for a few seconds and then turn on again. If the meter still shows the error, proceed to step 2.
2. Check the fuses for both negative and positive leads. Use only 1 **amp** fast blow fuses for 12 VDC V300S Series systems only. Blown fuses could indicate a shorted VSL line. Isolate the short by disconnecting sections of the VSL line and checking for proper meter operation. Another way to check for a shorted line is to disconnect the green and white from the back of the meter. Measure the resistance between the green and white wire. It should be greater than 1000 ohms. This method can be used to check different sections of the VSL line to isolate the short circuit.
3. Inspect and replace any connection or 2-wire VSL cable that may show signs of being pinched or crushed as this could cause either open circuits or shorted lines.
4. To check for an open VSL line, ohm the VSL Vulcoder line by disconnecting and twisting the green and white wires together at the back of the meter. Disconnect each Vulcoder from the VSL Vulcoder line. Measure the resistance at these connection points. There should be no resistance detected when measuring between the green and white wires at the Vulcoder hook up point.

5. To check for a bad Vulcoder, **disconnect** each Vulcoder from the VSL line and power up the meter. If the meter powers up, connect one Vulcoder at a time and manually resequence (Section 3.4.1) the Vulcoder before restarting the meter.
6. Replace meter.

6.6 TROUBLESHOOTING WORKSHEET

If you need assistance, this will help us find 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? _____

If not, whose Channel C load cells? _____

If not, whose Channel D 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 cutting, welding, 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 truck, such as an accident? _____

SYMPTOMS

Does the problem occur on Channel A, B, C, D, or all? _____

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

Is the problem intermittent, constant, or both? _____

Does the 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? _____

6.7 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

APPENDIX A

A. APPENDIX A – Using Axle Mode

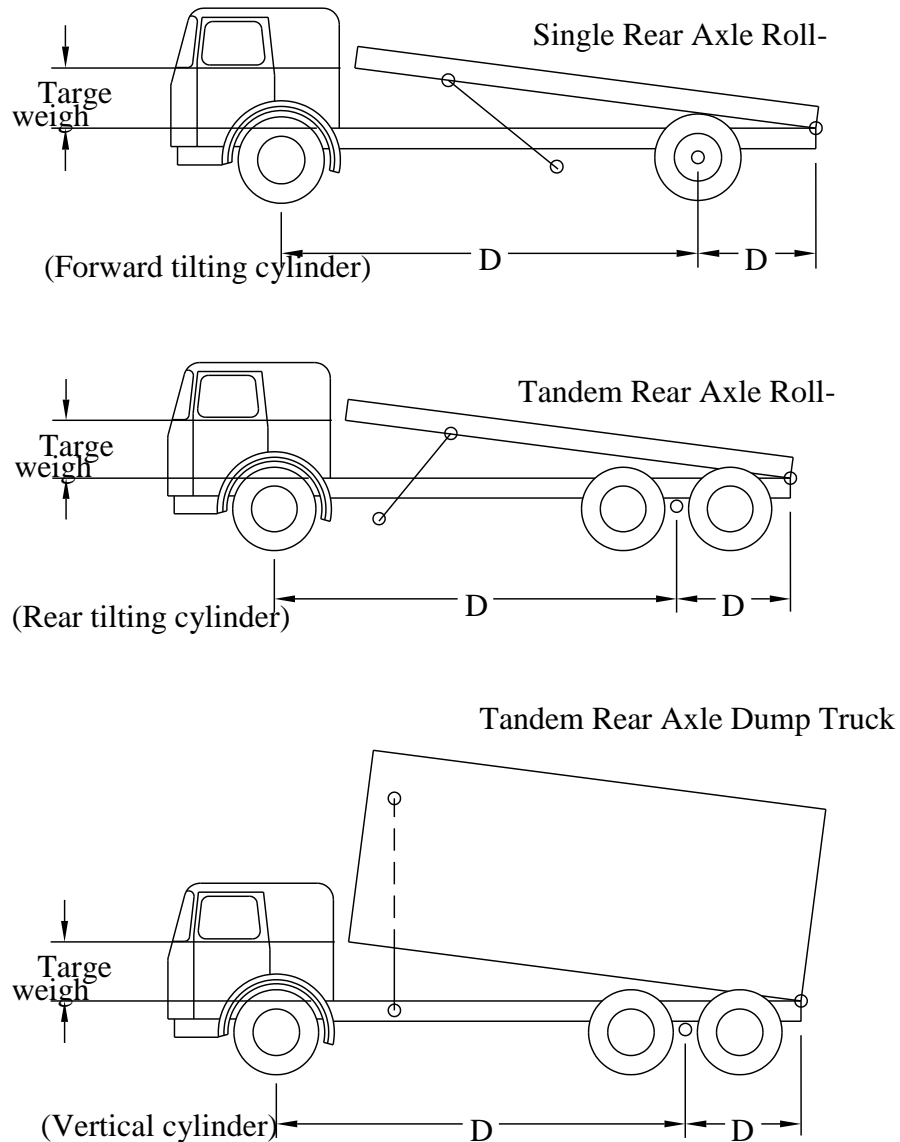
A.1. To Set Up Truck for Axle Weight Mode

1. Activate the Axle Weight mode:
 - a) Press the **PWR/MENU** button to show “PSFr”, “PSFr-” or “PSFrFr” on the display.
 - b) Press the **CYCLE** button to advance the display to “PA off”. This is the “Program Axle” option. Use the ▲ or ▼ button to change the display to read “PA on”.
 - c) Now, either:
 - i) Press the **PWR/MENU** button to enter the normal operating mode for viewing axle weights.
OR
 - ii) If setting up the Axle Weight mode **for the first time**:
 - a) Press the **CYCLE** button to enter “D” values for your truck. (Correct “D” values must be entered for accurate axle weights to be displayed).
 - b) Pressing the **CYCLE** button prompts the meter to ask you for two dimensions D1 and D2. You must make these measurements and input them into the meter using the following steps: (it is a good idea to write these dimensions down and keep them with your calibration information – space is provided at the end of this document to record these settings)
 - i) **“D1 nnn”**. This is “Distance 1” (D1). *It corresponds to the wheelbase of the vehicle – refer to Figure 2 below.* Measure the distance between the front and rear axles. If the rears are a tandem axle, measure to the midpoint between them. Press either the ▲ or ▼ button to change the “300” inch default to the D1 value you measured. Press the **CYCLE** button to move to the next D parameter.
 - ii) **“D2 nn”**. This is “Distance 2” (D2). *It corresponds to the distance between the rear hinge and the rear axle – refer to Figure 2 below.* If the rears are a tandem axle, measure from the hinge to the midpoint between axles (the same measurement point should be used for both D1 and D2). Press either the ▲ or ▼ button to change the “48” inch default to the D2 value you measured. Press the **PWR/MENU** button to return to weight display mode.

Note: The previous these menu options will NOT appear unless the V320/V340 meter has been placed in Axle Weight mode.

When you are in Axle Weight mode, the decimal points on the display will “blink” every few seconds to let you know you are viewing Axle Weights.

Note: Lift cylinders can tilt forward, to the rear, or be vertical



Target Weigh Height For Roll-offs	
Forward Tilting Cylinder	16"
Rear Tilting Cylinder	30"
Target Weigh Height For Dump Trucks	
Vertical Cylinder	10" to 12"

Figure 2: Axle Weight mode dimensions and weigh heights for roll-offs and dump trucks. All dimensions are in inches.

A.2. Calibrating the System in Axle Weight Mode

Calibrating a Roll-Off		
Instructions	Readings	Meter Indications
1. Be sure Driver Lockout is off.	See Section 2.11, page 22	
2. Place meter in Axle Mode.	See Appendix A, page 77	
3. Enter Distances D1 and D2.	D1: _____ D2: _____	
4. Pull front axle of empty roll-off onto platform scale (body down). Record weight of front axle here:	4. _____	
5. Pull ENTIRE empty roll-off onto platform scale with body down. Record weight here:	5. _____	
6. Raise body to weighing position.		
7. Press TARE button.		LEDs for Lock, Tare and Ch A light
8. Enter weight recorded in 4. Press CYCLE .		LEDs for Lock, Tare, Ch A and Ch B light.
9. Enter weight recorded in 5. Press TARE button.		Tare and Lock LEDs goes out.
10. Pick up loaded bin. Pull bin completely forward.		
11. Pull front axle of roll-off onto platform scale (body down). Record platform scale weight of front axle here:	11. _____	
12. Pull ENTIRE roll-off onto platform scale (body down). Record weight here.	12. _____	
13. Raise body to weighing position. Press CAL button.		Cal and Ch A LEDs light.
14. Enter weight recorded in 11. Press CYCLE button.		Cal and Ch A and B LEDs light.
15. Enter weight recorded in 12. Press CYCLE .		Both Cal and Tare LEDs light. Meter display reads "CAL"
16. Raise body enough to move bin backwards about 3 feet.		
17. Return body to weighing position.		
18. Press CAL button.		Both Cal and Tare LEDs go out. Meter displays computed CG.
19. Record the CG. Press CYCLE .	CG _____	Meter displays Cal number for Channel A
20. Record Cal Number for Channel A, press CYCLE .	Ch A Cal Number _____	Meter displays Cal number for Channel B.
21. Record Cal Number for Channel B, press PWR/MENU .	Ch B Cal Number _____	Calibration is complete.

Calibrating a Dump Truck and Trailer (V340S only)		
Instructions	Readings	Meter Indications
1. Be sure Driver Lockout is off.	See Section 2.11, page 22	
2. Place meter in Axle Mode.	See Appendix A, page 77	
3. Enter Distances D1 and D2.	D1: _____ D2: _____	
4. Pull front axle of empty truck onto platform scale (body down). Record weight of front axle here:	4. _____	
5. Pull ENTIRE empty truck (not the trailer) onto platform scale with body down. Record weight here:	5. _____	
6. Pull forward until ONLY the trailer is on the platform scale (body down). Record the trailer weight here:	6. _____	
7. Raise bodies of the truck and trailer to weighing position.	Be sure vehicle is as level as possible.	
8. Press TARE button.		LEDs for Lock, Tare and Ch A light
9. Enter weight recorded in 4. Press CYCLE .		LEDs for Lock, Tare, Ch A and Ch B light.
10. Enter weight recorded in 5. Press CYCLE button.		LEDs for Ch A and ChB go out. LED for Ch C lights.
11. Enter weight recorded in 6. Press TARE button.		Tare and Lock LEDs go out.
12. Load truck and trailer.		
13. Pull front axle of truck onto platform scale (body down). Record platform scale weight of front axle here:	13. _____	
14. Pull ENTIRE truck (not the trailer) onto platform scale (body down). Record weight here.	14. _____	
15. Pull forward until ONLY the trailer is on the platform scale (body down). Record the trailer weight here:	15. _____	
16. Raise truck body into weighing position. Press the CAL button.		Lock, Cal and Ch A LEDs light.
17. Enter weight recorded in 13. Press CYCLE button.		Lock, Cal, Ch A and Ch B LEDs light.
18. Enter weight recorded in 14. Press CYCLE .		Both Cal and Tare LEDs light. Meter display reads "CAL".
19. Carefully raise the truck body another foot.		
20. Press the CYCLE button.		Lock, Cal and Ch C LEDs light.

21. Raise the trailer body to the weighing position.		
22. Enter weight recorded in 15. Press CAL button.		Both Cal and Tare LEDs go out. Meter displays computed CG.
23. Record the CG. Press CYCLE .	CG _____	Meter displays Cal number for Channel A.
24. Record Cal Number for Channel A, press CYCLE .	Ch A Cal Number _____	Meter displays Cal number for Channel B.
25. Record Cal Number for Channel B, press PWR/MENU .	Ch B Cal Number _____	Calibration is complete.

APPENDIX B

APPENDIX B

B.1 STARTING CALIBRATION NUMBERS

LOAD CELL		VULCODER				
	STOCK NO.	V26 1 LEAD	V23, V27 2 LEAD	V24, V28 4 LEAD	V25 6-LEAD	V32 3-LEAD
15" SUPER-BEAM	L01, L02	2050	2050	2050	2050	1540
15" SUPER-BEAM IN MODULAR CENTER HANGER	L01, L02	N/A	4100	4100	4100	N/A
17" SHEAR BEAM SINGLE POINT	L03	N/A	2100	2100	N/A	N/A
26" SUPER-BEAM	L08, L09, L18, L19	2050	2050	2050	2050	1540
26" HEAVY DUTY SUPER-BEAM	L11	3075	3075	3075	3075	2306
2" SHEAR PIN	L25, L26	1895	1895	1895	1895	1420
2 1/2" SHEAR PIN	L43	N/A	3785	N/A	N/A	N/A
3" SHEAR PIN 58-10608-005		N/A	3618	N/A	N/A	N/A
3" SHEAR PIN	L53	N/A	7042	N/A	N/A	N/A
19" FIFTH WHEEL	L04, L05, L31	N/A	2050	2050	2050	N/A
AIR SENSOR	L20, L21, L40	6150	6150	6150	6150	4615
28" SHEAR-BEAM, EXTRA HD	L27	3660	3660	3660	3660	2745
4" TRUNNION LOAD CELL	L32, L33	8200	N/A	N/A	N/A	N/A
HEAVY DUTY SINGLE POINT	L63	3415	3415	3415	3415	3415
HEAVY DUTY HOLLAND FIFTH WHEEL	L67	3415	3415	3415	3415	3415
NOTES						
1. Vulcoder Stock No. V29, (Designed for 7-Pin Connectors), use Cal Number 6150.						

B.2 SYSTEM SPECIFICATIONS

Load Cells

Electrical:	350 Ohms nominal impedance.
Connector:	4-pin bulkhead, military type.
Voltage Required:	5.0 +/- .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 under normal operating temperature range and normal loading conditions.

VSL Vulcoder

Environment:	Environmentally sealed electronics.
Operating Temp:	-40 to +140 degrees F.
4-Wire Cable, Black:	Custom, shielded, 4-conductor, polyurethane jacket with drain.
2-Wire Cable, Orange:	Custom polyurethane jacket.
Connectors:	4 pin, military type.
Voltage Input:	10 VDC +/- .5 VDC.
Voltage Output:	5 VDC +/- .1 VDC

V300S Series Meters

Display:	L E D, Variable brightness.
Cycle Speed:	Variable cycle speed, 1 - 9 seconds.
Graduation:	5, 10, 20, 50, 100 or 200 lb or kg
Display Range:	-99,999 to 999,999
Voltage Required:	10.5 – 16 VDC.
Current Draw:	.5 A to 1 A.
Protection:	External and internal fuses & diode protection.
Hookup:	Screw type, quick release terminal block on rear panel.
Operating Temp:	-40 to +180 degrees F.
Weight:	1.5 lbs.
Installation:	Power cables, fuses, mounting bracket and thumbscrews provided.

B.3 ASSISTANCE IN FINE TUNING YOUR SCALE SYSTEM (Primarily for Two Channels On One Truck Application Only)

1. Lock the meter on the channels to be fine-tuned (Example A+B).
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.

Set the Cal Number for each channel being fine-tuned to that shown in section B.1.

No.	Date	Truck Fully Loaded		Truck Empty	
		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 _____ Cal Number _____

Channel _____ Cal Number _____

Channel _____ Cal Number _____

Channel _____ Cal Number _____

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

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

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

Channel _____ Final Cal Number _____

Channel _____ Final Cal Number _____

Channel _____ Final Cal Number _____

Channel _____ Final Cal Number _____

Date Final Calibration Numbers were set _____

B.4 KEEPING RECORDS

Channel A

Channel A Active? Yes No

Tare Number _____

Final Cal Number _____

Channel B

Channel B Active? Yes No

Tare Number _____

Final Cal Number _____

Channel C

Channel C Active? Yes No

Tare Number _____

Final Cal Number _____

Channel D

Channel D Active? Yes No

Tare Number _____

Final Cal Number _____

APPENDIX C

APPENDIX C

RS -232 Output Formats

PP obc

The OBC option is specifically designed to interface with an on-board computer. When this option is selected in refuse applications, the V320S/V340S Meter will output the total weight every ½ second.

For standard trucking applications, this option will output the Total Gross Weight. For example, if you have a two channel scale showing Gross weights, the V320S/V340S meter will add the gross weights on all channels and transmit the total. If the V320S/V340S is in Axle Weight Mode, this number will be the total of the axles. If an error occurs on any of the channels, the weight will be set to “999999”.

Transmission Format: RS-232, ASCII data

Baud Rate: 9600

Data Bits: 8

Start Bits: 1

Stop Bits: 1

Parity Bits: None

Transmit frequency: Every ½ second.

Data Frame:

AAFF55aaaaaufffx<CR><LF>

Where:

Code	Description	Size	Comments
AAFF55	Sentinel	3	Three byte sentinel to mark the beginning of a transmission. These three hex bytes (0xAA, 0xFF, 0x55).
<i>aaaaaa</i>	Weight	6	Zero filled
<i>u</i>	Units	1	“p” or “k” for pounds or kilograms. Note: if units is set to tons, PP obc will output “pounds”.
<i>fff</i>	Flags	3	Lift codes (always “020” for body scales – for compatibility with forks)
<i>x</i>	Checksum	1	Sum of weight, units and flag bytes.
<i><CR></i>	Carriage Return	1	(0x0D)
<i><LF></i>	Line Feed	1	(0x0A)

Connector: D-Subminiature, 9-pin Socket

<u>Function</u>	<u>Pin</u>	<u>Notes</u>
N/C	1	
RxData	2	
TxDat3		
DTR	4	+V through 1K resistor
Ground	5	Isolated ground
N/C	6	
RTS	7	Not used
CTS	8	Not used
N/C	9	

PP GPS

The GPS option is based on the NMEA 0183 specified message format. It provides individual channel data to other on-board devices. The V320S/V340S will transmit approximately twice per second. All transmissions are made at 9,600 baud, 8 data bits, 1 stop bit, and no parity. Each record sent from the V320S/V340S Meter will have the following format:

*\$GPSWM,C,aaaaaa[,bbbbbb[,ccccc[,dddddd]]],UU*CS<CR><LF>*

Where:

Code	Description	Size	Comments
<i>\$GPSWM</i>	NMEA sentinel	6	
<i>C</i>	Number of Channels	1	1 to 4 possible channels
<i>aaaaaa</i>	Scale Weight Ch A	up to 6	ASCII numerals followed by “,”
<i>bbbbbb</i>	Scale Weight Ch B	up to 6	Optional Channel B followed by a “,”
<i>ccccc</i>	Scale Weight Ch C	up to 6	Optional Channel C followed by a “,” (V340S only)
<i>dddddd</i>	Scale Weight Ch D	6	Optional Channel D followed by a “,” (V340S only)
<i>UU*</i>	Units of measure	3	“LB*” or “KG*” NOTE: “Tons” will always be sent as “pounds”
<i>CS</i>	Checksum	2	NMEA 0183 specified checksum
<i><CR></i>	Carriage Return	1	(0x0D)
<i><LF></i>	Line Feed	1	(0x0A)

This option will output the individual channel weights. A V320S may have up to two channels, while the V340S may have up to four.

NOTE: An error on a channel will produce 999,999 in the channel’s position.

For example, if a truck had two channels, displaying Net weight in pounds, the output might look like this:

*\$GPSWM,2,9450,23150,LB*5F*

Connector: D-Subminiature, 9-pin Socket

Function	Pin	Notes
N/C	1	
RxDatA	2	
TxDatA3		
DTR	4	+V through 1K resistor
Ground	5	Isolated ground
N/C	6	
RTS	7	Not used
CTS	8	Not used
N/C	9	

PP ALL

Transmission Format: RS-232, ASCII data

Baud Rate: 4800

Data Bits: 8

Start Bits: 1

Stop Bits: 1

Parity Bits: None

Transmit Frequency: One line of the Data Frame sent once every one-half second. The number of data frames is equal to the number of channels active in the meter (as determined by the display code).

Data Frame:

W, <M>, <S>, <C>, ##### <CR> <LF>

Notes:

1. <M> is the Unit of Measure of the meter. This character will be “P” for pounds or “K” for kilograms. <S> is the scale mode. This character will be “G” for Gross mode or “A” for Axle Mode. <C> is the channel (“A” through “D”). “#####” represents the weight (zero filled). <CR> is a carriage return (HEX 0D). <LF> is a line feed (HEX 0A). The commas are actually transmitted by the meter to separate the fields.
2. If the Unit of Measure is set to “Tons”, the **PP ALL** output weight will remain in “Pounds”.
3. Weights are not rounded to the nearest graduation size.
4. If a negative weight is transmitted, the leading zero is replaced by a minus sign.
5. The number of active channels determined by the Display Code of the meter will determine how many and which channels are transmitted.
6. If there is an error on a channel, the weight will be set to “999999”.
7. A typical example of the output as seen on a terminal screen is shown below. The meter is using Display Code 201. The scale is displaying Gross weight in pounds.

W, P, G, A, 023761

W, P, G, B, 034845

Connector: D-Subminiature, 9-pin Socket

<u>Function</u>	<u>Pin</u>	<u>Notes</u>
N/C	1	
RxData	2	
TxDat3		
DTR	4	+V through 1K resistor
Ground	5	Isolated ground
N/C	6	
RTS	7	Not used
CTS	8	Not used
N/C	9	

PP Sb3

Transmission Format: RS-232, ASCII data

Baud Rate: 1200

Data Bits: 8

Start Bits: 1

Stop Bits: 1

Parity Bits: None

Transmit Frequency: Data Frame sent once every one-half second. Each Data Frame represents the weight – in tons – of the channel being displayed on the V320S/V340S meter at that moment in time.

Data Frame:

<01><C> ##.#<CR>

Notes:

1. <01> is a single byte containing the hexadecimal value 01. It is used by the scoreboard to indicate the beginning of a transmission.
2. <C> represents the current channel (“A” through “D”).
3. “##.#” represents the weight (zero filled) in tons. If the meter is displaying weight in kilograms, the scoreboard will read metric tons.
4. <CR> is a carriage return (HEX 0D).
5. If a negative weight is transmitted, the leading digit position is replaced by a minus sign.
6. A typical example of the output as seen on a terminal screen is shown below. The meter has two channels active. Channel A shows 10,350 pounds and B shows 33,050 pounds
7. If the Units are set to “kg”, the scoreboard will display “metric tons”.

```

      ■ A 05.2
      ■ B 16.5
      ■ A 05.2
  
```

where the “■” is displayed to represent the hex 01 byte.

Connector: D-Subminiature, 9-pin Socket

<u>Function</u>	<u>Pin</u>	<u>Notes</u>
N/C	1	
RxDData	2	
TxDData3		
DTR	4	+V through 1K resistor
Ground	5	Isolated ground
N/C	6	
RTS	7	Not used
CTS	8	Not used
N/C	9	

PP Sb6

Transmission Format: RS-232, ASCII data

Baud Rate: 1200

Data Bits: 8

Start Bits: 1

Stop Bits: 1

Parity Bits: None

Transmit Frequency: Data Frame sent once every one-half second. Each Data Frame represents the weight of the channel being displayed on the V320S/V340S meter at that moment in time.

NOTE: The scoreboard cannot display decimal points, so if the meter is set to Tons, the scoreboard will be in 10's of tons. For example, if the V320S/V340S is displaying "t 23.9", the scoreboard will display "239" – without a decimal point.

Data Frame:

#####<CR>

Notes:

1. "#####" represents the weight (space filled). <CR> is a carriage return (HEX 0D).
Weights are rounded to the nearest graduation size.
2. If a negative weight is transmitted, the leading digit position is replaced by a minus sign.
3. An error will cause the scoreboard to display "999999"
4. A typical example of the output as seen on a terminal screen is shown below. The meter is locked on channel A:

```

23760
23760
23770
23770

```

Connector: D-Subminiature, 9-pin Socket

<u>Function</u>	<u>Pin</u>	<u>Notes</u>
N/C	1	
RxDat	2	
TxDat3		
DTR	4	+V through 1K resistor
Ground	5	Isolated ground
N/C	6	
RTS	7	Not used
CTS	8	Not used
N/C	9	

PP Sb

Transmission Format: RS-232, ASCII data

Baud Rate: 1200

Data Bits: 8

Start Bits: 1

Stop Bits: 1

Parity Bits: None

Transmit Frequency: Data Frame sent once every one-half second. Each Data Frame represents the weight of all the channels being displayed on the V320S.

NOTE: The scoreboard cannot display decimal points, so if the meter is set to Tons, the scoreboard will be in 10's of tons. For example, if the V320S/V340S is displaying "t 23.9", the scoreboard will display "239" – without a decimal point – for that channel.

Data Frame:

aaaaaa[bbbbbb[cccccc[dddddd]]tttttt] <CR>

Notes:

1. "aaaaaa" represents the weight (space filled) on Channel A. "bbbbbb" represents the weight (space filled) on Channel B (if present). "cccccc" represents the weight (space filled) on Channel C (if present). "dddddd" represents the weight (space filled) on Channel D (if present). <CR> is a carriage return (HEX 0D). Weights are rounded to the nearest graduation size.
2. If a negative weight is transmitted, the leading digit position is replaced by a minus sign.
3. An error will cause the scoreboard to display "999999"
4. NOTE: If there is only one channel, the output is identical to "PP Sb6".
5. A typical example of the output as seen on a terminal screen is shown below. In this example, assume there are two channels. The output would look like this:

```
23760 36280 60040
23760 36280 60040
23770 36280 60050
```

Connector: D-Subminiature, 9-pin Socket

<u>Function</u>	<u>Pin</u>	<u>Notes</u>
N/C	1	
RxDData	2	
TxDData3		
DTR	4	+V through 1K resistor
Ground	5	Isolated ground
N/C	6	
RTS	7	Not used
CTS	8	Not used
N/C	9	

PP SCA

The SCADA option is specifically designed to interface with a Laurel LTS Transmitter. This transmitter will produce a 4 – 20 ma. analog signal proportional to the weights on individual channels. When this option is selected, the V320S/V340S Meter will output the Gross Weight readings from all channels in the format shown below. The weight information string **is sent twice every second**. All transmissions are made at 9600 baud, 8 data bits, 1 stop bit, and no parity. Each record sent from the V320S/V340S Meter will have the following format:

**aaaaaa,[bbbbbb,[ccccc,[dddddd,]]ttttt,]#<CR><LF>*

Where:

Code	Description	Size	Comments
*	Start character	1	
aaaaaa,	Scale Weight Ch A	7	ASCII numerals followed by “,”
bbbbbb,	Scale Weight Ch B	7	Optional Channel B
...			Up to four channels of data
dddddd,	Scale Weight Ch D	7	Optional Channel D
ttttt,	Total Weight	7	If two or more channels
#	Stop character	1	
<CR>	Carriage Return	1	(0x0D)
<LF>	Line Feed	1	(0x0A)

NOTE: “Scale Weight” is ALWAYS pounds, regards of the Units selected. An error on a channel will cause the output to be set to “-99999”

For example (assuming a two channel system – output contains: Ch A, Ch B, Total):

** 15000, 14760, 29760, #*

The output in a three channel system when it is nearly empty might look like this (including Total):

** 10, - 10, 22, 22, #*

A single channel might look like this:

** 15550, #*

Connector: D-Subminiature, 9-pin Socket

<u>Function</u>	<u>Pin</u>	<u>Notes</u>
N/C	1	
RxData	2	
TxDat3		
DTR	4	+V through 1K resistor
Ground	5	Isolated ground
N/C	6	
RTS	7	Not used
CTS	8	Not used
N/C	9	