

CJS-119

Digital Junction Scale

Installation and Operation Manual



Skip-Line®, Inc.

Leading the industry since 1972

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PRELIMINARY DRAFT

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CAUTION



READ BEFORE INSTALLING!

NOTE: DO NOT ADD WEIGHT TO TANK UNTIL SCALE HAS BEEN PROPERLY CALIBRATED. READ ENTIRE INSTRUCTIONS PRIOR TO OPERATION.

After calibration of your Digital Junction Scale, use the following table to note your truck-specific settings.

Parameter:	Value:
Load Cell Channel Count:	
Load Cell Sensitivity (mV/V):	
Load Cell Capacity Rating:	
Calibration Adjustment:	

i. Warnings, Warranty, and Disclaimer

WARRANTY

Each CJS-119 device is covered by a 30-day return for refund satisfaction guarantee. Buyer is responsible for determining suitability of this product for intended application prior to engaging in any contract that would rely on product functionality.

This product is also covered by a limited one year warranty. Products with defects in workmanship will be repaired or replaced at the sole discretion of Skip-Line, Inc. without charge for up to one year from date of invoice.

DISCLAIMER

All electronic equipment is subject to failure due to: Unanticipated use, non-compatibility of accessories, stress by mechanical vibration, electrical spikes, exposure to intermittent, poorly regulated, highly inductive, or noisy power sources, overload, temperature extremes, induced load-dump and welding currents, insulation chafing, improper wiring, poor cable routing, or stressed mounting. Indiscriminate high-pressure washing can cause moisture intrusion and corrosion.

All computerized systems can fail. Skip-Line, Inc. will not be held responsible or liable for any loss as a result of the use of this device, including but not limited to loss of time, money, opportunity, or personal injury. In no case shall Skip-Line, Inc. be responsible beyond the purchase price of this product.

IMPORTANT NOTE

Not all units have exactly the same appearance, functionality, or graphical style. Some graphics contained in this manual may show functions or features that are not installed on every unit and should not be relied upon for operational decisions.

Contents of this manual are subject to change without notice.

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1. Overview

The Skip-Line CJS-119 (CAN Digital Junction Scale) device provides advanced, per-load-cell diagnostics for glass bead or other material monitoring on a road marking vehicle. Each load cell is read individually, allowing the operator to diagnose load cell problems individually. With other scales that use load cell summing or junction boxes, considerable troubleshooting effort could be required to find load cell issues.

A Digital Junction Scale device does not require load calibration. Instead, the calibration is determined by entering the load cell ratings as determined by the manufacturer. While not normally necessary, a further calibration adjustment can be made to account for discrepancies.

The weight on each load cell is calculated individually, then they are summed together digitally, providing better signal resolution and faster diagnosis of weight monitoring issues.

When used with a Skip-Line Video Overlay system, a Digital Junction Scale can provide real-time bead application rate calculations in addition to reporting tank weight. When used with a Data Logger system, it can also provide GPS-tagged bead usage information.

The CJS-119 does not conform to any particular system of units. This means that the display does not show either "lbs" or "kg" labels for weight. The units of the number entered at calibration, whether imperial units (pounds) or metric units (kilograms), are the implied units of scale readings displayed during operation.

2. Specifications

Please observe the following operational and storage specifications for your Digital Junction Scale device. Operation or storage outside of these specifications may reduce performance, the life of the device, and (in some cases) void the warranty.

Specification	Minimum	Maximum
Operating Temperature	33°F	140°F
Storage Temperature	10°F	160°F
Humidity (non-condensing)	10% RH	90% RH
Voltage	10V	16V
Current	--	1A/device

CJS-119 devices should receive power from a BUS-012, and therefore require no further fusing.

3. Installation

Installation of a Digital Junction Scale requires physical installation of the device and communications/power cabling.

3.1 Preparing for Installation

Check that the following are ready before getting started:

- Select a mounting location for the Digital Junction Scale box.
 - Ensure there is sufficient room around the mounting location for connectors and cable routing.
 - Ensure the display will be sufficiently visible to the operator.
- Plan routes for the communications cable.
 - Make sure the mounting location can be reached with a five meter cable. Do not use cables longer than five meters to connect the CJS-119 to a BUS-012.
- Plan routes for the load cell cables. Cables should be routed away from pinch points, and properly protected from chafing or other cable damage.

Follow these precautions during installation:

Do not connect power until all other connections have been made.
Double check wiring prior to applying power.



**Important
Note!**

*All load cells connected to a Digital Junction Scale must have identical ratings (weight capacity and output sensitivity) for proper functionality.
Using the same model for all load cells is highly recommended.*

3.2 Installation

To install:

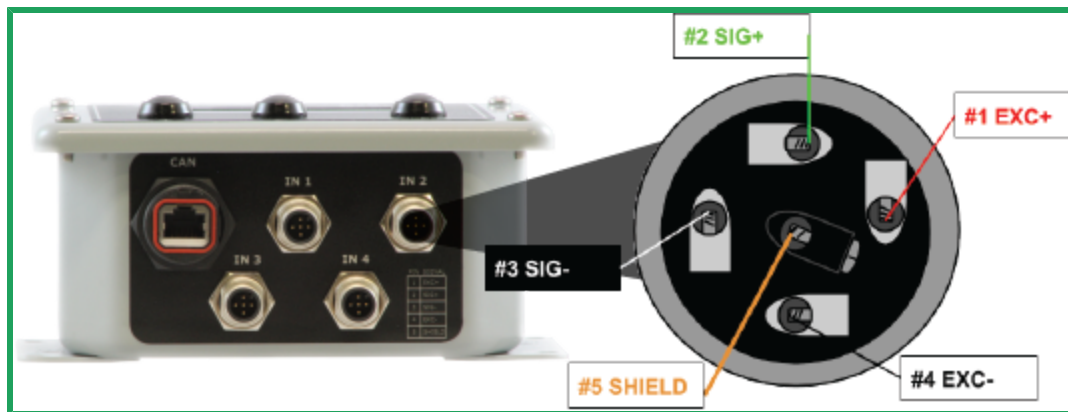
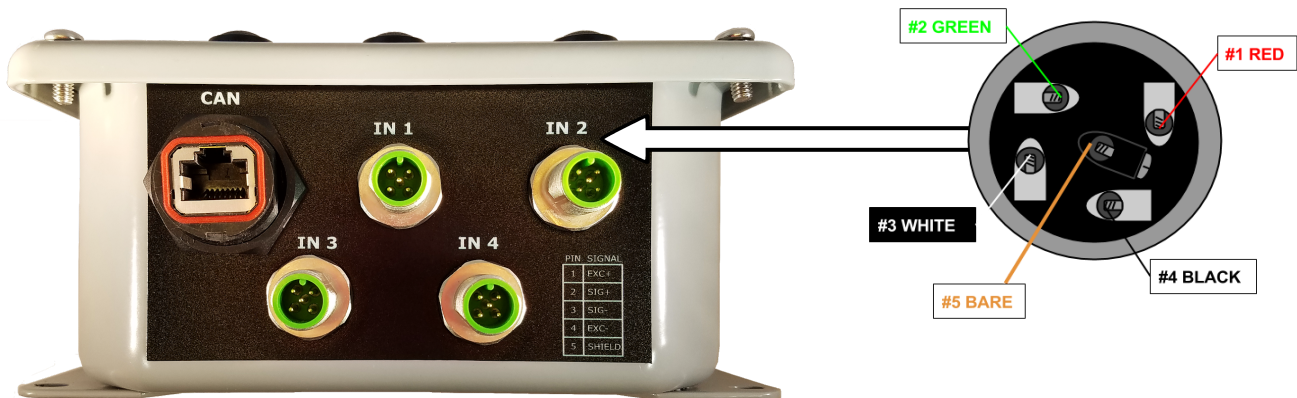
- Mount the Digital Junction Scale using the flange mounting holes.
- Connect power/communications cable (RJ45 connector).
- Connect each load cell to an input on the Digital Junction Scale.
 - Use M12 connectors, following the wiring table below.
 - For faster diagnostics in the future, it is recommended to label the load

cells and connector with the respective input number that it has been connected to.

Load Cell Wiring Table for M12 Connectors:

Signal Name	Wire Color*	Pin Number
EXC+	Red	1
SIG+	Green	2
SIG-	White	3
EXC-	Black	4
SHIELD	Bare	5

* Diagram represents the most common color scheme; actual colors may vary. Refer to load cell datasheet for actual wire colors.





**Important
Note!**

*Load cell connections must be in order, starting with input 1.
Example: For a system using 3 load cells, you must use inputs 1, 2, and 3.
The device will NOT work properly if an input is skipped, such as connecting
load cells to inputs 1, 3, and 4.*

Your Digital Junction Scale is now ready to be configured.

4. Menus

Proper configuration of your Digital Junction Scale is required for accurate operation. All the necessary configurations and calibrations can be done within the device menus.

The menus use a combination of three menu buttons to navigate and change setup parameters:

- **SELECT Button**
 - Press and hold the SELECT button for at least one second to enter the menu from the main screen.
 - When viewing a list, press the SELECT button to enter a sub menu.
 - When setting a value, press SELECT to save it or move to the next step in the process.
- **'+' (Plus) and '-' (Minus) Buttons**
 - In a list, use the '+' and '-' buttons to move up and down.
 - When setting a value, use the '+' and '-' buttons to increase or decrease the selected field.
 - Pressing both '+' and '-' buttons at the same time cancels out of a menu without saving the result.

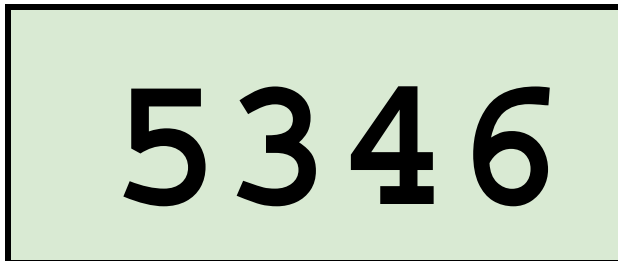


**Important
Note!**

Before configuring your Digital Junction Scale, make sure you have correct load cell specifications on hand.

If this is a retrofit installation, it is strongly recommended that you inspect the load cells for a part number to ensure the specification sheet matches.

4.1 Main Screen



The Digital Junction Scale device main screen shows the current sum of all connected load cells, minus the stored tare point. In cases where the calibration

factor is set, the number showing has been adjusted by the calibration factor.

4.2 Guided Setup

```

SETUP MENU
*Guided Setup
Load Cell Params
Tare
  
```

The “Guided Setup” menu asks several questions about your particular load cell specifications and configuration, and then tares the tank. This is the fastest way to quickly set up your Digital Junction Scale device.

Enter the “Guided Setup” menu by selecting it from the list and pressing the SELECT button.	<pre> SETUP MENU *Guided Setup Load Cell Params Tare </pre>
Press the SELECT button to continue through this informational screen.	<pre> This menu will ask for all load cell parameters. Press SEL to cont. </pre>
In order to tare the tank at the end of this menu, ensure the tank has been emptied. Press the SELECT button to continue through this informational screen.	<pre> Make sure tank is empty before continuing. Press SEL to cont. </pre>
If at a later point in this process you wish to cancel changes and exit this process, press the '+' and '-' buttons simultaneously. Press the SELECT button to continue through this informational screen.	<pre> Press '+' & '-' at same time to exit and cancel any time. Press SEL to cont. </pre>

The first step is to tell the device how many load cells it should attempt to read. Enter the number of load cells connected to your Digital Junction Scale, then press SELECT.	Enter number of load cells, then press SELECT. 4
The sensitivity rating, in millivolts per volt, can usually be found in the load cell datasheet. For most load cells, it is either 2mV/V or 3mV/V. Enter that number here, then press SELECT.	Adjust load cell sensitivity in mV/V, then press SELECT. 2.00
The capacity rating (also “full scale” or “full scale range”) of the load cells can be found in the load cell datasheet. If the pound rating is entered, then this device will report pounds. If the kilogram rating is entered, then this device will report kilograms.	Adjust capacity of load cells, then press SELECT. 10000
The settings are now sufficient for the device to correctly read the load cells and set a tare point. To save these settings, tare the scale, and proceed, press the SELECT button. To cancel without saving any changes, press the '-' button.	Save settings and tare the scale? Press '-' to cancel Press SEL to proceed

The Digital Junction Scale will now save the entered settings, begin reading the scale, and transmit readings to a Data Logger System.

Test the scale settings by adding a removable, known weight to the tank. The tank should correctly show the rise in weight within 5-10 seconds. If the weight shown on the display does not correctly match the known weight added to the tank, see section 5, “Testing and Troubleshooting”.

4.3 Load Cell Parameters

```
Load Cell Menu
*Load Cell Count
  Sensitivity (mV/V)
  Capacity ▼
```

The parameters set in the Guided Setup can also be configured individually. In addition, a calibration adjustment menu can be used (in rare situations) to correct circumstantial load cell error.

4.3.1 Load Cell Count

```
Enter number of load
      cells, then
      press SELECT.
                                     4
```

Enter the number of load cells connected to your Digital Junction Scale.

The scale will read from load cells connected to Input 1, up to the input number entered on this menu, when calculating a reading.

If fewer than 4 load cell inputs will be used, it is recommended to install a protective cap on all unused input connectors to prevent accidental misconnections.

4.3.2 Sensitivity (mV/V)

```
Adjust load cell
sensitivity in mV/V,
then press SELECT.
                                     2.00
```

Enter the load cell output sensitivity rating. This number can be found in the data sheet or ordering information for your load cell.

4.3.3 Capacity

Adjust capacity
of load cells,
then press SELECT.
10000

Enter the load cell capacity rating (also called “full scale” or “full scale range”). This number can be found in the data sheet or ordering information for your load cell.

Metric Operation

For metric operation, enter the load cell capacity rating in kilograms instead of pounds. For example, a load cell with a 10,000 lb rating has a matching metric rating of 4,536 kg. Entering 4,536 on this screen will generate calculations with a resulting weight in units of kilograms.

If a Data Logger system is connected, the weight units it expects from the scale will need to be configured to ensure it interprets the measurements with the correct units.

Using an External Junction Box

For systems where the load cells are wired to a junction box separate from the Junction Scale, the output of the junction box **MUST** be connected to Input 1 on the Junction Scale, and the capacity setting should be set to the sum of all connected load cells. For example, if four 3mV/V load cells are brought to a junction box which is connected to Input 1, and each load cell has a 5,000 lb rating, together they behave as a single 3mV/V load cell with a 20,000 lb rating. Note that the capacity rating for any input is limited to 60,000 (corresponding to 4x15,000 lb load cells joined together).



Important Note!

While an external junction box configuration is possible, Skip-Line does not normally recommend it for use with the CJS-119 because it diminishes the ability to quickly troubleshoot a problematic load cell or cable.

4.3.4 Calibration Adjustment

A Calibration Adjustment can correct the weight in the tank. This action is not normally needed, and should only be done to make small adjustments once it has been determined that the scale has a slight error.

Proceed with Calibration Adjustment only if:

The weight reading is steady, but after loading a large load, the weight is consistently off by a small amount.

There is an accurate, known weight of material in the tank.



**Important
Note!**

Calibration Adjustment should not be used if the weight reading is not stable or consistent. This indicates other issues that will only be complicated by using Calibration Adjustment.

See Section 5, "Testing and Troubleshooting", for more information.

If you are certain that a Calibration Adjustment is the correct course of action, press the SELECT button to continue.

The scale will take a reading once and display it.

As the Calibration Factor is changed, the Measured Weight will change accordingly.

Change the Calibration Factor until the measured weight correctly reads the amount known to be in the tank.

Press SELECT to continue.

**This is not normally
necessary. Refer to
manual for usage.
Press + or - to exit**

Measured weight:

2105.7

Calibration factor:

1.000

4.3.5 First Zero Calibration

The first zero method is generally more accurate than the false zero method and should be used when it is possible to remove all (or most) weight from the scale. This method determines where the zero point is, and calculates a calibration value.



Important Note!

This calibration method is not recommended if the tank's load cell specifications are known. Its primary use is for retrofitted trucks with inaccessible or illegible load cells.

If you are certain that a First Zero Calibration is the correct course of action, press the SELECT button to continue.	This is not normally necessary. Refer to manual for usage. Press + or - to exit
Remove all weight from the scale. If all weight is not removable, it is acceptable to leave that weight on the scale, but note that the scale reading will go negative if that weight is ever removed.	Remove all weight from the scale. Press SEL to proceed
Add a known weight to the scale. Generally, the greater the weight a scale is calibrated with, the more accurate the calibration is.	Add a known weight to the scale. Press SEL to proceed

The scale will display the weight it measured in the previous step.

As the calibration factor is changed, the measured weight will change accordingly.

Adjust the calibration factor until the measured weight correctly reads the amount known to be in the tank.

Press SELECT to continue.

Measured weight:

2105.7

Calibration factor:

1.000

4.3.6 False Zero Calibration

This method should be used when all of the weight cannot be removed completely from the scale, but it isn't full. This method uses the zero point determined from the most recent tare, calculating only a new calibration value.



Important Note!

This calibration method is not recommended if the tank's load cell specifications are known. Its primary use is for retrofitted trucks with inaccessible or illegible load cells.

If you are certain that a False Zero Calibration is the correct course of action, press the SELECT button to continue. The scale will take an initial reading to use as a reference for the calibration process. This may take several seconds.	This is not normally necessary. Refer to manual for usage. Press + or - to exit
When prompted, add a known weight to the scale. Generally, the greater the weight a scale is calibrated with, the more accurate the calibration is.	Add a known weight to the scale. Press SEL to proceed
The scale will display the weight it measured in the previous step. As the calibration factor is changed, the measured weight will change accordingly. Adjust the calibration factor until the measured weight correctly reads the amount known to be in the tank. Press SELECT to continue.	Measured weight: 2105.7 Calibration factor: 1.000

4.4 Tare

Tare the tank to find a new “zero weight” point. This should not need to be done regularly. This is necessary to remove the weight of the tank itself from the reported material weight.

Before taring, make sure a stable weight is available. If a load cell is damaged or has an intermittent connection, causing very large positive and/or negative readings, taring the tank will not solve the issue.

Make sure the tank is empty (or nearly empty) and the truck is on a level surface before beginning. Do not allow personnel to move around on the vehicle during the tare procedure.

Make sure the tank is empty, and that the truck is parked on a level surface.

Once ready, press SELECT to continue.

After several seconds, the scale will finish the tare procedure and save a new tare point for the tank.

TARE: Ensure tank is at desired zero pt, then press SELECT to save new zero point.

If a load cell is incorrectly wired or experiencing issues, a warning may appear to alert the operator that an unexpected reading occurred. If this happens, check that the load cell in the warning is correctly connected. For further load cell troubleshooting, refer to section 5.3, “Load Cell Troubleshooting” for more information.

4.5 Zero Point Adjustment

This option allows an operator to adjust the point at which the scale reads "0.0". This should only be used to manually enter a zero point value known to be good. This is not common or recommended for regular use, and should not need to be done often. If the tank is empty, the Tare function should be used instead.

This adjustment is reset when the Junction Scale is tared.

If you are certain that a Zero Point Adjustment is the correct course of action, make sure the tank is empty, and that the truck is parked on a level surface. Press the SELECT button to continue.	This is not normally necessary. Refer to manual for usage. Press + or - to exit
Adjust the zero point so that the measured weight is correct. Once ready, press SELECT to save. To cancel, press + and - simultaneously.	Measured weight: 65.4 Zero pt adjustment: -30.0

4.6 Averaging Sensitivity

The Averaging Sensitivity setting adjusts the amount of time spent averaging load cell readings before a new value is reported. A high sensitivity means that fewer load cell measurements will be averaged before transmitting a new reading. Low sensitivity means more load cell measurements will be averaged.

Changing the sensitivity will also change how often the display is updated, and how often reading transmissions occur. More averaging means more time between updates, and less averaging means faster updates.

Sensitivity levels 3 and 4 are recommended for most applications. If it is observed that the weight "bounces" too much (due to vehicle characteristics, acceleration/deceleration during normal usage, etc.), then move the sensitivity down one level at a time until the variations in the measurements reported are reduced to an acceptable level.

Use the '+' or '-' buttons to select the desired averaging sensitivity.

Then press SEL to save.

Or, simultaneously press '+' and '-' to cancel without saving.

Avging Sensitivity:
5=sensitive, 1=least

4

Lower sensitivity can delay the geographic location of actual usage in logged records. Adjusting the sensitivity too low can cause less usage to be reported over short segments of work. Each averaging sensitivity level will cause approximately the following delays before the currently displayed weight matches the actual weight:

- Level 1: 6 seconds (Lowest Sensitivity)
- Level 2: 5 seconds
- Level 3: 4 seconds
- Level 4: 3 seconds
- Level 5: 2 seconds (Highest Sensitivity)

4.7 Diagnostics

247.7	Sum	1004.5
251.8	Avg	251.1
250.1	Cal	1003.9
254.9	Dsp	1004.1

The Diagnostics screen provides valuable insights into whether or not your scale has been configured correctly, and if load cells are functioning properly.

- The first column indicates the current weight detected on each load cell.
- "Sum" indicates the raw weight total of all load cells (without calibration adjustment).
- "Avg" indicates the average weight of all load cells.
- "Cal" indicates the weight total of all load cells, including the calibration adjustment.
- "Dsp" indicates the value that would be normally displayed on the main screen. This value represents many weight measurements averaged out over time, and should show significantly less "jitter" than the other measurements.

There are several error conditions that this screen can assist in detecting. See Section 5, “Testing and Troubleshooting”, for further information on how to use this screen.

4.8 Save & Load Factory Settings

Defaults can be saved and restored from Factory Settings. It is recommended that the settings are saved after initial configuration to ensure that if settings are changed, they can be restored to a previous known working state.

Save Factory Settings will cause the current factory defaults to be overwritten and replaced with current settings. Press '+' to save settings if you are certain the current settings are correct and functioning well.	This will overwrite factory defaults. Press + to Save Press - to Cancel
Load Factory Settings will cause the current settings to be lost and replaced with factory settings. Press '+' to load factory defaults if your present settings are faulty.	Current setup will be lost! Continue? Press + to Restore Press - to Cancel

4.9 Startup Screens

The start menu briefly displays a splash screen that shows useful details about your scale. This information can be used by your OEM or Skip-Line to assist during troubleshooting and product support.

This screen shows which scale it is configured for, and which software version is currently loaded into the Digital Junction Scale box. These numbers can be used by your OEM or Skip-Line to assist during support and troubleshooting.	Skip-Line, Inc. Version 9112 Junction Scale 1
Once the bridge detection routine is complete, the scale will begin measuring the load cells and display a weight after a few seconds.	Skip-Line, Inc. Version 9112 Junction Scale 1 Measuring Scale...
This screen means that the scale program has unexpectedly restarted. If this screen appears regularly, contact your OEM or Skip-Line for further assistance.	WD Measuring Scale...
This screen indicates a memory error has been detected. The active settings have been corrupted and cannot be used. Press '+' to restart the device and retry. Press '-' to revert to default settings. You can attempt to restore factory settings, or re-enter your load cell parameters.	MEMERR: Call Support Error #: 4 +: Retry (restart) -: Revert to default

4.10 Reset All Settings

This allows the Scale to be reset to its internal defaults, rather than the changeable "Factory Settings". This is not normally necessary.

To enter this screen, hold both the '+' and SELECT buttons while powering on the Scale.

Press '-' to erase all of the Scale's settings and revert to internal defaults.

Press SELECT to cancel and continue the startup sequence as normal.

Reset all settings?

- : Reset

SEL: Cancel

5. Testing and Troubleshooting

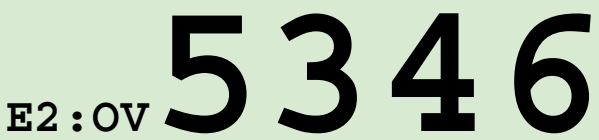
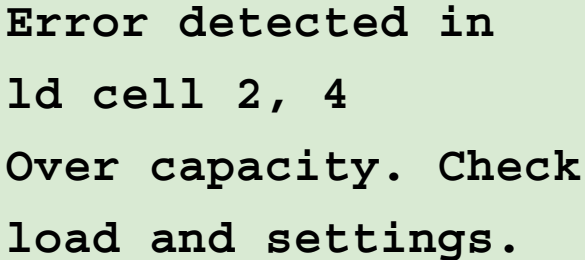
Testing load cells once mounted is very difficult. The improvements of the Digital Junction Scale, as compared with previous models, reduce the complexity of load cell testing and operation.

To test for proper operation, follow the instructions in the Standard Operation Test. If an error occurs, and a load cell (or load cell wiring) is determined to be bad, use the Load Cell Detection Test to determine which load cell is causing the issue.

For other issues and general troubleshooting, refer to section 5.5, "General Troubleshooting".

5.1 Main Screen Error Messages

While the Digital Junction Scale is running, it periodically checks each active input channel and attempts to detect and identify any errors.

A brief message in the lower left corner of the main screen indicates that an error has been detected in one or more of the load cell input channels. For example, the message E2:OV indicates that an over-capacity error has been detected in channel 2.	
Press the + button to show a more detailed error message. If errors are detected in more than one load cell channel, all affected channels will be listed on this screen. Press the SELECT button to exit and return to the main screen.	

CH	The input channel is clipping positive. This usually means the excitation voltage is shorted to the positive input.
CL	The input channel is clipping negative. This usually means the excitation voltage is shorted to the negative input.
IN	The input channel is reading a negative weight large enough that the load cell inputs might be inverted. Note that the zero point is not taken into account when detecting this error. This is to prevent it from being triggered by simply taring a non-empty scale and removing weight.
OV	The load cell is reading more than 90% of its rated weight capacity. Using load cells with a rating too close to the actual maximum load is not recommended, as a truck-mounted tank can easily put more than its own weight on a single load cell during acceleration or travel over rough terrain.

5.2 Standard Operation Test

To ensure the load cells and scale are working properly, do the following:

- Note the current reading (starting tank level).
- Add a known weight. The new weight reading should be approximately the starting tank level plus the added weight.
- Remove the added weight. The weight reading should be very near the starting tank level.

If the weight does not increase by the added weight, or did not return to the starting weight, refer to section 5.4, "General Troubleshooting" to troubleshoot the problem.

5.3 Load Cell Identification Test

If the scale reading is unstable, very large, or changes drastically on a slope, this often indicates a "floating" (open circuit) or "shorted" load cell connection. Load cell issues typically occur in three places:

- Wiring at the connectors
- Cable damage
- Load cell damage

If an error occurs, it is important to determine which load cell is causing the issue. To find which input the problem load cell is connected to, start by going to the diagnostics screen in the menu (see Section 4.6, "Diagnostics").

<u>NORMAL:</u> This is how the screen would normally appear, assuming there is approximately 1000 pounds of material in the tank.	247.7 Sum 1004.5 251.8 Avg 251.1 250.1 Cal 1004.5 254.9 Dsp 1004.1
<u>ERROR:</u> If a load cell has an issue, the final reading can be very erroneous. The diagnostics screen indicates which load cell this is. In this example, the load cell connected to Input #3 is experiencing an issue.	247.7 Sum -37946 251.8 Avg -9486.7 -38701.1 Cal -37946 254.9 Dsp -37944
<u>TO FIND A LOAD CELL:</u> If there is no label indicating which load cell is connected to which scale input, locate where the load cells are mounted under the tank. Add weight as directly over a single load cell as possible. In this example, Load Cell 1 is identified after noticing weight increase mostly on Load Cell 1. Repeat until all load cells are identified.	428.1 Sum -37946 255.3 Avg -9486.7 -38701.1 Cal -37946 242.7 Dsp -37944

5.4 Load Cell Troubleshooting

Load cell and load cell cabling account for most bead weighing issues. Performing the following inspections of your load cells can assist in finding the cause of some problems.

**Important
Note!**

While helpful in identifying bad load cells, there are some conditions in which load cells can pass these tests and yet still not operate correctly.

Advanced testing equipment is required to fully diagnose a load cell for proper operation—refer to your load cell manufacturer for further information.

5.4.1 Physical Inspection

Start by examining the load cell itself. Any of the following signs indicate that the load cell may need to be replaced:

- Corrosion or rust around the strain gauge seals indicate that liquid or chemicals may have entered the strain gauge sensor.
- Signs of corrosion or water entry around the load cell cable entrance.
- Cable shearing, kinking, cracking, abrasions, or other wear around the load cell cable entrance.
- Damage to load cell cable grip at the cable entrance—look for signs of water intrusion.
- Metal cracking, warping, fatigue, or bending.

The integrity of the cabling between the load cell and the Digital Junction Scale is just as important as the integrity of the load cell itself. Any of the following signs indicate a need to replace the load cell, or cable repair (at a minimum, as a stop-gap measure):

- Cable cracking, shearing, abrasions, or other cable insulation damage.
- Melted cable insulation due to external heat sources.
- Damaged extension connectors or splices.

Finally, connectors can be a failure point, due to either poor installation technique or damage. Any of the following signs indicate a need to replace or reinstall connectors:

- The connector hood is cracked, cross-threaded, or otherwise damaged.
- Cable insulation is not fully inside the connector hood seal, or the seal is loose (untightened).
- After removing the connector hood, inspect for:
 - Frayed wire ends as they enter the connector terminal.
 - Wires that have broken or come loose from the terminals.
 - Loose metal debris from shield or broken wire strands inside the connector or hood.
 - Other wiring deficiencies that could cause short or open circuits.

5.4.2 Electrical Inspection

Some issues may not be readily identifiable by visible inspection. Using a digital multimeter can assist in determining if a load cell is properly functioning.

For most tests, the easiest way to test is by pressing the probes onto an M12 connector terminal, with the hood removed. Be careful not to short the probes against each other.

Voltage Balance

If there is concern that a load cell has been damaged by over-stress or shock, the Voltage Balance test can help identify this damage. Put your digital multimeter into voltage measurement mode. If your multimeter allows you to select the voltage range, select the lowest range available. A multimeter with at least 0.1mV resolution is required.

1. Remove the load cell from the tank.
2. Remove the SIG+ and SIG- leads from the load cell connector terminals (usually, white and green colored wires).
3. Connect the load cell (using the M12 connector) to the Digital Junction Scale and power it on.
4. Measure the voltage from SIG- to SIG+ using your meter.
5. If the voltage is greater than the limits, it has likely been physically distorted due to shock or load:
3mV/V Load Cell: $\pm 1.5\text{mV}$
2mV/V Load Cell: $\pm 1.0\text{mV}$

If the load cell under test shows a voltage deviation greater than the limits above, it should be replaced.

Strain Sensor Resistance Tests

The resistance test can find issues with the sensor or cabling. This test does not require removing the load cell from the tank.

Put your digital multimeter into resistance measurement mode. If your multimeter allows you to select a resistance range, select 2Kohms. The analysis in this section assumes a 350 Ω load cell.

1. Disconnect your load cell from the Digital Junction Scale.
2. Measure resistance from one point to another, per the table below. Write down each measurement for analysis. Note that the exact resistance for the $\sim 280\Omega$ measurements is not important, however they must *precisely* match the matching resistance measurement indicated in the following

table:

<u>Signals To Test</u>	<u>Correct Range</u>	<u>Notes</u>
EXC- to EXC+	350Ω ±10%	If greater than error range, check for damage and replace load cell if necessary.
SIG- to SIG+	350Ω ±1%	If outside 1% tolerance range, replace the load cell.
SIG- to EXC+	~280Ω	Must match SIG+ to EXC+ reading.
SIG- to EXC-	~280Ω	Must match SIG+ to EXC- reading.
SIG+ to EXC+	~280Ω	Must match SIG- to EXC+ reading.
SIG+ to EXC-	~280Ω	Must match SIG- to EXC- reading.

3. If any measurements are 0Ω (short circuit), or open circuit (no reading, often indicated by an 'L'), check cabling for damage. If cabling shows no signs of damage, the cell itself may have a broken wire or loose connection internally. If cabling does not show signs of damage, replace the load cell.
4. If any measurements, or measurement matches, do not correspond as the table indicates, the load cell should be replaced.

5.5 General Troubleshooting

Issue	Solutions
Weight reading is erratic.	• Check if number of load cells connected is correct. • Check load cell connections. • Check load cell cabling. • If fewer than 4 load cells are in use, check that they are connected in order (see note in section 3.2).
Weight reading does not change.	• Load cells may be shorted to another signal—check connector wiring. • Settings may be incorrect—check settings against load cell ratings. • Check load cell cabling.
Weight changes significantly when truck gets wet (pressure washing, rain).	• Check load cell cabling and connectors for damage. • Check load cell mounting.
CJS-119 displays correct weight, but does not send readings to Video Overlay or Data Logger systems.	• Check communications cabling.
Weight reading is stable but incorrect by a constant percentage at several different load weights	• Check that the actual load cell count matches the setting in the menu. • Double check load cell specifications for an incorrect sensitivity or capacity rating. • If the error is below 10%, use the Calibration Adjustment menu to correct the error. Following the adjustment, perform a Standard Operation Test to ensure the adjustment is accurate.

Appendix A: Glossary

Hub

A BUS-012 hub provides clean, filtered power and communications to units on an SC-12 system. It also shows diagnostics for each port, as well as general fault conditions.

Data Logger System

A Skip-Line DL-18 or DL-12 Data Logger System provides application rate calculations and records this information for later office use.

Video Overlay System

A Skip-Line HDVO-318 or CVO-312 Video Overlay System displays guide crosshairs, application rate calculations, and other real-time information overlaid on a live camera feed.

Load Cell

Used in this manual as a generic term to describe strain gauge devices that can operate with the Digital Junction Scale. The Digital Junction Scale is compatible with load cells, weigh bars, or other styles of resistive strain gauges.

Select Button

This button is pressed and held to enter the main menu, to select a navigation item, or to confirm a changed value.

'+' Button

Used to navigate up in a list of options, or scroll a value up.

'-' Button

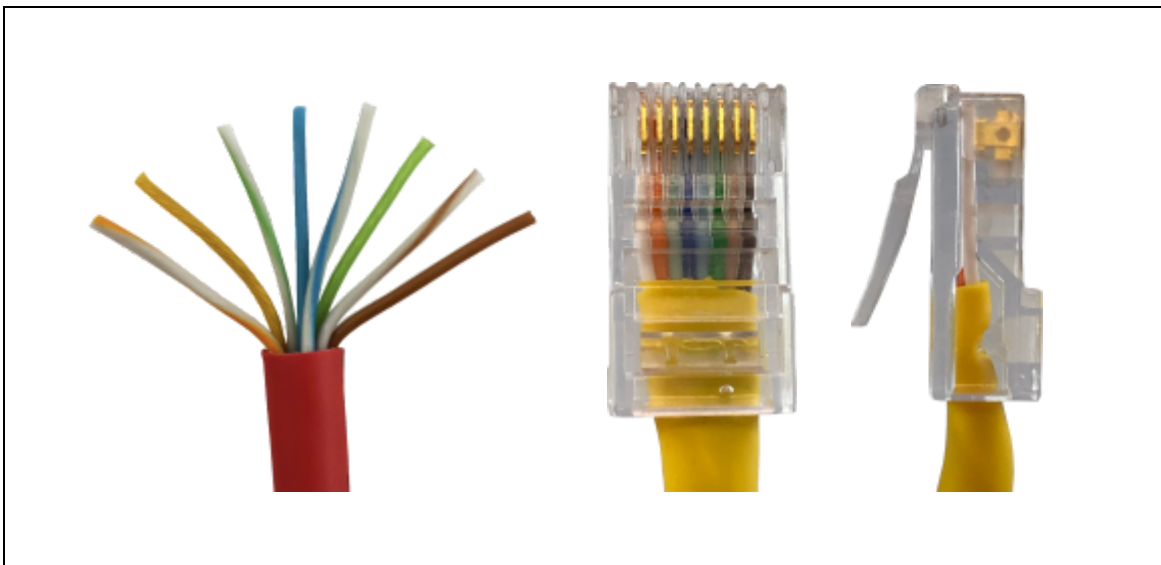
Used to navigate down in a list of options, or scroll a value down.

Appendix B: Making a Communications Cable

Communications cables for the SC-12 system follow the EIA/TIA 568-B cable wiring standard. These are commonly referred to as Cat5, RJ45, or simply as a network patch cable.

A communications cable should be constructed using the following pin assignments on both ends of the cable.

- Pin 1 - white / orange stripe
- Pin 2 - orange
- Pin 3 - white / green stripe
- Pin 4 - blue
- Pin 5 - white / blue stripe
- Pin 6 - green
- Pin 7 - white / brown stripe
- Pin 8 - brown



TIA/EIA 568-B

These cables can also be purchased pre-assembled from your local computer store or big box retailer in varying lengths.

A sealed waterproof RJ-45 connector with strain relief is available from your OEM or Skip-Line.

Appendix C: Copyright Notice

The firmware for the Digital Junction Scale includes a portion of source code provided by Analog Devices, Inc. for use with one or more components manufactured by Analog Devices, Inc. comprising part of the Digital Junction Scale's design. The use of said source code by Skip-Line, Inc. requires that the following information be published:

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