Safety and Warnings

All Belt-Way components MUST be used as described in this manual!

Please note the labels on the integrator and in the manual denote dangerous voltage. Failure to take safety precautions may result in serious injury or death.

The protective conductor terminal (Earth Ground) is signified by the following label. It must be properly connected to earth ground per local electrical codes.
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Introduction

The Belt-Way conveyor belt scale is a highly accurate and cost effective in-motion weighing system. It is designed to measure material flow over a conveyor belt in real-time. The primary components are the integrator (AKA, controller, display, indicator), load cell assemblies, and speed sensor. The scale system processes speed and load signals to accumulate weight and calculate flow rate.

This manual covers the following belt scale models:

- Model 45 (Low capacity)
- Model 100, Model 200 (Medium capacity)
- Model 350, Model 500, Model 1000 (High Capacity)

This manual pertains to scales operating on firmware 6.43 and above. A manual for previous versions may be found at beltwayscales.com
## Scale Accessories

Call or visit [beltwayscales.com](http://beltwayscales.com) for a complete list of all the accessories that Belt-Way has to offer.

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Angle Sensor</strong></td>
<td>The angle sensor eliminates the need for constant recalibration when the scale is installed on a variable angle conveyor or portable machine.</td>
</tr>
<tr>
<td><strong>RS485 Junction Box</strong></td>
<td>A Smart junction box can be installed on the conveyor to place the scale integrator up to 1000 ft. from the scale.</td>
</tr>
<tr>
<td><strong>IO Board</strong></td>
<td>The IO board allows the scale to interface with a PLC system, automate loadout of trucks or rail cars, control a VFD, and blend multiple products.</td>
</tr>
<tr>
<td><strong>Self-Storing Test Weight Kit</strong></td>
<td>The test weight kit remains installed on the conveyor. It is activated from one side for easy, safe calibration.</td>
</tr>
<tr>
<td><strong>Outdoor Protection Enclosure</strong></td>
<td>Heavy duty enclosure offers extra protection for the scale integrator. Includes power switch.</td>
</tr>
<tr>
<td><strong>Wireless Multi-Scale Remote Display</strong></td>
<td>The remote display allows multiple scales to be viewed from one location. Monitor production, clear weight, and perform zero calibrations. Wireless communication makes installation simple and cost effective.</td>
</tr>
<tr>
<td><strong>Plant Connect - Online Scale Production Reporting</strong></td>
<td>Our Plant-Connect website allows users to monitor belt scale production on a PC, tablet or smart phone.</td>
</tr>
</tbody>
</table>
Integrator Specifications

Replacement Part Number: BWINT
100-240 AC Power Supply Factory Installed Part Number: BWPS-AC
9-30 DC Power Supply Factory Installed Part Number: BWPS-DC
9-30 DC Power Supply Field Installation Kit Part Number: BWPSKIT-DC
IO Option Board Part Number: BWIO (Factory Installed)
IO Option Board Kit Part Number: BWIOKIT (Field Installed)

Display: 4.3” Color LCD
Enclosure: Cast Aluminum
Operating Temperature: -20°C to 45°C
Required Power: 12-24 VDC, 55 Watts
optional 110/240 AC power adapter
Inputs: 8 Load Cells (millivolts)
1 Speed Sensor (0-5 VDC Pulse)
1 Angle Sensor (0-4 VDC)
Outputs: 1 RS232 (Printer Port)
1 RS232 (Display Port)
1 Ethernet Port (Modbus TCP)
1 USB 2.0 Client

Optional IO Outputs:
4-20 mA outputs (Tons Per Hour)
Digital Pulsed Output (Total Weight)
Min / Max Speed
Min / Max Tons Per Hour
Zero Calibration
Loadout
Optional IO Inputs:
Clear Weight
Print Ticket
Zero Calibration
## Electrical Ratings

<table>
<thead>
<tr>
<th>Input Power to Belt-Way Integrator:</th>
<th>12-30 VDC, 24 VDC 2.25A Max</th>
</tr>
</thead>
</table>
| AC Power option: | Input:100-240VAC 50/60Hz, 1A Max  
Output: 24VDC, 2.25A Max |
| **Use of the factory supplied AC Power option is recommended.** | |
| AC control power over-current protection with isolated circuit, and disconnect point such as a breaker or switch box, is recommended. Conformance to local electrical codes is required. |
| Digital Inputs: (IO option installed) | 12-24VDC, 50mA sink |
| Digital Outputs: (IO option installed) | 12 - 24VDC, 100mA sink |
| Analog Outputs: (IO option installed) | 4-20mA, 24VDC powered loop |
| Relay Outputs, UL contact ratings: (IO option installed) | 220VDC, 0.24A, 60W  
125VDC, 0.24A, 30W  
250VAC, 0.25A, 62.5VA  
125VAC, 0.5A, 62.5VA  
30VDC, 2A, 60W |

### Environmental

- **Temperature:** Normal operating range -20°C to +45°C.
- **Humidity:** The unit is suitable for outdoor use.
- **Altitude:** The unit is suitable for use to elevation of 2000m.
## Scale Components

The single idler scale consists of the following components

<table>
<thead>
<tr>
<th>1 - Integrator</th>
<th>2 - Load Cell Assemblies</th>
<th>2 - Mounting pipes</th>
<th>1 - Hardware Kit</th>
<th>1 - Speed Sensor with mounting arm</th>
</tr>
</thead>
</table>

The dual idler scale consists of the following components

<table>
<thead>
<tr>
<th>1 - Integrator</th>
<th>4 - Load Cell Assemblies</th>
<th>4 - Mounting pipes</th>
<th>2 - Hardware Kits</th>
<th>1 - Speed Sensor with mounting arm</th>
</tr>
</thead>
</table>

### Unpacking the Scale

Each scale is comprised of at least three boxes

- 26” x 10” x 8” - Integrator and Speed Sensor
- 26” x 10” x 8” - Load Cells and Hardware kit
- 48”, 60” or 72” long boxes for mounting pipe and various sizes for angle sensors and other accessories
Mechanical Installation

2D component and installation drawings are available at beltwayscales.com
3D drawings are available by request.

A. Recommended Tools

- Cutting torch and grinder (remove idler mounting feet)
- Heavy duty drill or magnetic drill press (drill u-bolt holes)
- Tape Measure (measure idler distance)
- Angle finder or phone app (measure conveyor angle)
- 1/2” socket and wrench (load cell and speed sensor brackets)
- 9/16” deep socket and wrench (V-block, u-bolts, leveling bolts)
- String (to level weighbridge idlers)
- Shim kit (to adjust idler height)
- 4 way screwdriver (integrator mounting, integrator door, hose clamps)
- Small Belt-way screwdriver (integrator wiring)

B. Conveyor Design Recommendations

The following design suggestions are essential for best scale accuracy and repeatability.

- Reduce speed whenever possible to maximize belt load. Slow moving, heavily loaded belts work better than fast moving, lightly loaded belts.
- Proper belt tension must result in 1%-2% deflection between idlers. For example, 2% deflection is 1 inch sag in the belt over a 4 ft. idler spacing.
- Lower trough angles, 0°-35°, are preferred. Avoid 45° troughed idlers.
- Install a belt scraper to keep the belt clean.
- Cover the conveyor to shelter it from wind, rain and snow.
C. Scale Placement

- Install the scale where it is easily accessible for maintenance purposes.
- Choose a very rigid section of conveyor such as an idler over a brace.
- The scale must be at least 40 ft. away from curves in the conveyor.
- Stay at least three idlers away from the head pulley, tail pulley, and loading points.

Material must not impact the belt near the scale!

D. Define the Weighbridge

The Weighbridge is the section of belt actively being weighed by the scale.

- The weighbridge idlers must be in good mechanical condition.
- The weighbridge idlers must be the same trough angle, and diameter.
- The weighbridge idlers should be an equal distance apart.
- Skirting should not make contact with the belt in the weighing area.
- A single idler weighbridge consists of 5 idlers.
  Scale must be installed on the center idler
- The dual idler weighbridge consists of 6 idlers.
  The scale must be installed on the 2 center idlers.
E. Attach Load Cell Assemblies to idler

- Bolt the load cell assemblies to the idler as shown using the V-Block.
- The load cell cable should point downhill.
- Leave plenty of clearance between the load cell assembly and conveyor frame.
- Do not overtighten the V-Block bolts.
- The bolts should be tightened ¼ turn after compressing the lock washer.
- Position the load cell assemblies an equal distance from the conveyor frame.
- This balances the load of the belt evenly between the load cells.

NOTE: Stainless Steel Load Cells – Do not use a full thread bolt, or over tighten the existing V-Block bolt on a stainless steel load cell. This will damage the load cell cable.
F. Install Scale Support Pipes

This step is extremely important to ensure long term scale accuracy.

- The mounting pipe must touch the strap on the uphill side of load cell assembly.
- The strap on the downhill side must create an oval opening.
- Center the pipe in the oval hole.
- The load cell assembly must be free to move up and down slightly on the pipes. This eliminates torque on the conveyor frame, which allows automatic alignment of the weighing elements.
- Install the four hose clamps onto the pipe with the screw fitting directly over the top of the pipe, but do not tighten the clamps at this time.

**Uphill side:**
Retaining strap fits tightly around the pipe.

**Downhill side:**
Retaining strap forms oval hole around the pipe.
G. Drill U-bolt Holes

- Use the leveling plate as a drill template for the U-bolts.
- The leveling plates and pipe centers should measure 15” apart.
- The holes should be at least 7/16” to clear the 3/8”-16 U-bolts.

H. Remove and Modify Idler

- Unbolt idler from frame.
- Remove the idler mounting feet to create clearance above the conveyor frame.
- If the idler feet are not removed, all other weighbridge idlers must be shimmed up 3/8”.
- Make sure the idler is centered from left to right on the conveyor.
I. String-Line Idlers to level the Weighbridge:

This is an extremely important step in the installation process.

- The empty belt must rest uniformly on all idlers within the weighbridge.
- Use a minimum of three strings to align all 5 or 6 weighbridge idlers.
- Shim idlers if necessary to bring them into alignment.

- Use the 3/8-16 leveling bolts to adjust the scale idler height.
- Tighten U-bolts evenly so pipes remain parallel and oval clearance around bottom pipe is maintained.
- Tighten the jam nuts against the leveling plate to lock the pipes in place.
J. Install Hose Clamps:

- Install the hose clamps on the outside of the load cell assembly.
- Leave clearance so the clamps don’t bind between the pipe and load cell bracket.
- Rotate the screw barrels away from the gaps between the hanger brackets and the pipes.

K. Install Speed Sensor Assembly

- The standard speed sensor assembly may hang from either pipe. It must point downhill.
- The wheel must ride smoothly on the belt.
- Avoid installing it near return idlers that may cause the wheel to bounce.
- A small amount of weight may be added to the speed wheel arm to hold the wheel firmly on the belt.
- Use two hose clamps to retain the mounting arm.
- Secure the cable to the arm with cable ties. Route the cables carefully along the conveyor frame so they are protected from falling debris and pinch points.

L. Optional Angle Sensor

Any conveyor that frequently changes angle must have an angle sensor installed.

- Mount the Angle Sensor directly on the conveyor frame.
- Mount in the direction of the head pulley.
- Reference the UP arrow indicator on the sensor.

Caution: Excessive vibration will interfere with Angle Sensor performance.
Wiring the Sensors

A. Extending the sensor cables

- Standard load cells, speed sensors, and angle sensors have 30 ft cables.
- 50 ft. cables are available upon request for an additional charge.
- Factory supplied cables may be extended up to 100 ft. in one of four ways:
  1. Solder and waterproof a similar shielded cable onto the original.
  2. Use a waterproof terminal strip. Do NOT sum multiple load cells into a single cable. Each load cell must individually connect to the integrator.
  4. Belt-Way RS485 Junction box with Quick Disconnect option

- Distances greater than 100 ft should utilize the Belt-Way RS485 Junction box.
- Use of any style crimp connector or wire nuts to extend sensor cables is unacceptable and will void the warranty!
- Use of unshielded cable is unacceptable and will void the warranty!

B. Connecting the sensors to the integrator or junction box.

C. Connecting the shield wire

All sensor wires MUST be connected as shown below. 
Properly terminating the shield wire is required to prevent electrical interference.

Route the cable through the rubber grommet and loop the shield wire back out so it touches the aluminum connector.
**WARNING!**

Always disconnect power before servicing the integrator.

Make sure you **LOCK OUT, TAG OUT** and **TRY OUT** the electrical system before any maintenance or service. Please follow all Federal, State and Company Safety procedures and policies when working with this product.

**Integrator Installation**

The mounting kit includes four mounting feet and four M6 x 1mm x 60mm screws with nuts to attach mounting feet to the integrator. Customer must supply fasteners from mounting feet to mounting location. Leave a minimum of 3” clearance on the hinge side to allow the door to open.

The integrator is weatherproof, but should be installed in a protective enclosure whenever possible. Physical damage to the integrator is not covered under warranty.

**WARNING!**

Do not install the integrator where it is subject to vibration. Damage from vibration is not covered under warranty.

Rubber or neoprene should be used to dampen the effects of vibration. This is especially important on portable machines. Vibration Mounting Kits are available from Belt-Way. Order part number **BWVIBRATIONMT**.
A. Sensor Board

The load cells, the speed sensor, and the angle sensor all connect to the sensor board unless a junction box is required.

**.80 A Fuse**

### Speed Sensor Wiring
- SIGA – GREEN
- +5V – RED
- GND – BLACK & WHITE

### Angle Sensor Wiring
- SIG – GREEN
- GND - WHITE
- +5V – RED
- GND - BLACK

### Load Cell Wiring
- -SUP – BLACK
- +SUP – RED
- -SIG - WHITE
- +SIG – GREEN

**A Single Idler Scale must use LC1 and LC2.**
**A Dual Idler Scale must use LC1 to LC4.**

**DO NOT SUM THE LOAD CELL WIRES BEFORE CONNECTING TO THE INTEGRATOR!**

The load cells are processed independently and require individual wires for each load cell connector. Summing the wires will cause the scale to malfunction.
B. Terminal Board with 110 / 240 AC Power Supply

All power wiring must conform to local and national electrical codes. Always disconnect power before servicing the integrator.

The AC Power supply is installed below the Sensor Board. It converts 110/240 AC to 24 VDC.

**Ethernet Port**
- Power Over Ethernet 1.25 A Fuse
- Only install this fuse when using a wireless transmitter. See page 21

**110 AC - To Power Supply**
- LINE – BLACK
- NEUTRAL - WHITE
- EARTH GROUND – GREEN
- The user must supply a minimum 16-gauge 3 wire power cord.
- Connect to a properly grounded receptacle that is rated for at least 15 Amps at 110 VAC.

**24 VDC From Power Supply**
- GND = BLACK
- +24V = RED
- 6 A Fuse

**Ferrite Bead Installation**
- Each scale includes a Ferrite Bead to meet CE emission requirements.
- Run all AC wires through it as shown to the right.

**NOTE FOR GENERATOR POWER**

A generator may produce unstable power during the startup or shutdown sequence.

The integrator is sensitive to power fluctuations and should be disconnected at startup and shutdown to prevent data loss. Use a breaker or simply unplug the power cord from the outlet until the generator is fully powered up.
C. Terminal Board with DC Power Supply

The DC Power supply is installed below the Sensor Board. It boosts 9-24 VDC up to 24 VDC and regulates the voltage during engine cranking.

9-24 VDC Landing Board

- VDC = BLACK
+24 VDC = RED
Output from Power Supply To Integrator

- 9-24 VDC
- VDC
7.5 A Fuse

Input from Battery to Power Supply

User should supply a toggle switch to isolate the integrator from the battery.
D. Integrator Board

The scale firmware and programmable settings are stored in the integrator board.

![Integrator Board Image]

USB Port

1.25 Amp Fuse

E. IO Board

The IO board is optional. It provides 4-20mA outputs, 3 digital outputs, 4 digital inputs and 2 relay outputs.

The IO board mounts to the bottom of the enclosure. If it is installed, then there will be black wires connected on top of the terminal board.

The most common use of the IO board is to remotely monitor the scale from a PLC system.

The 4-20 mA output mirrors the tons per hour. The output is powered by the integrator. Connect IOU1 + AGND or IOU2 + AGND to the PLC input.

The digital pulsed output is used as a remote counter. A 24 VDC solid-state control relay is required if the PLC has a 110 VAC digital input. This may be purchased from Belt-Way or a 3rd party electrical supplier. Use SNSR PWR to supply 24 volts to positive relay terminal. Install a jumper wire between GND and DOGND. Connect DOUT1 to the other side of the relay.
Integrator Configuration and Scale Calibration  
A. Integrator Navigation and Data Entry

**HOME:** Returns to the Run Screen

**MAIN MENU:** Displays the Main Menu

**BACK:** Moves to previous screen only

**ZERO CALIBRATION:** Initiate the Zero Calibration process

**PRINT TICKET:** Print ticket or save a screenshot to USB when no printer is installed

**CLEAR WEIGHT:** Press TWICE to reset the accumulated weight to 0

**ENTER KEY (Middle Arrow):** Press to select menu options or accept value changes

**ARROW KEYS:** Use to navigate menus

---

**Editing Numeric Values**

Various integrator functions require the user to edit numeric values: (Idler distance, test weight calibration, IP address etc.)

When prompted, use the arrow keys and follow the on screen instructions.

---

**Editing Alphanumeric Values**

Various integrator functions require the user to edit alphanumeric values: (scale name, password, etc.)

Use the arrow keys to highlight desired letter and press **Enter** to select. When the word is complete, use the virtual enter button to save.
B. Setup Wizard

The Setup Wizard is a step by step guide for the initial setup of the integrator. Record the following information before beginning the wizard.

- Number of weigh idlers
  (1 for single idler scale and 2 for dual idler scale)
- Load cell capacity found on Load cell assembly label
  (45 kg, 100 kg, 200 kg, etc. one box will be punched out)

![Idler spacing distance](image)

- Convoy Angle if an automatic angle sensor is not used.
  Note: If the conveyor angle is not known, leave the angle at the default of 12 degrees.
  Pulley diameter if using shaft mount speed sensor instead of the wheel speed sensor.

C. Scale Setup

View or edit scale parameters at the Scale Setup Menu.

<table>
<thead>
<tr>
<th>Run Mode</th>
<th>Weight / Rate, Loadout, Rate Control, Blending</th>
<th>Weight Units: Tons, Long Tons, Pounds, Tonnes, Kilograms</th>
<th>Speed Sensor Wheel Diameter: 7.97 Pulses per Revolution: 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Idlers: 1, 2, 3, 4</td>
<td>Rate Time Units: Hour, Minute</td>
<td>Conveyor Angle: 12 (factory default) or install Angle Sensor</td>
<td>I/O Board: Not Installed / Installed</td>
</tr>
<tr>
<td>Load Cell: 45, 50, 100, 150, 200, 350, 500, 1000 kg</td>
<td>Idler Distance: 48 (factory default)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance Units: English, Metric</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Use the following page to record all the initial scale setup values.
## Dealer Contact Information

| Dealer Name: |  |
| Contact Name: |  |
| Contact Phone: |  |
| Contact Email: |  |
| Address: |  |
| City, State, Zip |  |

## Scale Information

| Serial Number: | BWINT- |
| Date of Install: |  |
| Conveyor Type: | Stationary [ ] Stack [ ] Mobile (track mounted) [ ] |
| Conveyor Make: |  |
| Conveyor Model: |  |

### Initial Scale Setup Parameters

| Run Mode: |  |
| Number of Idlers: |  |
| Load Cell Size: |  |
| Units: | Distance: | Weight: | Rate-Time: |
| Conveyor Angle: | Angle Sensor Installed? | YES [ ] |
| Idler Distance: | Dist A: | Dist B: | Dist C: |
| Speed Sensor: |  |
| Decimal Places: |  |
| I/O Option Board: | Installed [ ] |

### Initial Calibration Parameters

| Trim Factor: |  |
| Zero Value: | Belt Length: |

## Test Weight Calibration

| Test Weight Amount | Belt Speed | TPH with Test Weight Installed |

## Material Test Calibration

| Belt Scale Weights |  |
| Truck Scale Weights |  |
D. Scale Calibration

Navigate to Main Menu > Calibration

i. Perform Length and Zero (if not completed during the Setup Wizard)

Navigate to Calibration > Belt Length Cal > Length & Zero and follow instructions.

The **Length and Zero** measures the belt length and weight of the empty belt. It must be performed once at startup and whenever the belt length changes significantly. **Paint a mark on the belt to easily determine one revolution.**

If the belt length is less than 60ft and the belt speed is more than 400 fpm, we suggest increasing the belt length to improve zero stability. Allow the belt to run 2 or 3 revolutions during the Length and Zero procedure.

ii. Perform Zero Calibration from Keypad

The Zero Calibration weighs one revolution of the empty belt and calculates a new zero weight. Start the belt running empty and press the Zero Calibration button on the keypad. You do not have to wait for a specific mark because the belt length is already established. Follow the instructions on the screen.

- The Zero Calibration should be performed at least once per day.
- The Zero Calibration should be performed whenever a conveyor moves.
- Pay attention to the accumulated weight when the belt is running empty.
- If it adds or subtracts a significant amount then perform a new zero calibration.
- If multiple zero calibrations don’t correct the problem, review the maintenance checklist and inspect the scale for mechanical problems.
iii. Test Weight Calibration

The Test Weight Calibration adjusts the Trim Factor to properly calibrate the scale. The calibration should be performed at startup and several times per year on a stationary conveyor. A portable conveyor should be calibrated each time it is moved. A Test Weight Calibration is quick and easy, but a repeatable Material Test is typically the most accurate method of calibration. A scale may seem properly calibrated with test weights, but may be inaccurate when running material if the idlers and belt are not properly aligned or the belt is too tight.

<table>
<thead>
<tr>
<th>Suggested test weight amounts by scale model:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 45 or 50</td>
</tr>
<tr>
<td>20-40 lbs.</td>
</tr>
</tbody>
</table>

Option 1: Hang weights on the load cells

Obtain a bar that extends past the edge of the conveyor and barbell or hand weights. Make sure to weigh the weights on a certified scale to get an accurate total. You must include the weight of the bar in the test weight total. If you don’t know the weight of the bar you can perform a zero calibration with the bar on the load cells. Repeat the zero calibration without the bar when the test weight calibration is complete.

Make sure the weights don’t touch the belt or conveyor frame!

Option 2: Self-Storing Test Weight Kit

Rotate the test weights from the storage position to the calibration position.
Navigate to **Main Menu > Totals & Diagnostics > Live Weight**

**Live Weight** shows the current force on the load cells in pounds or kilograms. **Trimmed Live Weight** adjusts the value by the Trim Factor. Confirm the **Live Weight** shows the correct test weight amount. If the **Live Weight** isn’t close, then check to make sure that nothing interfering with the idler, test weight bar, or load cells. Measure the test weights out to 2 decimal places. For example, 50.25 pounds. Check all other parameters including model number, idler distance, and angle. When the weight is correct then proceed with the calibration.

Navigate to **Main Menu > Calibration > Test Weight**. Enter the test weight amount.

Start the belt running empty and follow the instructions on the screen. The calibration will run for several belt revolutions and then stop. Pay close attention to the Old Trim Factor and New Trim Factor on the **Accept Cal** screen.

The **Trim Factor** will ideally be between .90 and 1.10. If the **Trim Factor** is close to 1.000, use the following formula to verify the calibration.

\[
\text{(Test Weight Amount / Idler Distance) \times \text{Belt Speed} \times 60} / 2000 = \text{Tons Per Hour}
\]

**Example:** \((100 \text{ lbs.} / 4 \text{ ft.}) \times 400 \text{ feet per minute} \times 60) / 2000 = 300 \text{ TPH}\)

Record calibration information on pages 37-38.
iv. Perform Material Test Calibration

The **Material Test Calibration** verifies the belt scale against a certified scale. The calibration is typically performed with a legal for trade truck scale. It is also possible to do a material test comparison with a loader scale, rail scale, barge draft, or other very accurate weight.

1. Weigh the truck **EMPTY** to get an accurate tare weight.
2. Reset the weight on the belt scale or record the starting weight.
3. Start the test and make sure all material is caught in the truck. Larger tests are better. A minimum of 10 tons per test is recommended.
4. Allow belt to run empty for 10-15 seconds prior to recording the accumulated weight. Complete 3 or more tests in a row without changing anything on the scale. **Run the belt empty and perform a Zero Calibration prior to each material test load.**
5. Compare the results to prove the scale is repeatable. **See the example below.**

<table>
<thead>
<tr>
<th></th>
<th>Belt Scale</th>
<th>Truck Scale</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test 1</td>
<td>14.00 tons</td>
<td>11.00 tons</td>
<td>21.43 %</td>
</tr>
<tr>
<td>Test 2</td>
<td>10.75 tons</td>
<td>11.25 tons</td>
<td>-4.65 %</td>
</tr>
<tr>
<td>Test 3</td>
<td>13.00 tons</td>
<td>13.50 tons</td>
<td>-3.85 %</td>
</tr>
<tr>
<td>Test 4</td>
<td>12.00 tons</td>
<td>12.50 tons</td>
<td>-4.17 %</td>
</tr>
</tbody>
</table>

6. Discard any tests that are unreasonably different from the rest. **Test 1 is excluded in the example.**

7. Navigate to **Calibration > Material Test.**

8. Enter the **Belt Scale Weight.**
   Add tests 2-4 to calculate Belt Scale Total of 35.75

9. Choose the **Certified Units.**
   Units in example are Tons

10. Enter the **Certified Weight.**
    Add tests 2-4 to calculate Truck Scale Total of 37.25

11. Follow the instructions and press **Enter** several times until you reach the **Accept Cal** screen. The **New Trim Factor** will typically be range from .90 to 1.10. The example changes the Trim Factor from 1.000 to 1.042. A 4.2% change in the calibration. If the trim is out of range make sure the correct weights and units were used. **Reject and Repeat** the calibration if incorrect values were entered. **Record calibration changes on page 37-38.**

   If multiple truck loads vary greatly from one to the next then there is most likely a mechanical problem. Review the mechanical installation and maintenance checklist!
E. Scale Totals

Navigate to Totals & Diagnostics > Totals

- **Job Total**: Accumulates until it is manually reset. Press Clear Weight twice to reset the Job Total to Zero.
- **Daily Total**: Automatically resets each day.
- **Weekly Total**: Automatically resets each week.
- **Monthly Total**: Automatically resets each month.
- **Yearly Total**: Automatically resets each year.
- **Master Total**: The Master total will never reset.

F. Device Setup

Navigate to Main Menu > Device Setup

CONTACT BELT-WAY FOR ADDITIONAL DOCUMENTATION COVERING THESE ACCESSORIES

i. **USB Data Logging**

The integrator saves to a periodic_log.txt file once per minute. Up to 40 days of records are saved to the internal memory. The data files can be manually downloaded to a USB flash drive. Insert a maximum 32 Gb USB flash drive into the USB port on the integrator board. Look for the USB indicator in the bottom right corner of the Message line.

Navigate to > Device Setup > USB > Report Data

Press Enter on Sync Periodic Logs to copy all historical data from the scale memory to the USB. The Sync can take up to 15 minutes. The Message line will show when the Sync is complete. The files can be opened on a PC in any spreadsheet software. The files are stored in the following folder on the USB. BeltwayScales/Belt Scale/Periodic Logs
ii. **Backup & Restore Function**

Navigate to **Device Setup > USB > Report Data**

This feature saves the scale's current settings to a USB.

It is ideal to create a backup file after the initial scale setup and calibration is complete.

Choose **CREATE BACKUP**. The file is saved on the USB at *Beltway Scales/Belt Scale/Backups*

To restore the scale configuration, choose **RESTORE BACKUP** and select the desired backup file.

iii. **IO Board**

**Configure 4-20 mA output and Pulsed output**

Navigate to **Main Menu > Device Setup > IO Board**.

**Analog Outputs**

The Analog Setpoint will usually be 100%.

The **Maxrate** is in tons per hour.

It sets the top of the 4-20 mA range.

It must match the PLC or the scale tph will not agree with the PLC display.

Example: A scale configured to Maxrate of 500 will show 4 mA at 0 TPH, 12 mA at 250 TPH, and 20 mA at 500 tph

**Digital Outputs**

Configure the output for Pulsed Output.

**Weight per Pulse** controls how frequently pulses are generated.

**Pulse on Time** controls how long each pulse is ON.

Example: A scale configured to 1.00 Tons and 250 mS generates 1 pulse for each ton of weight and the pulse stays on for 250 milliseconds.
Plant Connect
web-based production monitoring:

Unlimited Scales + Unlimited Users

Realtime Dashboard

Historical Data

Production Reports

Contact Belt-Way for more information about how to sign up!
G. Administration

Navigate to Main Menu > Administration

i. Security

Navigate to Administration > Security
Create a password to restrict access certain scale functions. Any locked item requires the password. The default password is 1. Contact Belt-Way if you forget your password.

ii. Set the Time and Date

Navigate to Administration > Settings
Time must be in 24 hour format. The Date can be MM/DD/YYYY or DD/MM/YYYY format.

iii. Ethernet

The IP address must be changed when connecting the integrator to a Local Area Network or Remote Display.

Navigate to Administration > Ethernet

DHCP Client controls how the IP address is assigned. DHCP Enabled - Set dynamically from a network router. DHCP Disabled - User must enter a static IP address.

iv. Scale Restart

Navigate to Administration > Restart
This feature allows the user to restart the integrator firmware without disconnecting power.
## Routine Maintenance Checklist

The scale will only perform as well as the surrounding environment allows. Inspect the scale, belt, idlers, etc on a regular basis to ensure all components are functioning properly.

<table>
<thead>
<tr>
<th>Maintenance Item</th>
<th>Task</th>
<th>Daily</th>
<th>Weekly</th>
<th>Monthly</th>
<th>As Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weighbridge Idlers</td>
<td>Check rollers for flat spots, collapsed bearings and make sure the rollers spin freely.</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scale Idler</td>
<td>Make sure there is no material build up between the idler and conveyor frame. Make sure the scale idler is not bent or twisted.</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scale Frame</td>
<td>Make sure there is no material build up around the load cell assemblies or mounting pipes.</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>String Line</td>
<td>Restring line when replacing idlers. The idlers need to be the same type &amp; angle. They also need to be square and equally spaced. +/- 1/16(^{th}) Inch</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Return Rollers</td>
<td>Make sure they are in good condition and in position. They must also be clean &amp; free from any material build up.</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed Sensor</td>
<td>Check for wear &amp; flat spots on the wheel. Ensure that the wheel spins freely. Make sure wheel remains in contact with belt at all times when running.</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belt Condition</td>
<td>Make sure belt is in good condition and repair or replace as needed.</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Belt Tension</td>
<td>Make sure belt tension is NOT too tight or too loose and that it touches all idlers in the weighbridge.</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Belt Tracking</td>
<td>Make sure belt tracking is good, especially across the weighbridge area.</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Zero Calibration</td>
<td>Perform a Zero Calibration.</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Test Weights</td>
<td>Perform a Test Weight Calibration.</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Material Test</td>
<td>Perform a Material Calibration test and adjust as needed.</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
H. Diagnostics

Navigate to Totals & Diagnostics > Diagnostics

i. Calibration

Navigate to Totals & Diagnostics > Diagnostics > Calibration

- **Trim Factor (Calibration Multiplier)**
  Should be close to 1.000

- **Zero Value (Empty Belt Weight)**
  Typically, 75 – 150 pounds.
  This varies based on belt width, idler spacing, idler weight, etc.

- **Belt length**

ii. Voltages

Navigate to Totals & Diagnostics > Diagnostics > Voltages

- **Load Cell Supply** - Typically 9 - 9.15VDC
- **+5v** - Typically 4.95 - 5.10VDC

iii. Sensors

Navigate to Totals & Diagnostics > Diagnostics > Sensors

- **Load cells 1-8**
- **Speed Sensor**
- **Angle Sensor**

Load Cell mV signal diagnostics.

- Each load cell should show 1.0 - 7.0 mV when the belt is empty.
- The mV reading varies based on the zero value. Review the mechanical installation if there is more than 2.0 mV difference between load cells.
- 31 mV is the maximum and is usually caused by a wiring error.
- Negative values mean the load cell is wired wrong or could be damaged.
- Check weighbridge for anything pushing up on the idler.

**Testing the Load Cells**

If mV readings are out of range use a volt meter to manually check the load cells. Measure Actual Excitation Voltage at the Sensor Board +Sup and -Sup should be 9 - 9.10VDC
Measure Actual Load Cell mV Signal
Set your meter to DC mV (or DC Volts on auto ranging meter)
Place the Black Lead on White Wire (-SIG) and Red lead on Green Wire (+SIG)
The reading should match the integrator.

Measure Load Cell Resistance (Ohms)
Disconnect the load cell from the sensor board.
Set your meter to Ω (OHMS)
Test Supply wires - Black and Red should measure approximately 420 Ω
Test Signal wires - White and Green should measure approximately 350 Ω

Belt Speed Diagnostics
If there is no belt speed:
- Confirm the belt is running.
- Confirm the speed sensor wheel is touching the belt and turning.
- Confirm that the wheel is not excessively worn or bouncing.
- Shaft Mount – Check the shaft for pulley shaft damage.

Check Speed Sensor Supply Voltage
- Set Meter to VDC and measure between +5V and (GND) Ground.
- Check for damaged wires.
- Set Meter to Ω (OHMS) or Ringer.
- Remove cover from the speed wheel.
- Perform checks for an open circuit or broken wire.
- If the cable is not damaged then the encoder board may be damaged.

Angle Sensor Problems / Invalid Angle Error
- Conveyors usually have an angle between 0 and 25 degrees.
- If the angle shows 45 degrees then most likely there is no angle sensor installed.
- Compare the angle reading to an external angle finder.
- Manually move the angle sensor up and down to see if the angle changes.
- If the Angle Sensor is connected make sure it is “Installed” in Scale Setup menu.
- Make sure the Arrow on the angle sensor is Pointing UP.
- Check Angle Sensor Supply Voltage.
- Supply voltage should be about 5 VDC. Set Meter to VDC and measure between +5V and (GND) on the angle sensor terminal.

Power Problems
The integrator requires a minimum of 12 VDC to operate properly. Underpowered AC transformers or DC batteries will not work. We strongly suggest use of the Belt-Way AC or DC power supply. A toggle switch may be installed so the integrator can be turned off prior to startup and shut down.

AC Power Supply Spec:
- Input: 100-240 VAC 50/60 Hz.
- Output: 24VDC, 2.25A Max.

DC Power Source:
- Input: 9-30 VDC
- Output: 24VDC, 2.25A Max.
Error Messages

No Comm with Sensor Board / INF error
If the Rate and Belt Speed show inf then there is no communication with the Sensor Board.
- Check supply voltage. The Sensor board stops working below 12 VDC.
- Unplug SENSOR PWR and SEN RS485 INTERFACE ribbon cables if using a junction box.
- Check the cable running from integrator to the junction box. Confirm the RS485 wiring is correct.
- Test for 24 VDC on SNSR PWR and GND.
- Check the fuse above SNSR PWR to make sure it is good.

No Com with IO Board
- IO board is not installed. Change IO setting in Scale Setup menu.
- Check ribbon cable from integrator board to IO board.

Problem with the Angle Sensor
- Review Angle Sensor troubleshooting steps.
- Check ribbon cable from integrator board to IO board.
## Calibration Logs

**Calibrated by:**

### Zero Calibration

**Previous Zero Value:**

**New Zero Value:**

### Test Weight Calibration

**Test Weight Amount:**

**Belt Speed:**

**TPH with Test Weight Installed:**

**Calculated TPH:**

**Old Trim Factor:**

**New Trim Factor:**

### Material Test Calibration

<table>
<thead>
<tr>
<th></th>
<th>Test 1</th>
<th>Test 2</th>
<th>Test 3</th>
<th>Test 4</th>
<th>Test 5</th>
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Product Warranty

Belt-Way Scales, Inc. ("Belt-Way"), warrants its products only on the terms contained herein. No one has the right or authority to assume or create any obligation or responsibility, express or implied, on behalf of or in the name of Belt-Way Scales, Inc., or to bind Belt-Way Scales, Inc., in any manner whatsoever.

Products manufactured by Belt-Way are warranted to be free of manufacturing defects for a one year period after the original date of purchase. Belt-Way's liability hereunder is conditioned on dealer, or in the event of a direct sale to a first-end user (then on first-end user) giving notice in writing to Belt-Way of any alleged defect. Such notice must be given immediately upon the discovery of such alleged defect.

If, within the warranty period, any machinery or parts shall be proved to the satisfaction of Belt-Way to be defective, the defective item shall be replaced or, at Belt-Way's option, repaired at Belt-Way's factory.

The right to have defective machinery or parts, repaired or replaced as set forth above, shall constitute the dealer or first-end user's sole and exclusive remedy. No warranty shall apply to machinery, parts or accessories which have been furnished, repaired or altered by others so as (in the opinion of Belt-Way) to have affected the same adversely. Belt-Way cannot and does not warrant or represent that machinery or parts furnished by it will handle specific materials or will produce specific results from such materials.

This warranty does not include damage to the product resulting from accident, misuse, improper installation or operation. If a component should become defective within the warranty period, we will repair or replace it free of charge at our option. Defective components must be returned freight prepaid to Belt-Way or to an authorized Belt-Way service center.

Complete products included with our system that are not manufactured by Belt-Way such as printers, remote displays, etc. are warranted to the extent that they are warranted to us.

The customer's sole remedy shall be such repair or replacement as is expressly provided above, and we shall in no event be liable for any incidental or consequential damages arising out of the use or inability to use this product for any purpose whatsoever.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific legal rights. You may also have other rights which vary from state to state. For products purchased outside the United States, see your distributor for warranty.

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