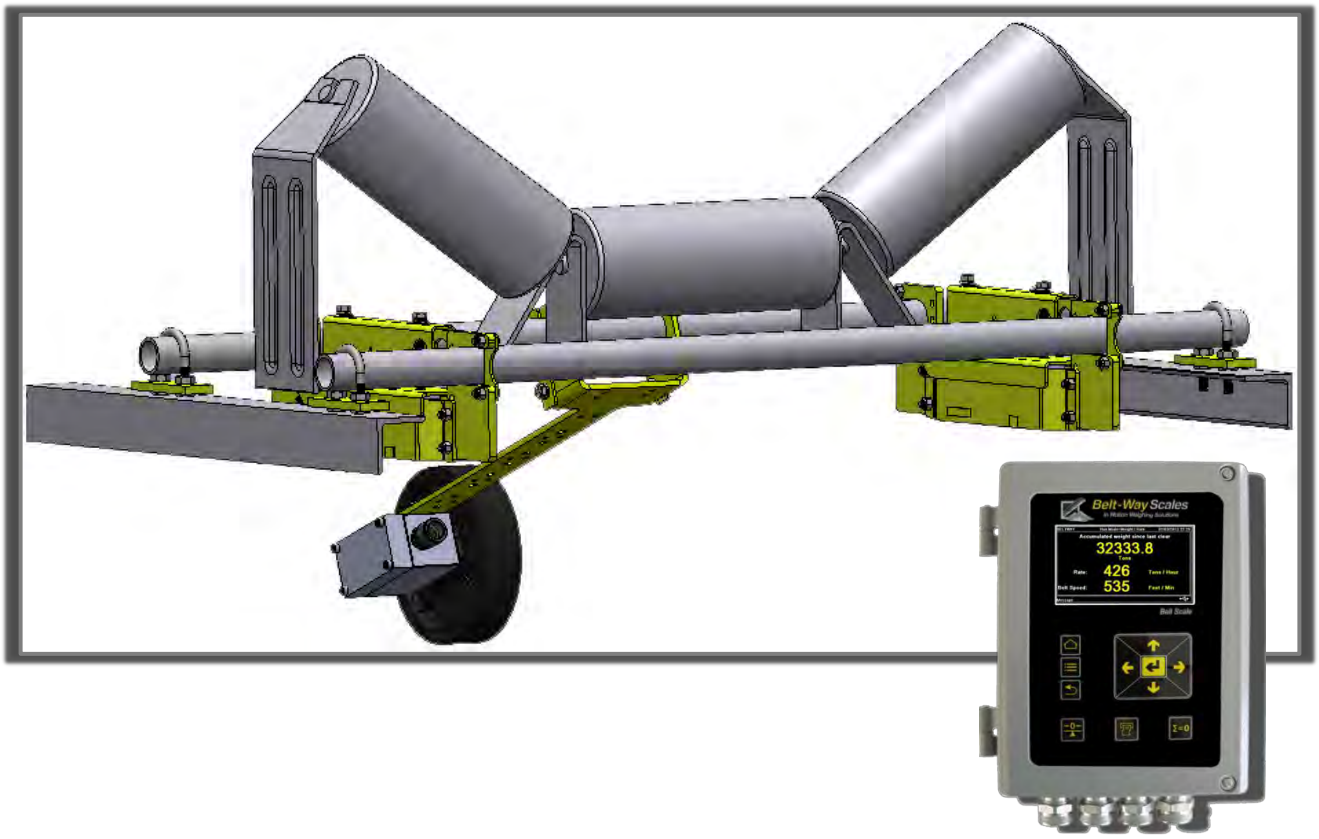
Conveyor Belt Scale Instruction Manual
Revision 2.3

Belt-Way Scales
In Motion Weighing Solutions



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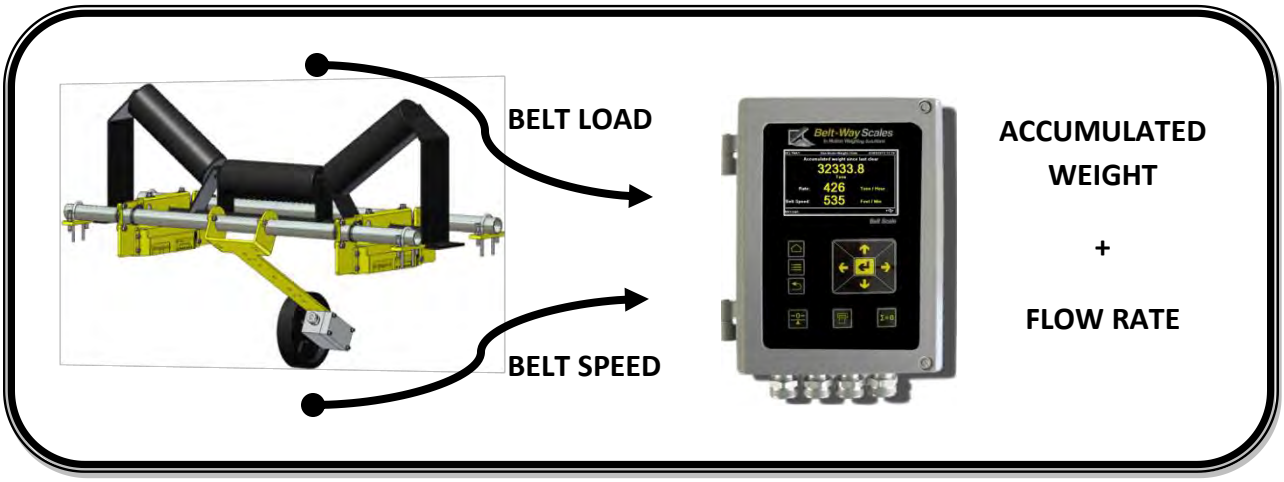
Introduction

The Belt-Way conveyor belt scale is a cost effective and highly accurate in motion weighing system. It is designed to measure matieral flow over a conveyor belt in realtime. The primary components are the integrator (control box, display, etc), load cell assemblies, and speed sensor. The scale system processes speed and load signals to produce a flow rate and accumulated weight calculation.



The Belt-Way scale is versitle and may be installed on nearly any bulk material conveyor system including aggregate processing, sand and gravel, mining, frac sand, fertilizer, grain, scrap, recycling, etc.

Scale performance may vary depending on specific conveyor specifications. Slow moving heaviliy loaded belts produce the most accurate results. It is best to consult with our experienced sales and enginieering team to ensure a conveyor is properly designed to allow for best scale performance.

Features & Accessories

The new Belt-Way Integrator includes many state of the art features:

- L arge Color Graphic Display with multi-Language support.
- Easy to follow Scale Setup Wizard
- Choose from 3 available modes of menu driven calibration
  - Test Weight calibration
  - Automatic digital calibration
  - Material test calibration
- Built-in USB for easy upload and download
  - Log calibration and production data
  - Easy software upgrade
  - Screenshots on demand
- Standard on-board Ethernet Port
  - Modbus TCP
  - Wireless Communication
  - Plant Connect Website for online productions reports
- Expanded I/O communication capabilities
  - 4 digital inputs
  - 3 digital outputs
- 2 Independent RS-232 Serial outputs
  - Simultaneously connect printer and scoreboard display.
- Improved Automated Control Capabilities
  - Batching / Load-Out
  - Flow rate (TPH) control
    - Consistent feed
  - Material load (lb/ft) control
    - Increases scale accuracy
  - Continuous Proportional Blending
    - Multiple additives to 1 main material
- Self diagnostics
  - Independently view signal status for up to 8 load cells
  - Digital Speed Sensor frequency
  - Current Angle Sensor readings
  - Scale configuration setup parameters
  - I/O settings
  - Calibration parameters and values
- Error Reporting
- Password protection capabilities
- New Zero Rate Limit Feature
- Internal Power Supply

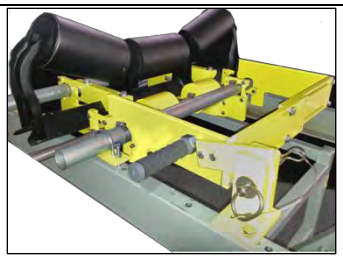
Belt scale accessories include the following:

- **Solid State Angle Sensor**

The angle sensor removes the need for constant recalibration when the scale is installed on variable angle conveyor.

- **Self-Storing Test Weight Calibration System**

This item permanently stores test weights on the scale. Recalibration is fast and easy as there is no need to haul test weights to the conveyor. It also makes calibration safer where the conveyor is only accessible from one side.



- **Wireless Multi Scale Remote Display**

The remote display allows multiple scales to be controlled from one location. Wireless communication makes installation simple and inexpensive.

- **Plant Connect - Online Scale Production Reporting**

Our Plant-Connect website allows users to monitor belt scale production on a PC, tablet or smart phone.
Visit **www.plant-connect.com** for more details.

Plant Connect
Production Data Anywhere

Safety and Warnings

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

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

The protective conductor terminal (Earth Ground) is specified by the following label:

It must be properly connected to earth ground according to local codes.

Read this First

Customers who are familiar with our legacy integrator should read this section first. There have been several changes to the terminoligy and functionality in the new integrator.

1. **Color Display / Graphical User Interface** - The Belt-Way integrator now icon and menu driven. On screen instructions make screen navigation simple. The large color display is easy to read. Runtime values can be viewed from a long distance even in direct sunlight.

2. **Smaller Keypad** - The complicated keypad has been replaced a simpler version. There are three shortcut keys to quickly activate frequently used functions such as Zero Calibration, Print Ticket, and Clear Weight. All other functions can be accesed through the main menu.

3. **No Switches** - There are no manual switches. (SW1, SW2, Gain) All scale setting adjustments are made through the user interface software.

4. **Load %** - There is no load % shown on the home screen.

5. **Terminology** - The Span number is now the Trim Factor. Set Zero is now Zero Calibration. Idler Span is now Idler Distance. The zero number is now shown in pounds or kilograms. The belt length is measured in distance units instead of pulses.

6. **Weight and Rate units** - It is now possible to automatically convert between Standard and Metric units without recalibration. Pounds, Tons, Long Tons, Kilograms, and Metric Tonnes are available.

7. **Scale Setup Parameters** - The capacity of the load cells must be entered into the integrator during the setup process. The conveyor angle should be entered if an automatic angle compensator is not used.

8. **Internal Power Supply** - The new power supply module must be purchased separately from the integrator. It mounts inside the integrator box. It accepts 100 - 240 VAC and produces 24 VDC. The integrator may be powered from an external 12-24 VDC source. It requires approximately 55 watts of power to operate.

9. **8 Load Cell Inputs** - We can now accept 8 load cells. The load cells are no longer summed together in the integrator. Each load cell is processed independently, which allows calculation of individual mV readings making troubleshooting very easy.

10. **New Digital Junction Box** - The new integrator can be used with our new digital junction box. The junction box converts component signals (load cells, speed sensor, angle sensor, etc) to a digital signal and transfers it to the integrator. We feel it will be beneficial to limit the length of load cell and speed sensor cables when possible.

11. **Ethernet Port with POE**- The new integrator has Ethernet built in so a converter is not required. The Power Over Ethernet allows for easy wireless transmitter installation with no need for an external power supply.

Read This First

Backwards Compatibility Issues

Old Power Supply

Old 12 or 15 VDC power supplies are NOT powerful enough to drive the new integrator.
Our new 100/240 VAC to 24 VDC power supply is required to run the integrator from line power.

Old load cells, speed sensors and angle sensors are compatible with new integrator. Old IO boards are NOT compatible with the new integrator.

OLD IO BOARD

NEW IO BOARD

Old junction boxes should NOT be used with the new integrator unless the load cell wires are run separately. See the electrical section for details. The new junction box is NOT compatible with the old integrator.

OLD JUNCTION BOX

NEW DIGITAL JUNCTION BOX

General Specifications

Part Number: BWINT

100-240 AC Power Supply Part Number: BWPS

IO Option Board Part Number: BWIO

Electrical Ratings:

- Input Power to Belt-Way Integrator: 12-30 VDC - 24 VDC 2.25A Max.
- AC Power option:
  - Input: 100-240 VAC 50/60 Hz.
  - Output: 24VDC, 2.25A Max.
- Use of the factory AC Power option is recommended.
- Conformance to local electrical codes is recommended.
- AC control power over-current protection with isolated circuit, and disconnect point such as a breaker or switch box, is recommended.
- Digital Inputs: 9-30VDC, 10mA
- Digital Outputs: 9 - 30VDC, 100mA sink
- Analog Outputs: 24VDC, 20mA (powered loop)
- Relay Outputs, UL contact ratings:
  - 220VDC, 0.24A, 60W
  - 125VDC, 0.24A, 30W
  - 250VAC, 0.25A, 62.5VA
  - 125VAC, 0.5A, 62.5VA
  - 30VDC, 2A, 60W

Input & Output Connections:

- Power Inputs
  - P1: AC Mains Input, 100-240VAC, 50/60Hz, 1A Max
    - **L** is line (hot)
    - **N** is Neutral (return)
    - **E** is Earth
  - P7: DC Supply: 12-30VDC, 54W Max.
    - **USER PWR** is + positive
    - **GND** is - negative
  - P14: DC Power Input for Junction Box option - Fused 12-24VDC (follows VDC Supply in scale)
    - **SNSR PWR** is +positive
    - **GND** is reference
    -

- Power Outputs
  - P8: DC Power Output for Junction Box option - Fused 12-24VDC (follows DC Supply Voltage)
    - **SNSR PWR** is +positive
    - **GND** is reference
- Digital Inputs – User programmable, Optically Isolated
  - P14A:
    - **DIGND**: Digital Input Reference
    - **DIN1**: Digital Input 1
    - **DIGND**: Digital Input Common Reference
    - **DIN2**: Digital Input 2
  - P14B:
    - **DIGND**: Digital Input Common Reference
    - **DIN3**: Digital Input 3
    - **DIGND**: Digital Input Common Reference
    - **DIN4**: Digital Input 4
- Digital Outputs – User programmable, optically isolated, Open Drain
  - P5A:
    - **DOGND**: Digital Output Common Reference
    - **DOUT1**: Digital Output 1
  - P5B:
    - **DOGND**: Digital Output Common Reference
    - **DOUT2**: Digital Output 2
  - P5C:
    - **DOGND**: Digital Output Common Reference
    - **DOUT3**: Digital Output
- Relay Outputs – User programmable, 1 NO Contact (Form A),
  Mechanical endurance 10^8 operations
  - P16_A:
    - **IO BRD RL1 COM**
    - **IO BRD RL1 NO**
  - P16_B:
    - **IO BRD RL2 COM**
    - **IO BRD RL2 NO**
  - P16_C:
    - **IO BRD RL3 COM**
    - **IO BRD RL3 NO**
- Analog Outputs - Isolated 0-20mA/4-20mA Outputs
  - P18:
    - **AGND** Common return for current loops
    - **IOUT2** Current Loop 2 Output
    - **AGND** Common return for current loops
    - **IOUT1** Current Loop 1 Output
- Canbus/ Expansion Slot - Firmware

- P19:
  - **GND -** Common Reference
  - **CANL/ EXPN RXD -** Canbus Low (-)/ Expansion Port Receive Data
  - **CANH/ EXPN TXD -** Canbus High (+)/ Expansion Port Receive Data
  - Debug port
- P20:
  - **GND -** Common Reference
  - **DEBUG RXD -** Receive Debug Data
  - **DEBUG TXD -** Transmit Debug Data

- Junction Box Data – Isolated, 4 wire, RS485 to Sensor Board
  - P9:
    - **SEN TX+** positive transmit to J-Box
    - **SEN TX-** negative transmit to J-Box
    - **SEN RX+** positive receive from J-Box
    - **SEN RX-** negative receive to J-Box
- Ticket Printer – Isolated RS232 for ticket printer option
  - P10A, P10B:
    - **TXD** transmit data
    - **RXD** receive data
    - **CTS** clear to send
    - **DSR** data terminal ready
    - **GND** common signal return
- Scoreboard Display – Isolated RS232 for Scoreboard Display option
  - P11: Isolated RS232 port for option
    - **SCR BRD TXD** transmit data
    - **GND** common signal return
- Network blending - Isolated RS485 ports for Blending Control. Two ports are available for daisy chaining a master and multiple slaves.
  - P12, P13:
    - **INT TX+** positive transmit to another Belt-Way Integrator
    - **INT TX-** negative transmit to another Belt-Way Integrator
    - **INT RX+** positive receive from another Belt-Way Integrator
    - **INT RX-** negative receive from another Belt-Way Integrator
- Ethernet Port – Supports ModbusTCP (port 502) and FTP (port 21)
  - P21: RJ45 jack with 15VDC, 1A POE (Power Over Ethernet)
    - Pins 4,5 are +15VDC (V+)
    - Pins 7, 8 are return (V-)
- USB – USB Host, Type A jack. Supports up to 4GB Flash Drive

- Load Cells 1-8 – Nominal Supply +9VDC, Nominal Signal 2mV/VDC
  - P1 – P8:
    - **+SIG** is positive signal input from load cells
    - **- SIG** is negative signal input from load cells
    - **+SUP** is positive supply voltage to load cells
    - **-SUP** is negative supply voltage to load cells
- Angle Sensor – Analog Input for Angle Measurement
  - P13:
    - **GND** is common return
    - **+5V** is +5VDC Supply for Belt-Way Angle Sensor
    - **GND** is common return
    - **SIG** is 0-5VDC analog signal from Angle Sensor
- Speed Sensor – Digital Input for Speed Measurement
  - P15, P17:
    - **SIGB** For future use only
    - **SIGA** Pulse Input from speed sensor
    - **+5V** +5VDC Supply for Belt-Way Speed Sensor
    - **GND** common return
    - **GND** common return
    - **SIGC** For future use only
- Analog Input – PID Setpoint, 0-20mA/ 4-20mA Input
  - P18:
    - **SEN TX+** positive transmit to J-Box
    - **SEN TX-** negative transmit to J-Box
    - **SEN RX+** positive receive from J-Box
    - **SEN RX-** negative receive to J-Box
- Junction Box Data – Isolated, 4 wire, RS485 to Integrator Board
  - P12:
    - **SEN TX+** positive transmit to Scale Box
    - **SEN TX-** negative transmit to Scale Box
    - **SEN RX+** positive receive from Scale Box
    - **SEN RX-** negative receive to Scale Box

Environmental:

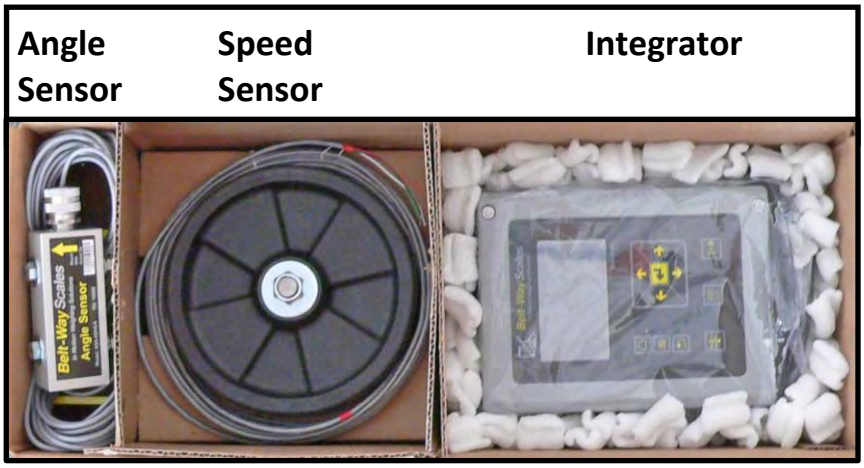
- Temperature: Normal operating range -20^{o}C to +45^{o}C. Please consult the factory if the unit will be operated outside the stated range. Wide temperature range components may be required.
- Humidity: The unit is suitable for outdoor use.
- Altitude: The unit is suitable for use to elevation of 2000m.

Maintenence and Replacement Parts:

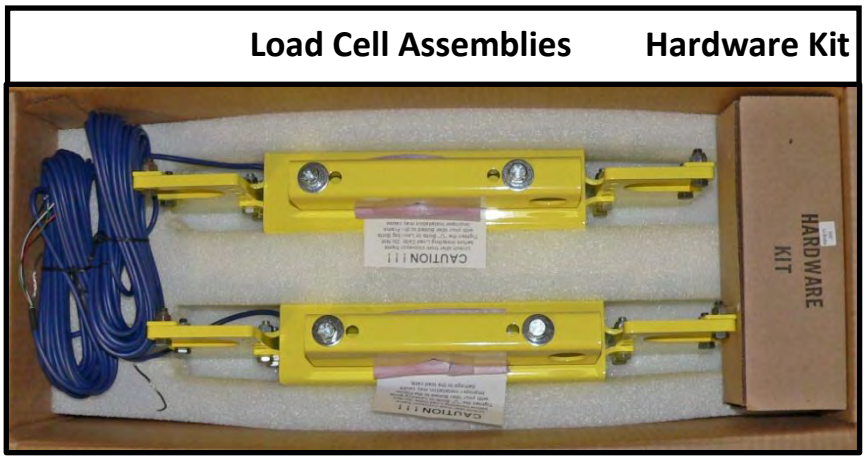
- The integrator may be cleaned using a mild cleaner and soft rag.
- The load cell assemblies, speed sensor, and angle may be wached with low pressure water and mild soap.
- The scale components should be periodically inspected for damage.
- All cables should be inspected for pinches or breaks
- Load cells should be visually checked for material build-up.
- The speed sensor wheel shoud be checked for wear.
- Replacement parts are available from local dealers or the factory.
- Replacement fuses may be purchased locally or from the factory
- The following fuses are required for operation:
    - Integrator Board F1: 1.25A, 250VAC, Slow Blow, 5X20mm
    - Sensor Board F2: 800mA, 250VAC, Slow Blow, 5x20mm
    - I/O Board: F1 200mA, 125V, Fast, 5x20mm
    - SMPS Board (power supply): Primary 1A, 250 VAC, Time Lag Fuse
    - SMPS Board (power supply : Secondary 3A, 250VAC, Fast Acting, 5x20mm
    - Terminal Board: 7A, 125VAC, 125VDC, Fast, 5x20mm
    - Terminal Board: 1.25A, 250VAC, Fast Acting, 5x20mm

Unpacking The Scale

Each Belt-Way Scale is comprised of a minimum of three cartons: One 26 in. x 10 in. x 8 in. carton contains the integrator, speed sensor, speed sensor hardware kit, and angle sensor (if purchased with the scale).



Another 26 in x 10 in x 8 carton contains the load cell assemblies and load cell hardware kit. Dual, triple, or quad idler scales will have multiple cartons of load cell assemblies. Please record the load cell model number shown on the box or on the load cell assembly. It must be entered into the integrator during the initial scale setup.



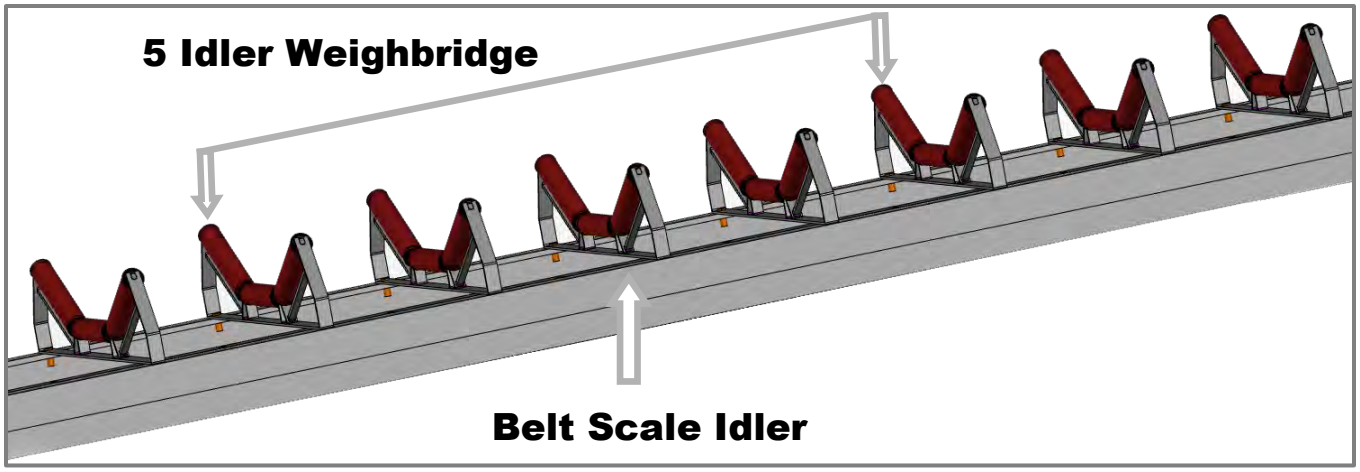
A third carton contains the galvanized mounting pipe. 48 in. long pipe is the standard length, but 60 in. or 72in may be provided upon request. Dual, triple, or quad idler scales will have multiple cartons of mounting pipe. Other cartons will contain various accessories. Open packages carefully as they may contain packing lists or other documentation.

Mechanical Installation

Installation Procedure For Standard CEMA Idlers

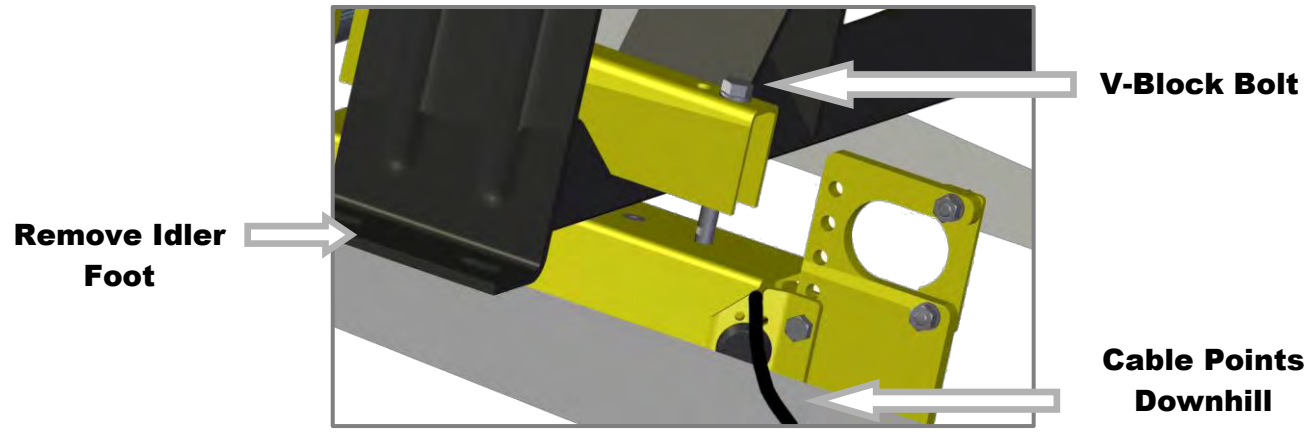
1. Scale Placement

The belt scale should be installed on an existing idler and mounted on the lower third of the conveyor. The scale should be several idlers from the head pulley, tail pulley, and bends or curves in the conveyor. The lower third of the belt is also more accessible for the installation and calibration process. The weighbridge consistes of a five idler conveyor section. These five idlers must be in good mechanical condition, be the same trough angle, and have identical diameter rollers. It is best to mount the weighbridge idlers an equal distance apart. Skirting should not make contact with the belt in the weighing area. Material must not impact the belt near the weighbridge.



2. Attach Load Cell Assemblies

Remove the mounting foot from the scale idler to giveclearance above the conveyor frame. 3/8" is usually enough but the area must be kept free of matierial. If the foot is not removed, the other weighbridge idlers must be shimmed to produce enough clearance. 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 as this will produce improper load cell readings. The bolts should be tightened just enough to compress the lock washer.



NOTE:Special care must be taken when installing stainless steel load cell assemlbies. Do not use a full thread bolt, or over tighten the existing V-Block bolt. The cable passes directly below the bolt and can be damaged.

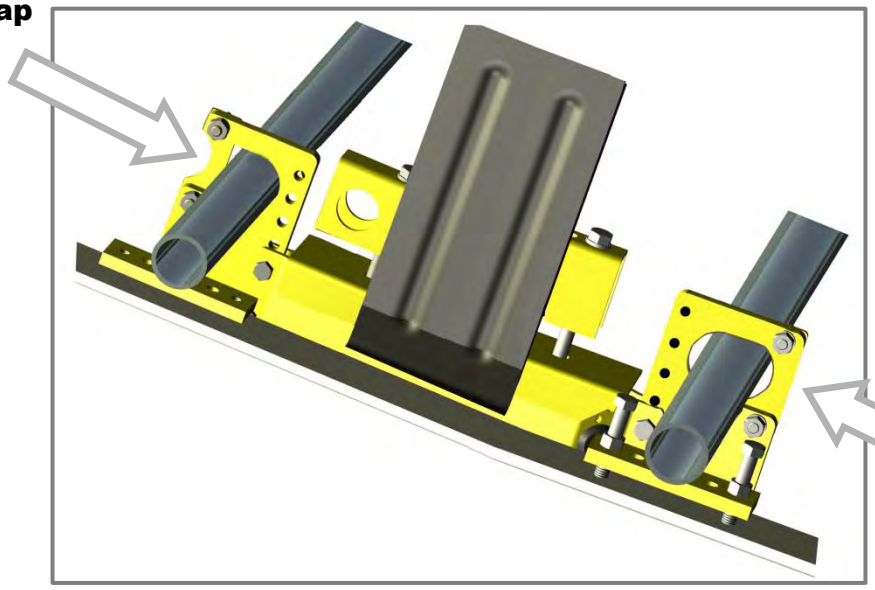
3. Install Scale Support Pipes:

This is an important step to ensure long term scale accuracy!

Uphill end of load cell assembly

Note the retaining strap placement. The notch points away from the pipe. The mounting pipe must touch the strap on the high end of load cell assembly.

Retaining strap fits tightly around the pipe.



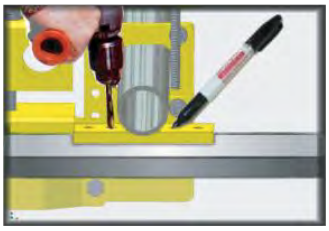
Retaining strap forms oval hole around the pipe.

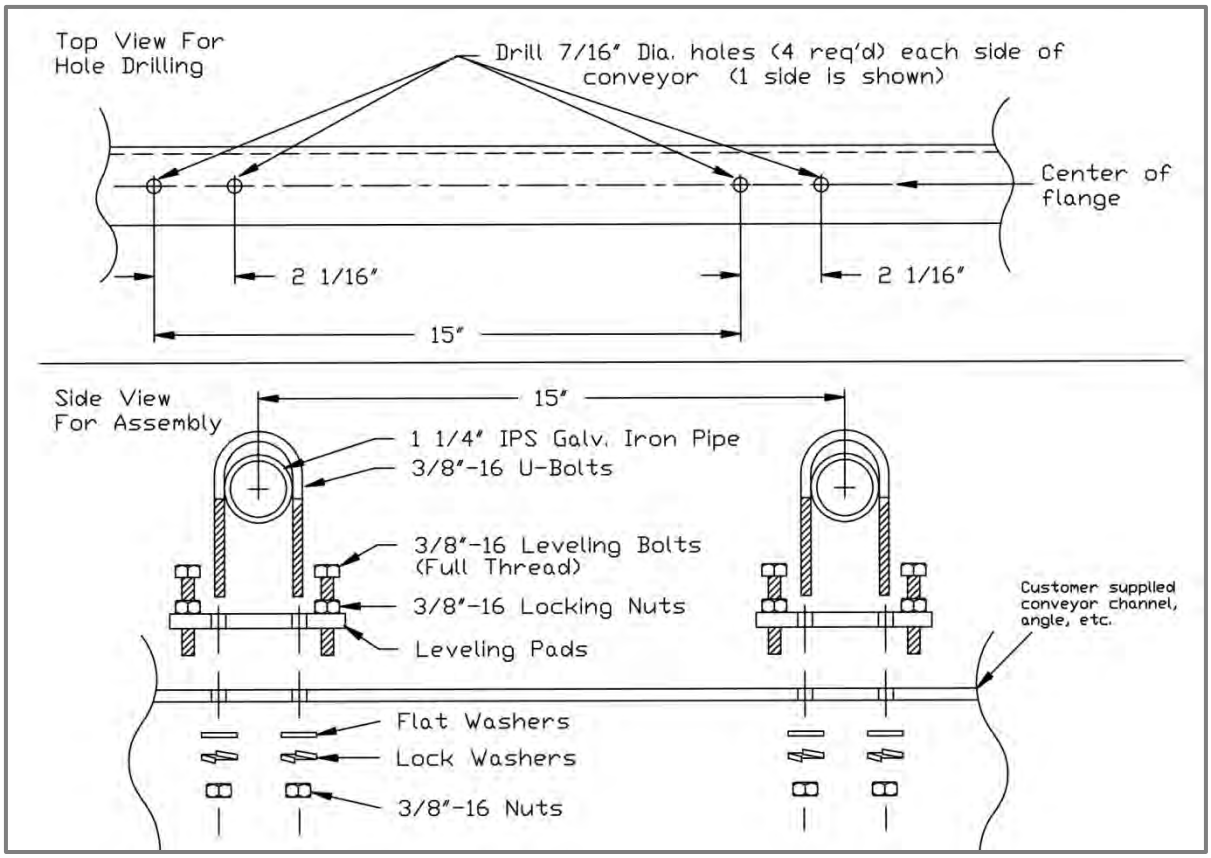
Downhill end of load cell assembly

The strap on the downhill side must create an oval opening. Center the pipe in the oval hole. This prevents the load cell from binding due to twisting of the conveyor frame. There should alway s be a gap around the lower pipe. The load cell assembly must be able to move slightly. If the

4. Drill Ubolt Holes:

Use the leveling plate as a drill template for the U-Bolts. The centers of the leveling plates and pipes should measure 15" apart. Use the following drawing for correct hole placement. The The pipes must be parallel to each other at 90° to the conveyor frame to ensure proper scale alignment. Do not tighten the Ubolts yet! The scale must be adjusted for height before all bolts can be tightened for the last time.

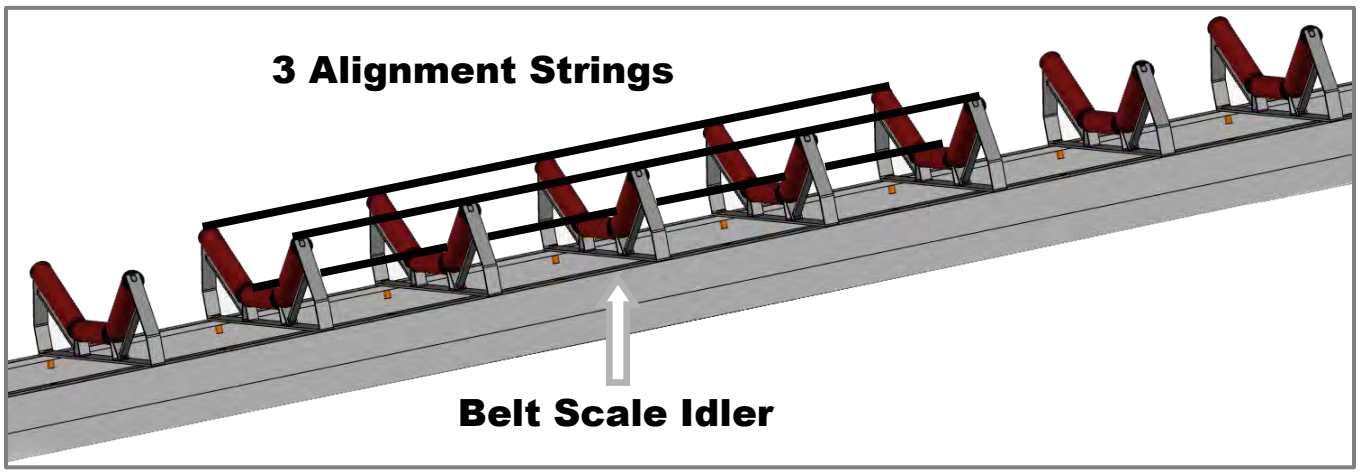




5. Level Idlers and String-Line the Weighbridge:

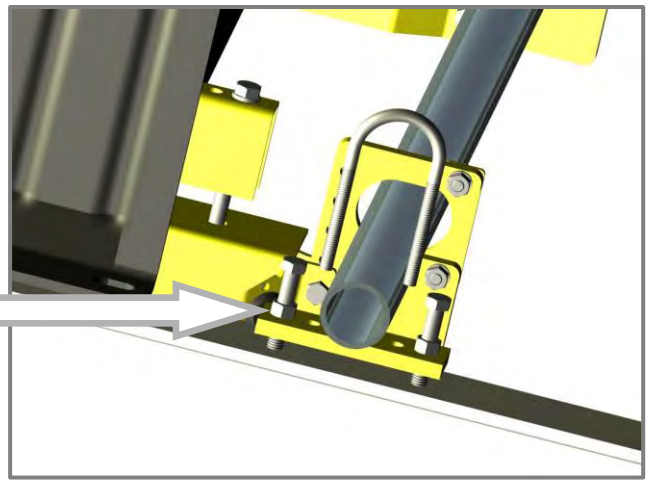
This is an extremely important step in the installation process!

The scale idler rollers must be level with the two idlers before and after. The empty belt must rest uniformly on all idlers within the weighbridge. Use a minimum of three strings to align all five weighbridge idlers. Place one string at the tip of each wing roller and in the middle of the center roller. Shim the surrounding idlers if necessary to bring them into alignment. It is essential to ensure repeatable and accurate results from the scale.



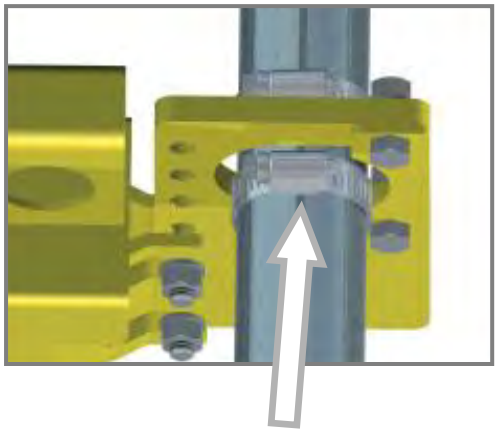
Use the leveling bolts to adjust the scale idler height. Tighten the lock nuts once the scale is at the proper height. Tighten the Ubolts uniformly so the pipes remain parallel and the clearance remains around the bottom pipe.

Leveling Bolts and Lock Nuts



6. Install Hose Clamps:

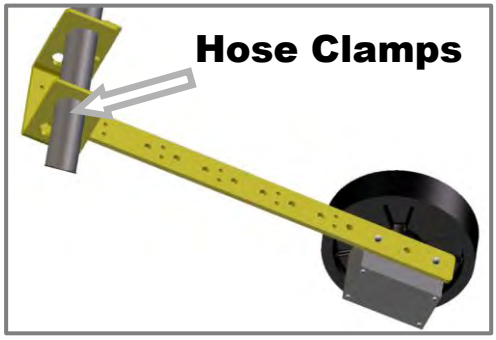
Position the load cell assemblies so they are an equal distance from the frame of the conveyor. This ensures that the load is evenly balanced between both load cells. Intall stainless steel hose clamps to hold the load cell assemblies in place. Position the clamps on either side of the load cell assembly. Make sure there is enough clearance so the clamps don't bind between the pipe and load cell bracket.



Hose Clamp

7. Install Speed Sensor Wheel Assembly

The standard wheel speed sensor assembly can 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 additional weight may be added to the speed wheel assembly to hold the wheel on the belt. Use two hose clamps to hold the arm in place. Secure the cable to the arm with cable ties. Route the cables carefully along the conveyor frame so they are protected from falling debris or pinch points.



8. Install Optional Angle Sensor

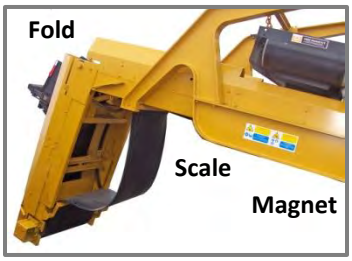
Scale recalibration is required whenever a conveyor changes angle. The angle sensor alleviates the need for constant test weight or material test calibration due to frequently changing conveyor angle. **A zero calibration should still be performed when the conveyor angle changes! This adjusts the scale when there are mechanical changes to the conveyor. The angle sensor should be installed directly on the conveyor frame and away excessive vibration.**

Mechanical Installation for a Channel Inset Idler (Primarily used for Portable Machines)

Many producers require a weighing solution for their portable crushers, screen plants, etc. Installing a scale on this type of equipment is possible but can be more challenging than a standard conveyor. There are to many types of portable machines to cover in this document. This section is meant to offer broad exposure to portable equipment and not be a step by step guide. Scale accuracy and repeatability may vary greatly due factors beyond our control. We strongly suggest that you consult a Belt-Way dealer before attempting the following installation procedures.

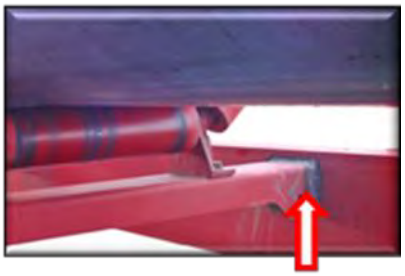
1. Scale Placement

The same rules apply when choosing a location to install a scale on a portable machine. However, the belts are usually shorter so it might not be possible to utilize a five idler weighbridge. A three idler weighbridge may be used when necessary. The scale should not be placed near the head pulley, near a fold in the conveyor or directly under a magnet.



2. Modification of Channel Inset Idlers

Portable equipment typically employ channel inset idlers. They mount flush to the inside of the conveyor frame. These idlers may require significant modification to attach the load cell assemblies. The idler must be removed from the frame and trimmed so it no longer touches the frame at the original mounting point.



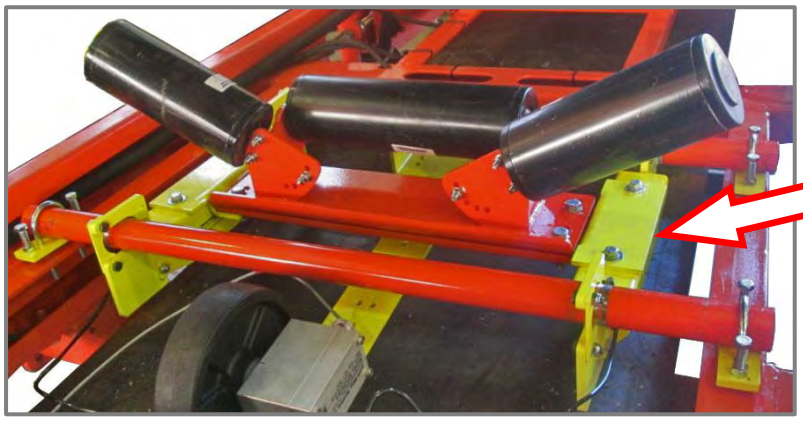
Idler mounts flush to frame.

Modified Idler Example

Idler frame is trimmed back and angles are attached to use our V-Block.

We offer an alternative "Z bracket" to replace our standard V-Block. It easily bolts to a channel idler with little or no modification.

Scale on portable machine using Z brackets



Z bracket

3. Use Recessed Idler Mounting Brackets To Mount Scale Load Cell Assemblies.

Two recessed idler mounting brackets must be used to create a frame to hold the scale support pipes. You must be careful to not install the angle brackets too high. It is better to install them lower and raise the scale into position using the leveling plates. The weighbridge idlers must be leveled and aligned as previously stated.

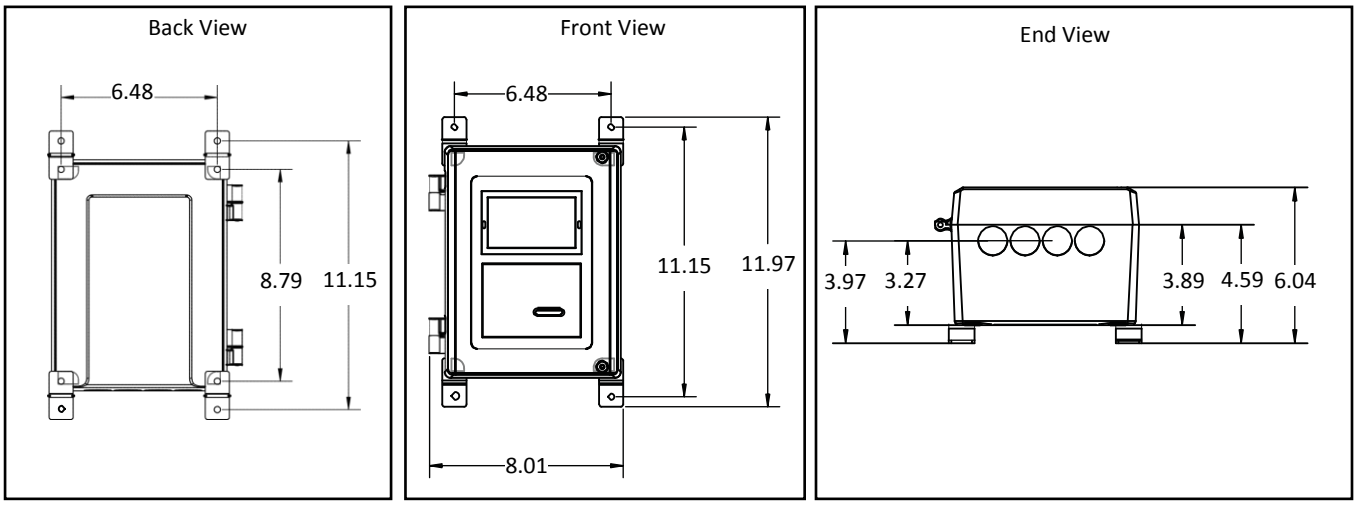
Recessed Mounting Bracket mounted to conveyor frame

Recessed Idler Mounting Bracket

Installed Load Cell Assemblies

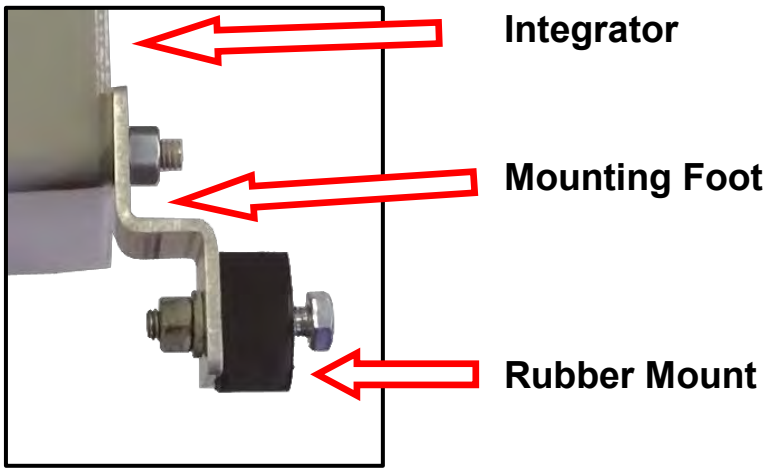
Integrator Installation

Leave a minimum of 3" clearance on the left side to allow the door to open.
All dimensions are in inches. The mounting kit includes 4 feet and 4 - 2.36" (60mm) screws and nuts.



Do not install the integrator where it is subject to vibration!
Damage from vibration is not covered under the Belt-Way warranty!

Rubber or neoprene should be used to dampen the effects of vibration on portable machines.
A kit of four rubber mounts is available from Belt-Way under part number BWVIBRATIONMT.

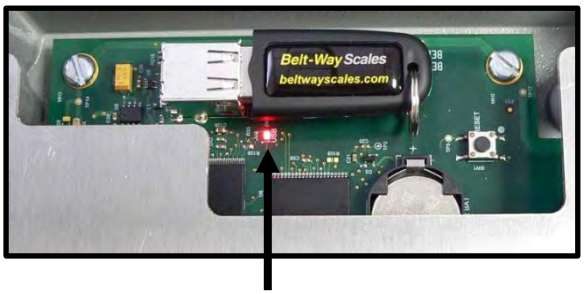


Electrical Connections

PLEASE INSTALL THE USB FLASH DRIVE
BEFORE PROCEEDING WITH SCALE SETUP!

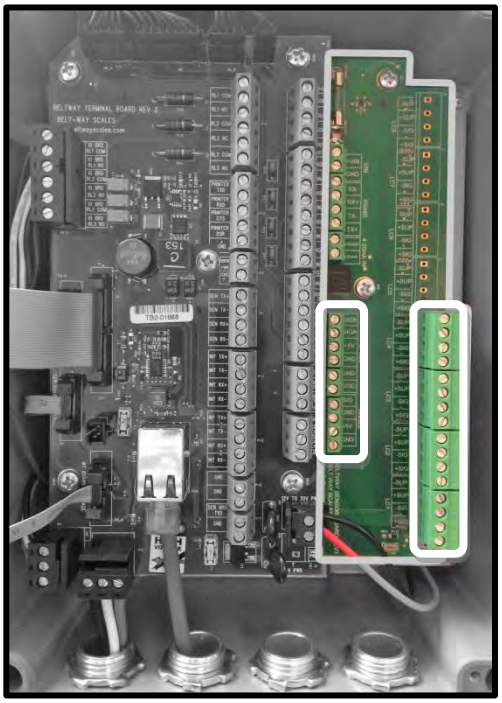
Integrator Board

USB Flash Drive Installed on Integrator Board

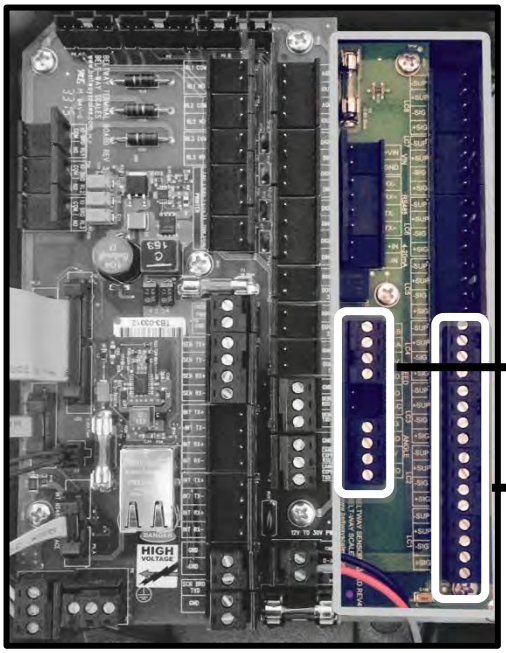


USB indicator light

Sensor Board Rev 3



Sensor Board Rev 4

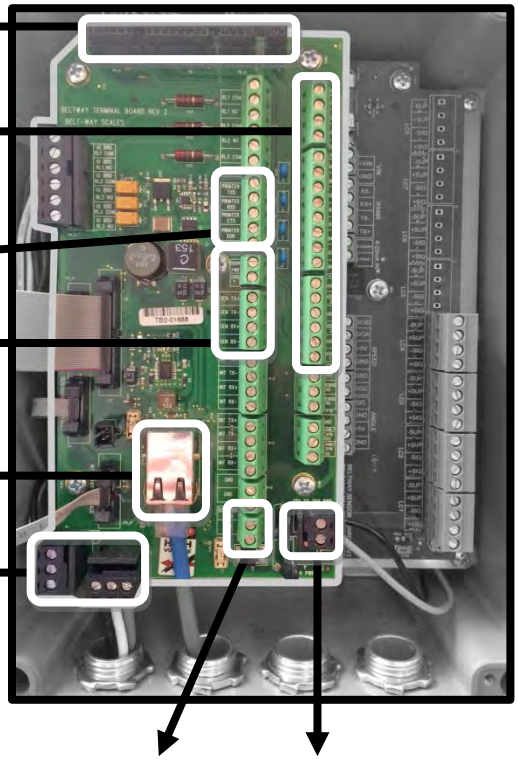


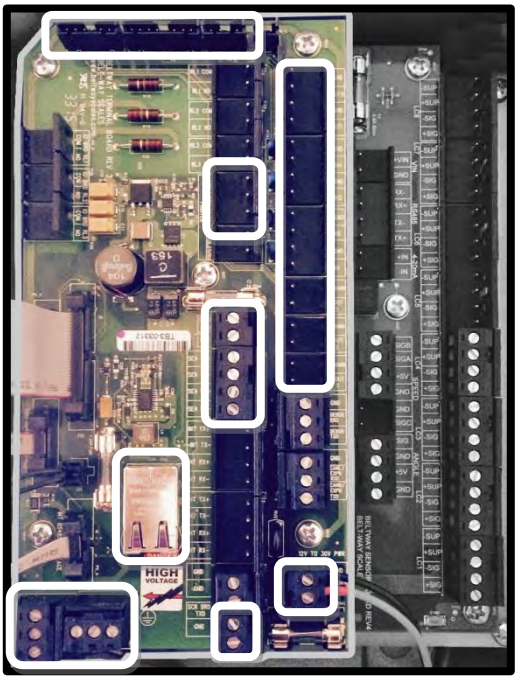
Angle Sensor and Speed Sensor Terminals

4 Load Cell Terminals

Terminal Board Rev 2

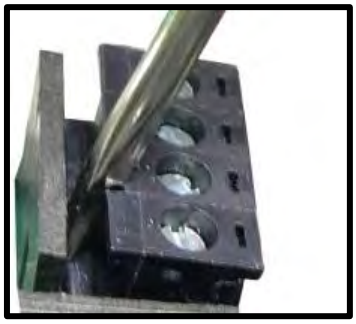
Terminal Board Rev 3





The two revisions of Sensor circuit boards are interchangeable. For example a Revision 3 Sensor board is compatible with a Revision 3 Terminal Board.

The newest boards introduced pluggable connectors for all components. Use a small screwdriver to pry the connector out of the terminal strip. Any other method may result in damage to the connector or circuit board!

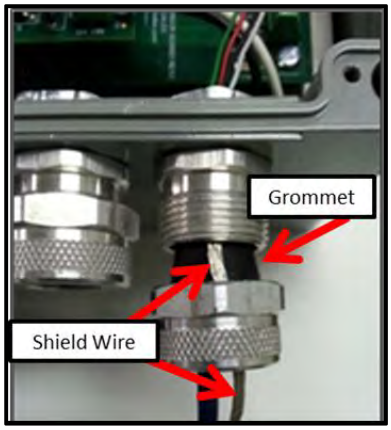


WARNING!

There is high voltage inside the scale integrator box so please make sure the supply power to the scale integrator has been unplugged or disconnected at the circuit breaker to reduce the possibility of electrocution and injury.

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

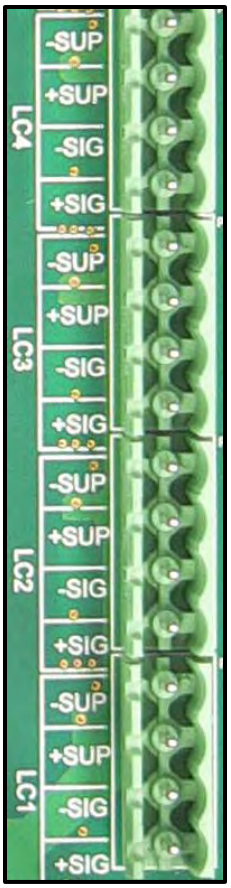
All component wires must be connected as shown below.
Properly grounding the shield is essential to keep electrical noise out of the integrator.



1. The cable must go through the grommet hole.
2. The shield then must be wrapped backwards over the grommet and fed through the cord grip nut. Strip the cable jacket back enough to get the shield to the
3. Insert the cable through the hole in the integrator enclosure so that the cord grip presses the shield against the housing as the nut is tightened.

1. Load Cells

Up to 4 load cells can be connected to the sensor board.



Use LC1 and LC2 for a single idler scale (2 load cells).
Use LC1, LC2, LC3 and LC4 for a dual idler scale (4 load cells).
Each load cell MUST be connected to its own LC terminal.
Multiple load cells should NOT be summed into a single cable.

USE CORRECT COLOR CODE FOR YOUR LOAD CELLS! MOST SCALES ARE STANDARD NOT STAINLESS!	
Standard Aluminum Load Cells In Yellow Assemblies Capacities are 45kg,100kg,200kg, 350kg, 500kg, and 1000kg.	**Stainless Steel Load Cells In Gray Assemblies Capacities are 50kg, 100kg, and 150kg.**
BLACK = -SUP	**BLACK = -SUP**
RED = +SUP	**GREEN = +SUP**
WHITE = -SIG	**WHITE = -SIG**
GREEN = +SIG	**RED = +SIG**
SHIELD = Cord Grip	**SHIELD = Cord Grip**

If summing multiple load cells cannot be avoided, then additional jumper wires must be installed for the scale work properly.
Single Idler Scale Only:
Install a jumper from LC1 +SIG to LC2 +SIG and **LC1 -SIG to LC2 -SIG**
Dual Idler Scale Only:
Jumper all LC1,LC2,LC3 and LC4 +SIG terminals together.
Jumper all LC1,LC2,LC3 and LC4 -SIG terminals together
The scale will work properly but the troubleshooting capabilities will be greatly diminished as it isn't possible to view an individual load cell signal.

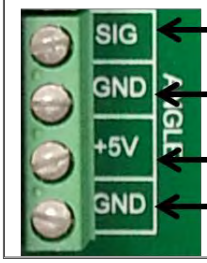
2. Speed Sensor

For standard return belt speed sensor and shaft mounted speed sensor

Color	Description
EMPTY	NONE
Green	SIG A
Red	+ 5V
Black& White	GND
EMPTY	GND
EMPTY	SIG C

3. Angle Sensor

Please connect the wires for the angle sensor to the ANGLE terminal as shown:



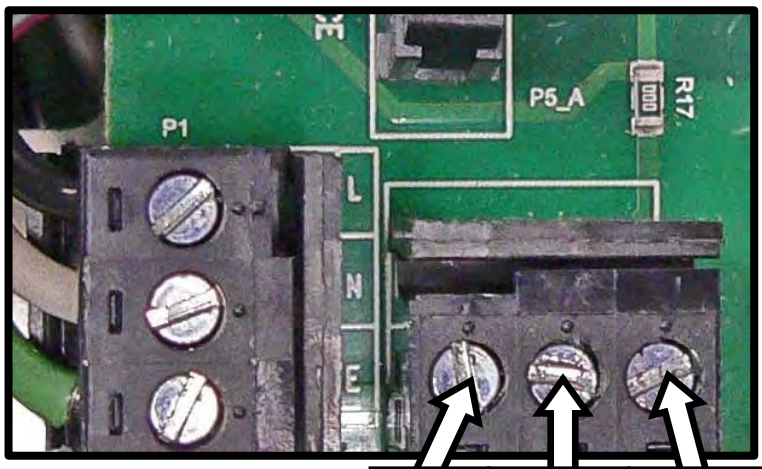
Color	Description
GREEN	SIG
WHITE	GND
RED	+ 5V
BLACK	GND

4. 100/240VAC Supply Power

The 100/240 VAC power supply is mandatory if the scale must be powered from AC line power or a generator! The power supply converts 110/240 VAC into 24 VDC. It is mounted below the Terminal and Sensor boards. It is best to have the power supply installed prior to shipment from the factory using **Part # BWPS** but may also be shipped as a field installable kit **Part # BWPSKIT.**

WARNING - HIGH VOLTAGE!!

Make sure you follow best safety practices!
Double check to be sure there is no power on the wires while making the connections!



5. 12-30VDC Power on Terminal Board

GND = BLACK
24 VDC = RED Optional 12-30 VDC

When the Belt-Way power supply is installed, it produces 24 VDC on the Red and Black wires labeled 12V TO 30V PWR. If 100/240 VAC is not available, the integrator may be powered from an alternate 12-30 VDC source. **A minimum of 16 gauge wire is recommended for direct connection to a battery.** Approximately 55 watts of power are required to operate the integrator. We recommend using a DC spike filter (**Part # PRD0085**) and external toggle switch when directly connected to a battery. **Memory loss may occur if the battery voltage drops below 12 VDC or is erratic during startup / shut down! The integrator should be switched off until the machine is fully powered on or turned off.**

6. I/O Board

The IO board is used to communicate to a PLC automation system or directly control an external device from the scale. The IO board is optional. It is installed upon request only. The terminal board connectors make wiring to the IO easy, but they only work when the IO is installed under the sensor board.

A. Analog Outputs

Analog Outputs produce a 0 - 20 or 4 - 20 mA signal for PLC monitoring or direct control of variable frequency drives.

AGND	Analog Output Ground
IOUT2	Analog Output 2
AGND	Analog Output Ground
IOUT1	Analog Output 1

C. Digital Inputs and Outputs

Digital inputs and outputs allow the integrator to be manipulated from a PLC system.
Digital inputs and outputs are **SYNCING**. It is best to power the inputs and outputs with 24 VDC from the PLC to keep them fully isolated. Alternatively, the SNSR PWR and GND terminals can supply 24VDC. This method eliminates the isolation between the scale integrator and PLC.

Digital Input Ground
Digital Input 4

Digital Input Ground
Digital Input 3

Digital Input Ground
Digital Input 2

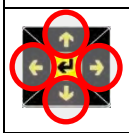
Digital Input Ground
Digital Input 1

Digital Output Ground
Digital Output 3

Digital Output Ground
Digital Output 2

Digital Output Ground
Digital Output 1

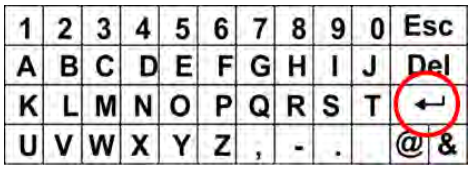
User Interface Navigation

	**HOME:** Press the **Home** key to display the currently selected Run Screen.
	**MAIN MENU:** Press the **Main Menu** key to display the Main Menu.
	**BACK:** Press the **Back** key to return to the previous screen.
	**ZERO CALIBRATION:** Press the **Zero Cal** key to start a zero calibration
	**PRINT TICKET:** Press the **Print Ticket** key to print a ticket or save a screenshot to USB when no printer is installed.
	**CLEAR WEIGHT:** Press the **Clear Weight** key **TWICE** to reset the accumulated weight to 0.
	**ENTER KEY:** Press the Enter Key to select menu options or accept value changes.
	**ARROW KEYS:** Press the **Arrow Keys** to navigate menu's, option lists and the virtual keypad when entering values.

Entering Alphanumeric values on Virtual Keypads:

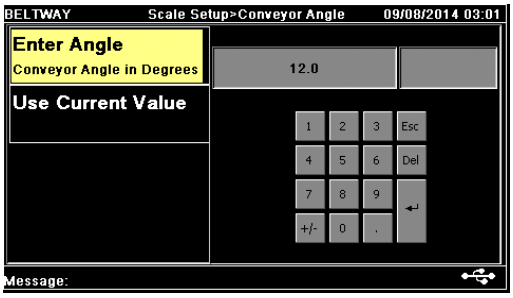
Press **ENTER**  on the keypad after highlighting each character.

When you have completed your entries select **ENTER** on the virtual keypad to save.

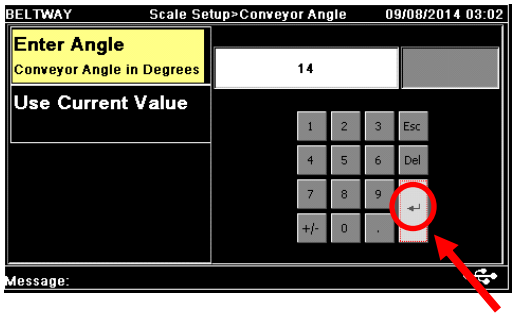


Data Entry Example: Enter an angle when no angle sensor is installed

1. Choose Enter Angle.



2. The cursor moves to the keypad. Enter "14".



3. Move the cursor to the Enter Arrow and press Enter on the keypad to save.

Setup Wizard

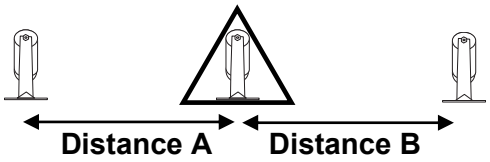
NOTE: Some of the following features may require a software upgrade!
Contact Belt-Way to receive the latest upgrades.

Install the USB flash drive before proceeding with scale setup!
The Setup Wizard should be completed once for each newly installed scale!

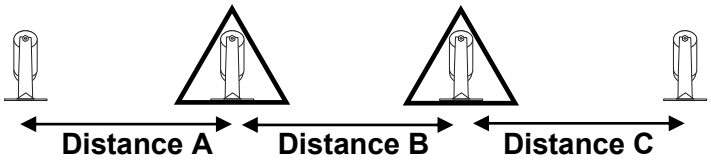
Several measurements are required to complete the wizard.
Record the following values before starting the wizard.
1. Number of weigh idlers (1 for single idler scale, 2 for dual idler scale, etc)
2. Load cell capacity found on Load cell assembly label (45 kg, 100 kg, 200kg, etc)

3. Idler spacing distance (Measure as shown below:)

Single Idler Scale:



Dual Idler Scale:



4. Conveyor 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.
5. Head or Tail pulley diameter if shaft mount speed sensor is used instead of the wheel speed sensor.

The Setup Wizard proceeds through the following configuration items:

1)	**Select Run Mode**	**8)**	**Enter Angle**
2)	**Select Number of Weigh Idlers**	**9)**	**Enter Idler Spacing**
3)	**Select Load Cell Size**	**10)**	**Speed Wheel Diameter**
4)	**Select Distance Units**	**11)**	**Belt Length Entry or Calibration**
5)	**Select Weight Units**	**12)**	**Zero Calibration Static or Dynamic**
6)	**Select Rate Time Units**		**Span Calibration - Option of Manual, Test**
7)	**Select Angle Sensor ON/OFF**		**Weight & Material Test**

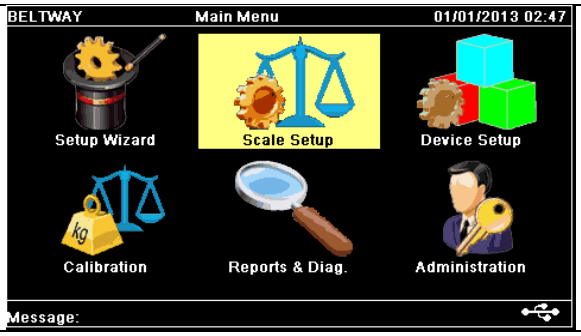
If you EXIT the Setup Wizard before it is completed you must start at the beginning of the Setup Wizard. Previous entries will be saved so you can quickly move through the Wizard to where you left off. It is also possible to make parameter changes by accessing the Scale Setup menu and perform all calibrations from the Calibration menu.

Scale Setup

The Scale Setup menu is available to manage important calibration parameters. You can configure the scale manually in this menu instead of walking through the Setup Wizard.

Use care when modifying Scale Setup parameters as they impact the calibration of the scale.

The Scale Setup menu will allow you to setup and view the following scale parameters:



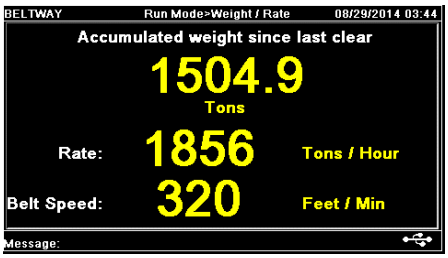
1) **Run Mode**
2) **Number of Weigh Idlers**
3) **Load Cell Size**
4) **Distance Units**
5) **Weight Units**
6) **Rate Time Units**
7) **Conveyor Angle**
8) **Idler Distance**
9) **Speed Sensor**

Run Mode

The Run Mode selection determines what information is displayed on the home screen. There are currently five run modes to choose from.

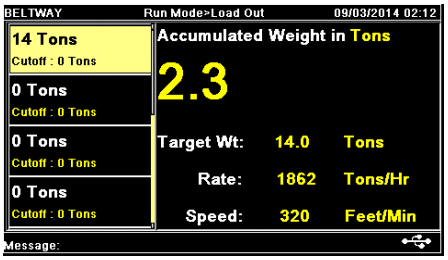
Weight / Rate

This is the default run mode. It displays total accumulated weight, flow rate (tons per hour, etc), and belt speed



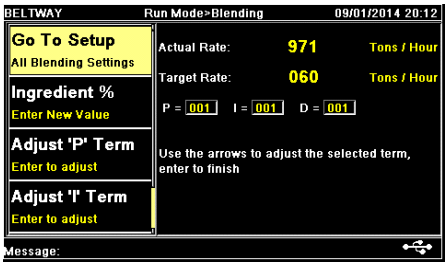
Load Out

This run mode is best when the scale is used to load product into trucks or rail cars. The user can quickly choose from preset load weights if the scale is setup to control the feed device.

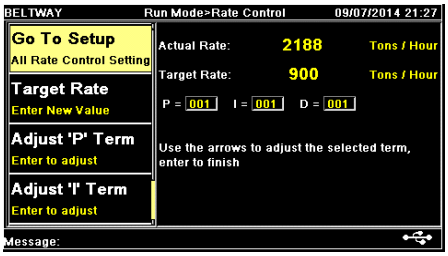


Blending

This run mode is best when the scale is used to accurately blend materials using our internal PID control function. The blend mixture can quickly be adjusted as needed.

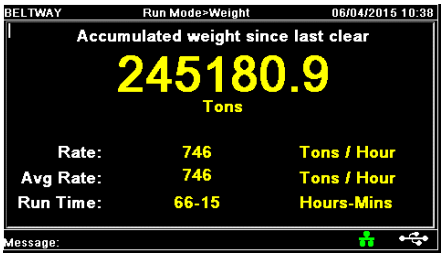


Rate Control



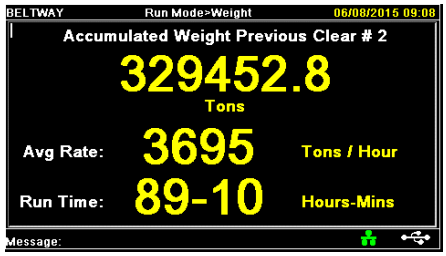
The rate control mode is best when the scale is automatically controlling a feeder to maintain a target flow rate. The target rate can be quickly adjusted as needed.

Weight



The Weight mode shows the accumulated weight along with flow rate, average flow rate, and run time since the last time the accumulated was reset.

8 Last Cleared Weights



The last 8 cleared accumulated weights are available in any run mode. Press the right arrow to scroll through the 8 cleared weight totals. The average flow rate and run time for each weight total is also displayed on the screen.

1. Number of Weigh Idlers

Choices for number of Weigh Idlers is:

- **1, 2, 3 or 4 idlers**

The single idler scale MUST be set for 1. A dual idler scale MUST be 2 idlers, etc.

2. Load Cell Size

This is where you would select the load cell capacity of the load cell assemblies used for this scale. Choices are:

- **45 kg (Aluminum)**
- **50 kg (Stainless)**
- **100 kg (Aluminum or Stainless)**
- **150 kg (Stainless)**
- **200 kg (Aluminum)**
- **350 kg (Stainless)**
- **500 kg (Aluminum or Stainless)**
- **1000 kg (Aluminum or Stainless)**
- **1000 lbs (Catenary Idler Scale)**
- **Custom (See Note)**

All load Cell mV/V specifications are pre-programmed in the software. For Custom you need to know the Load Cell Capacity and mV/V

3. Weight Units

Select the distance units you would like to display on the screen during operation. Depending Distance unit selection, the choices are:

I. **English**
- Pounds
- Tons
- Long Tons

II. **Metric**
- Tonne (Metric Tons)
- kg

4. Distance Units

Select the distance units you would like to display on the screen during operation. The units displayed are related to the distance units **previously selected**. EXAMPLE: If you select English Units the choices shown will be as listed under English units.

Choices are:

III. **English Units**
- Feet
- Inches
- Tons
- Long Tons

IV. **Metric Units**
- Meters
- Centimeters
- Tonnes (Metric Tons)
- Kilograms

5. Rate Time Units

Select the time based units you would like to display when in run mode.
Choices are:

- **Minute (min)**
- **Hour (Hr)**

6. Conveyor Angle

You need to select whether you have an angle installed.

Installed: The scale will automatically look at the signals for the angle sensor and use these signals for weight calculation.

Not Installed: You need to enter the angle of the conveyor as this effects the weight calculation.

If you do not have an “Angle Finder”, you can download a free Inclinometer application on your smart phone to help find the angle in degrees.

7. Idler Distance

You need to enter the exact distance between the conveyor idlers and the scale idlers so that the scale can accurately measure the weight on the belt. The measurement units required for entry are dependent on the distance units selected in #5:

- **English:** Inches (in)
- **Metric:** Meters (m)

8. Speed Sensor

The speed sensor default shown is for the “Return Belt Speed Sensor” however you are able to use Belt-Way Scales shaft mount encoder or a third party encoder for speed measurement. In order to get an accurate speed you would need change the following values:

A. Wheel diameter:

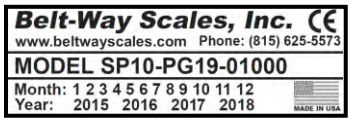
If you are using the Belt-Way Scales shaft mount encoder you will need to measure the pulley diameter that the encoder is mounted to. This measurement needs to be in Inches or Centimeters.

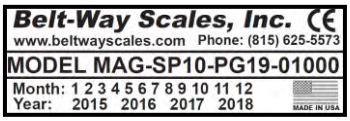
B. Pulses Per revolution:

The correct value must be entered here for the scale to work properly!

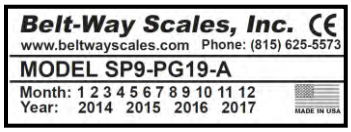
The current Belt-Way speed sensor uses 100 pulses per revolution.

The model number is SP10. Firmware version 3.28 defaults to 100 pulses.





The older Model SP9 speed sensors used 200 pulses per revolution.



If you are using a third party encoder you must enter the pulses/revolution for that specific encoder.

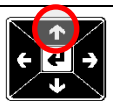
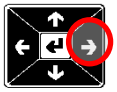
C. User Belt Speed

If the scales displayed belt speed is not correct and does not match the reading from your tachometer. You can adjust the scales displayed reading to match. You must know the pulses per revolution of the encoder being used and the correct belt speed which you can enter here and the scale will adjust the pulley diameter so the displayed belt speed will match the actual speed.

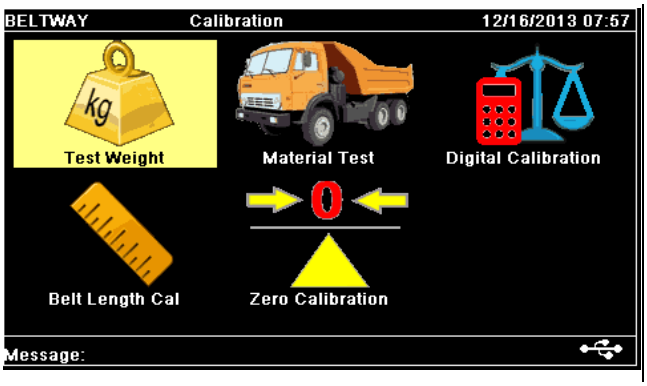
Calibration

The calibration menu is available to go to a specific type of calibration you would like to perform. Each calibration can be performed independently for a specific purpose. For more information on each calibration please continue reading.

SELECTION OPTIONS DURING AND AFTER THE CALIBRATIONS PROCEDURES

	Press the **Up Arrow** to go to the PREVIOUS screen
	Press the **Left Arrow** to CANCEL
	Press **Right Arrow** to CHANGE THE VALUE
	Press the **ENTER** key to ACCEPT / ACKNOWLEDGE.

The different types of calibration that can be performed from this menu are:



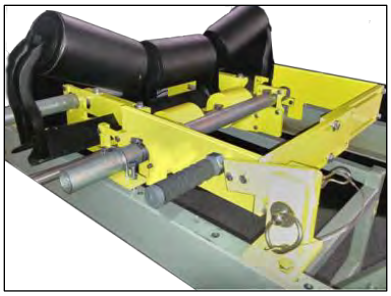
1) Test Weight Calibration
2) Material Test Calibration
3) Digital Calibration
4) Belt Length Calibration
5) Zero Calibration (Initial)

6) Zero Calibration (Routine)
Started by pressing the Zero Key
On the keypad in Run Mode.

A report of all calibration activity is stored on the USB flash drive.
Make sure the USB drive is installed before performing a calibration.

Test Weight Calibration

The Test Weight Calibration requires the user to hang static weights from the load cell assemblies. A common method is to use test weights and a test bar as shown in the picture. Stop the belt and be sure to follow all safety procedures when placing test weights in position on the scale for the test weight.



Belt-Way now offers a self Storing Test Weight kit that safely holds the test weight on the scale. This system makes calibration very easy and safe. The test weight requires one person to drop the weight onto the load cells. There is no need for a man lift to hang weights even when the conveyor only has access on one side.

No matter the method, the total weight including the bar must be entered before proceeding with the calibration.

The weight value must be entered in Pounds (lbs.) or Kilograms (kg's)

Suggested test weight amounts are as follows:

Model 45 or Model 50	Model 100 or Model 150	Model 200	Model 350	Model 500	Model 1000
25-50 lbs.	50-100 lbs.	50-100 lbs.	100-200 lbs.	200+ lbs.	200+ lbs.

Navigation Tip	
	Press the **MENU** key.
	Navigate to the CALIBRATION icon and press **ENTER** key
	Navigate to the TEST WEIGHT menu. Then press **ENTER** key.

Check the New Trim Factor upon completion of the test weight calibration. The Trim Factor of a properly calibrated scale should be close to 1. (.950, 1.025, etc) There may be a problem if the result is not close to 1. Recheck all settings, then repeat the zero and test weight calibrations to check for repeatability.

You may also view the Live Weight screen when test weights are installed on the scale. Navigate to Totals & Diagnostics > Live Weight. This screen shows the current weight on the scale. It should closely match the test weight value.

Material Test Calibration

The Material Test Calibration is one method that can be used to calibrate the scale and is based on the weight measured by the **Belt scale and a Certified scale (typically a truck scale).**

Navigation Tip	
	Press the **MENU** key.
	Navigate to the CALIBRATION icon and press **ENTER** key
	Navigate to the MATERIAL TEST menu. Then press **ENTER** key.

These two weights are entered into the scale and after acknowledging the entries, the scale will adjust the TRIM factor so that the belt scale will read very close to the certified scale.

The **CERTIFIED** scale units entered is selectable and does not need to be the same as the belt scale units because the scale will convert and adjust the scale as needed based on the units selected for the certified. The CERTIFIED scale unit choices are:

- **Tons (Equal to 2000lbs)**
- **Long Ton (Equal to 2240lbs)**
- **Pounds (lbs.)**
- **Metric Tons (Tonne)**
- **Kilograms (KG)**

Recommended steps to follow:

1. Weigh the truck **EMPTY** to get a good tare weight.
2. Make sure the scale **ZERO** Calibration is good. Zero Calibrate the scale if needed.
3. Clear the **TOTAL** weight on the belt scale.
4. Run the material to start test
5. **Complete 3 tests. We recommend a minimum of 15 tons per test if possible**
6. Compare the results to prove the scale is repeatable **BEFORE** adjusting the scale calibration.
7. If all tests are reasonably consistent, take an average of the belt scale and truck scale tests, or simply add the tests up and enter the total weight for the belt scale and truck scale, instead of a single load. Either of these methods will result in a more accurate calibration.

The Trim Factor of a properly calibrated scale should be close to 1.000. (.950, 1.100, etc.)
If your result is not close to 1 recheck all settings and perform the calibration again!

Digital Calibration

The **Digital Calibration** method resets the **Trim Factor** back to the default of 1.000.

Belt Length Calibration

The **Belt Length Calibration** calculates the length of the belt. This must be performed before other **Zero Calibration** methods will work properly.

Navigation Tip	
	Press the **MENU** key.
	Navigate to the CALIBRATION icon and press the **ENTER** key
	Navigate to the BELT LENGTH CALIBRATION. Then press the **ENTER** key.

You have various options when doing this calibration:

1. **Length and Zero**
   This calibration measures the length of the belt while also conducting an Initial Zero calibration while the belt is running and empty. When this calibration is completed the scale will know how long the belt is in Meters (m) or Feet (Ft) depending on the units selected during setup. The scale will also be zero calibrated.

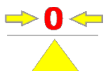
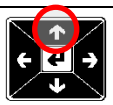
   The belt must be **RUNNING** and **EMPTY** to perform this calibration.

2. **Auto Belt length**
   This calibration is performed while the belt is running empty and only measures the length of the belt.
   You need to do the following steps to complete this calibration:
   1. Mark the belt
   2. Mark a point on the conveyor
   3. Start the conveyor
   4. Follow the prompts on the display. To **START** measuring the length press the ENTER key when the belt mark passes the conveyor frame mark. To **END** the measurement press the ENTER key when the belt mark passes the conveyor mark after **1** revolution.

3. **Manual Belt length**
   You may enter an exact belt length (in Feet or Meters) if the belt can't be run.

Zero Calibration (from the Calibration Menu)

The **Zero Calibration** must be performed when the scale is first installed or if a significant change has occurred to the scale or conveyor. This does not measure the belt length, it only re-weighs the empty belt to establish a new zero value.

Navigation Tip	
	Press the **MENU** key.
	Navigate to the CALIBRATION icon and press the **ENTER** key
	Navigate to the ZERO CALIBRATION. Then press the **ENTER** key.
OPTIONS AVAILABLE BEFORE ACCEPTING THE CALIBRATION PROCEDURE	
	Press the Up Arrow to REJECT and REPEAT the calibration
	Press the Left Arrow to REJECT and CANCEL
	Press Right Arrow to ACCEPT and REPEAT
	Press the ENTER key to ACCEPT / ACKNOWLEDGE.

There are 2 options when doing the Initial Zero Calibration.

1. **Dynamic –** This calibration is done when the belt is Running Empty

The Dynamic Initial Calibration is also accessible through the Setup Wizard or it can be done simultaneously when doing Length and Zero Calibration during the Belt Length Calibration.

You will also notice that this calibration requires the conveyor to complete 3 revolutions of the belt.

2. **Static –** This option is used when you are unable to start the belt and need to complete a quick zero Calibration.

The belt must be **STOPPED** and **EMPTY** when doing this calibration.

Zero Calibration – (from the Keypad)

This is the primary method for performing a **ZERO CALIBRATION**. We recommend repeating this process daily or as frequently as required by your application. Run the belt **EMPTY** and press the **ZERO CALIBRATION** button on the keypad. You can cancel the calibration at any time by pressing the **BACK** or **HOME** buttons. Follow the on screen instructions to save the new zero number.

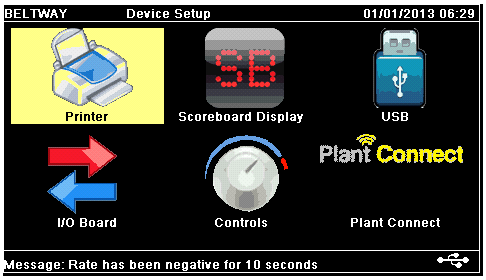
Some factors that the Routine or Daily zero calibration will help compensate for are:

- Material build up on the scale
- Material build up on the belt
- Ambient Temperature changes
- Belt temperature changes
- Added belt splices and vulcanizing
- Misalignment of the belt (belt tracking)

The zero calibration will overcome some of these issues but is not a replacement for routine maintenance.

Device Setup

The device setup menu is used to activate all peripheral devices.



1. **Printer**
2. **Scoreboard Display**
3. **USB**
4. **I/O Board**
5. **Controls**
6. **Plant Connect**

Printer

Tickets On / Off - Enable ticket printing.
Printer Type: Setup parameters for your printer.
Default settings:

- Belt-Way printer
- RS232 port
- Baud rate - 9600
- Data Bits - 8
- Stop Bits - 1
- Flow Control – None

The Custom option allows 3rd party printers to be used.
RS232 port parameters must be set to match the printer you are going to use.
Available Selections:

- Baud Rate: 9600, 19200, 57600 or 115200
- Data Bits: 7 or 8
- Stop Bit: 1 or 2
- Flow Control: None, Hardware Xon – Xoff

Setup Ticket:
Enter the following:

- Company Name
- Address
- Phone Number.

Press the **PRINT** key to print the ticket.

Scoreboard Display

Displayed Data - Choose the data you want to view on the display
Weight: Shows only accumulated weight
Rate: Shows only tons per hour.
Alternate: Shows both weight and rate.
Time Delay - Defines how many seconds each value is displayed.
SB Display Type - Setup parameters for the display.

Default settings for Belt-Way display type:

- Baud rate - 9600
- Data Bits - 8
- Stop Bits - 1
- Flow Control – None

The Custom option allows 3rd party scoreboard displays to be used.
RS232 port parameters must be set to match the display.

- Baud Rate: 9600, 19200, 57600 or 115200
- Data Bits: 7 or 8
- Stop Bit: 1 or 2

Terminal Mode - Determines length of data string.
The default setting for Terminal Mode is **OFF**.
The data string length is fixed at **+12345678.123**
Terminal Mode should only be **ON**, when connecting to a PC RS232 port to log data in a terminal program such as Putty or HyperTerminal. This mode adds a WEIGHT or RATE label before the data value and the data string length becomes variable.

USB

Enable data logging to the USB flash drive. A 4 GB or smaller flash drive must be installed to save date files. Press enter on the log file to be activated and choose "ON". All files are saved in ".txt" format. Each file saves a header row labeled HDR that includes the record number, Date, Time, Scale Name, Plant Name, and Product Name.

```
HDR, 0, 2015/6/3, 09:02:07, BELTWAY, BELTWAY USA, ROCKS
```

Calibration Data: Saved as calib_log.txt and calib_report.txt
The calibration log and report record all zero, test weight, material test, and digital calibration events.
The calibration log includes field descriptions for each value.
The record types are as follows:
ZER = Zero Calibration, MAT = Material Test Calibration, TST = Test Weight Calibration
DIG = Digital Calibration

Example Calibration Report:

```
Report Type                     ZER
Date                            2015/4/22
Time                            08:48:38
Scale name                      BELTWAY
Plant name                      BELTWAY USA
Product name                    ROCKS
Time for 1 revolution           0.000000
Belt Length                             0.0
Belt Length Unit
Belt Speed              333.000000
Belt Speed Unit         Feet/min
Conveyor Angle(Degrees)                 12.000000
No of scale idlers                      2
Idler_spacing1          0.000000
Idler_spacing2          0.000000
Idler_spacing3          0.000000
Idler_spacing4          NA
Idler_spacing5          NA
Prev set zero value             272.569550
New set zero value              206.403076
Accumulated Weight      206.403076
Accumulated weight unit Tons
```

Runtime Data: Saved as periodic_log.txt and daily_report.txt
The runtime log and daily report save all runtime production values (total weight, tons per hour, etc) . Program the Log Time to the desired Logging Interval. The smallest interval is once per minute. The periodic log and daily report will generate a new file each day. The calibration log includes field descriptions for each value. The record types are as follows:

IDT= Initial Daily Total Record, DAT = Standard Data Record, FDT = Final Daily Total
Example Daily Report:

```
Data Type                       REP
Report Type                     Daily Report
Report Date                             2015/6/3
Power ON Time                           00:00:00
Scale name                      BELTWAY
Plant name                      BELTWAY USA
Product name                    ROCKS
Belt Start Time                 00:01:00
Load Start Time                 00:01:00
Load Stop Time                  23:59:59
Belt Stop Time                  23:59:59
Loaded Run Time(Hours)                  24.000
Running Empty + Stopped Time(Hours)                     0.000
Total Report Time(Hours)                        24.000
Number of Belt Stops            0
Report Period Average Production Rate                       744.82
Rate Unit                       Tons/Hour
Total Weight                       17876.75
Weight Unit                     Tons
```

Error Data: Saved as error_log.txt
The error log records events such as communication, load cell, angle sensor, and speed sensor errors.

I/O Board

Assign Inputs

Assign any one of the listed input functions to any of the 4 digital inputs. The digital inputs are optically isolated and accept 5-30 VDC.

Input options are listed below:

1. **Print Ticket** - Prints a ticket if a printer is connected to the integrator.
2. **Print then Clear** - Prints a ticket first and then resets the Accumulated Weight to zero.
3. **Enter Load** - Used with legacy remote start stop stations.
4. **PID Rate = Zero** - Momentarily stops PID loop from calculating.
5. **Zero Calibration** - Initiates the dynamic Zero Calibration.
6. **Error Acknowledge** - Acknowledge and clear an error condition.

Assign Outputs

Assign any one of the listed output functions to any of the 3 digital outputs. The digital outputs are optically isolated with a maximum of 30 VDC, 100 mA sinking.

A solid state relay is required to connect our output to a 100 / 240 VAC PLC input card. See drawings section for proper wiring! Relays are available upon request.

Output Options are listed below:

1. **Pulsed Output** - Generates a pulse for each accumulated weight unit.

Pressing Enter will take you to the next setup screen where you must program the **Weight per Pulse** and **Pulse on Time** values.

- **Weight per Pulse**
  This can be set to **.1, 1.0, 10 or 100** of the selected Weight Units.
  For example, if the Weight unit is Tons and the Weight per Pulse is set to **.1**, a pulse will occur each time **0.1** Tons is accumulated.

Please note that small pulse values (.1 or 1.0) will not work with small Weight units (Lbs or Kgs) as an excessive number of pulses will be created!

- **Pulse on Time** controls how long the pulse remains on. The value is in **milliseconds**. This must be programmed properly so the control system can count each pulse.

2. **Quadrature Wave** - Allows a pulsed output to count positive or negative weight. This requires
   a second output to be programmed as the **Pulsed Output** channel.
3. **Error Alarm** - The alarm output will turn on when an error condition occurs.

Pressing the **ENTER** key will allow you to choose the error you wish to monitor with the output.

1. **Load Cell** - Activates when any load cell malfunctions.
2. **Angle Sensor** - Activates when the angle sensor malfunctions.
3. **Communications** - Activates when there is any communication error.
4. **Negative Rate** - Activates when the rate drops below the Negative Rate Limit.

The Negative Rate Limit is programmed in the Admin > Settings menu.

5. **Any Error** - Activates when any of the previously mentioned errors occur.
6. **Min/Max Speed -** Activates when the speed is above or below the programmed.

Pressing **Enter** takes you to the setup screen where you must program the **Min** or **Speed Setpoints**

- **Min Speed Output** (Turns on when speed is below setpoint) or
- **Max Speed Output** (turns on when speed is above setpoint).

7. **Min/Max Rate -** Activates when the rate is above or below the programmed.

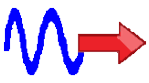
Pressing **Enter** takes you to the setup screen where you must program the **Min** or **Max Rate Setpoint**

- **Min Rate Output** (Turns on when rate is below setpoint) or
- **Max Rate Output** (turns on when rate is above setpoint).

8. **Batching / Loadout -** Activates when a batch is complete.
9. **Zero Calibration -** Activates when a Zero Calibration is in progress. Be sure to assign
   an input to initiate the Zero Calibration.

Assign Relays

Any one of the previously listed output functions can be assigned to any of the 3 relay outputs.
All digital output options EXCEPT pulsed outputs are available as relay outputs.
The relays can accept a direct connection to a 100 / 240 VAC input.



Analog Outputs

Selection choices are **4-20 mA** or **0-20 mA** output. This output is used by a PLC system to monitor scale flow rate (tons per hour etc.) or to automatically control a material feed device in blending, rate control or load control applications if configured to do so.

1. **Analog 1 Function** –
   Output **Default** - **Unassigned**

Selection choices available are:

- **0-20 mA**
  0 mA is the mA output when the scale rate is 0 (Tph, Kg's / Hr)
  20 mA is the maximum output when the scale rate exceeds the **Max Rate** value.
- **4-20 mA**
  4 mA is the mA output when the scale rate is 0 (Tph, Kg's / Hr)
  20 mA is the maximum output when the scale rate exceeds the **Max Rate** value.

2. **Analog 1 Setpoint**
   Default - 100%
   The setpoint determines what portion of the 4-20 mA output is sent to the PLC or feed device. 100% sends the entire value,
   50% sends half the value,
   10% sends one tenth of the value, etc.

   The value should remain at 100% when the output is simply monitored by a control system. It should be programmed to the required value when the scale is used for blending.

3. **Analog 1 Max Rate** - The Max Rate establishes the 20 mA level for the analog output. **The default is 500.**

The Max Rate MUST equal the PLC 20 mA value to make the scale and PLC rate readings match.

Controls

PID Control

These settings are used to control feed devices. A PID control loop allows a scale to speed up or slow down a feed device in order to keep with a programmed flow rate crossing the scale.

The PID control section is a generic setup for the other specific functions (Rate Control, Blending, etc).

- **PID Channel**
  Default – **1**
  Selection options are: **1 or 2**

  This is the analog output that will control the feed device.

- **PID Action**
  Default - **Reverse Action**
  Selection options are:

1. **Reverse Action**
   This method causes the feed device to speed up when the actual flow rate drops below the programmed flow rate, thus increasing the flow rate.

2. **Forward Action**

   This method causes the feed device to slow down when the actual rate is below the programmed rate. It can be used to control a conveyor belt to keep a consistent level of material on the belt.

- **PID Setpoint**
  The PID Setpoint is the programmed flow rate that the scale attempts to maintain when running a PID control loop.
  Default - Local Setpoint
  Selection options are:

  1. **Local Setpoint**
     The Local setpoint must be manually entered into the integrator.

  2. **Remote Setpoint**
     Remote setpoint requires a separate scale to automatically update the setpoint value in a Master - Slave configuration. See blending section for more details.

- **P, I, D Terms**
  The default PID terms will work for most applications. However, they may be adjusted to fine tune feeder performance. Be careful when changing the values as they may result in abnormal feeder behavior. **Contact Belt-Way with questions about PID control setup.**

Load Out

This setting stops a feed device after a predetermined weight has crossed the scale and is primarily used to automate truck and rail car loading.

8 Preset Load Weights can be programmed accommodate different size vehicles. Each **load weight** can also be accompanied by a **Cutoff** value. The **Cutoff** value must match the amount of material that is left on the conveyor after a load is complete. The **Cutoff** will usually be the same for each load weight, but different values can be used if multiple feeders are utilized in the loading process. The Cutoff must be calculated by trial and error testing. The final **Target Weight** equals the **Preset Load** weight minus the set **Cutoff** value.

Blending

Blending automatically controls one or multiple feed devices to create an accurately blended mixture of materials. A Master - Slave configuration is utilized to have one scale send its rate to the other networked scales.

Examples of blending include:

- Mixing cement and water in a batching plant
- Adding RAP to an asphalt mixture
- Mixing several sizes of sand into a final product

Settings for the blending functions are:

- **Number of Slaves**
  This must be set in the Master scale only. It determines how many scales are on the network.
- **Ingredient %**
  This is the percentage (%) of the master scale that a slave scale needs to add to the final mixture.
- **Feed Delay**
  The Feed Delay is programmed in **Seconds (s).** It delays the feeder from starting if it is a long distance from the scale.
- **Preload Delay**
  The Preload Delay is programmed in **Seconds (s).** It delays the Slave scale from responding to the master scale's rate. The feeder will run a lower "bias" rate until the delay timer expires.
- **Feeder Capacity** - Expected capacity of the feed device.

Rate Control

Rate Control allows the scale to automatically adjust a VFD (variable frequency drive) for a feeder to keep a consistent flow rate on the scale at all times. It is also possible to control vibratory feeders, Augers, conveyors and other material feed systems.

Rate Control settings are as follows:

- **Target Rate**
  This is the **RATE** the scale is attempting to maintain.

- **Preload Delay**
  This will Delay the PID loop calculations if the scale is a long distance away from the feed device. It is measured in **Seconds (s).**
  This method can dramatically reduce the scale's expected margin of error.

- **Target Load**
  The scale will attempt to keep the same or consistent amount of material on the belt at all times. It must be in **lbs / ft or kgs / M**.

- **Min. Belt Speed**
  This is the minimum expected belt speed of the conveyor.

- **Preload Distance**
  This is the distance from the feed device to the scale.

- **Empty Belt Speed**
  This is the expected belt speed of the conveyor when it is running empty.

Plant Connect

Plant Connect is an Internet based reporting system that allows you to easily access and monitor production from a PC, smart phone or Tablet. Contact Belt-Way Scales for more information.

Totals & Diagnostics

The **Totals & Diagnostics** menu is contains options to view production totals, scale diagnostic information, integrator firmware, and live weight readings.

Totals & Diagnostics :	
	**1) Totals** **2) Diagnostics** **3) Firmware** **4) Live Weight**

Totals

The Totals screen shows stored accumulated weight information.

1. Job Total: The Job Total accumulates until it is manually reset by the user. Press the button twice to reset the Job Total to 0.

2. Daily Total: The Daily Total automatically resets each day.

3. Weekly Total: The Weekly Total automatically resets each Saturday.

4. Monthly Total: The Monthly Total automatically resets on the first day of each month.

5.Yearly Total: The Yearly Total automatically resets on the first day of each year.

6. Master Total: The Master Total accumulates until it is reset by the user. Press the button twice to reset the Master Total to 0.

Firmware

The Firmware screen shows currently installed software versions. Firmware versions change as we add new features. Contact Belt-Way to keep updated on new firmware releases.

1. Integrator Board Firmware Version

2. IO Board Firmware Version

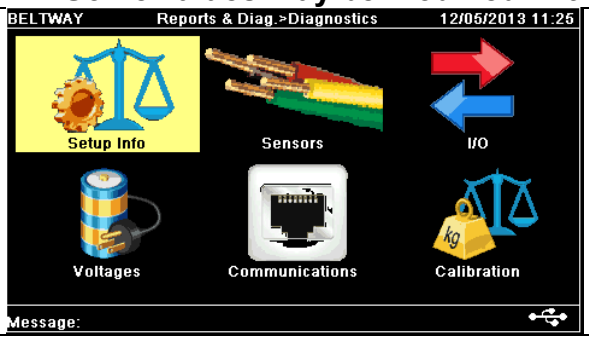
3. Sensor Board Firmware Version

Live Weight

The Live Weight screen shows the weight reading on the scale in real time. Compare the live weight reading to the expected test weight value to make sure the calibration is accurate. It is best to check the live weight before and after the calibration. If the live weight doesn't match the test weights, then there could be a problem with the load cells or improper test weight value. If the live weight is correct but the Trim Factor is not close to 1, the calibration is NOT accurate! The live weight should match the test weight amount AND the Trim Factor should be very close to 1.

Diagnostics

You can view the status of the settings and live data for the following menus.
Diagnostic values are READ ONLY.
Some values may be modified in the Scale Setup or Administration Menus



5) **Setup Information**
6) **Sensors**
7) **I/O**
8) **Voltages**
9) **Communications**
10) **Calibration**

Setup Information

The setup section displays the information entered when setting up the scale. This information is related to the load cell selection, conveyor angle, and idler spacing as well how many weigh idlers are used.

Sensors

The Sensors menu enables you to view the current signals from all scale components.

1. **Load Cell 1-8**

A Millivolt (mV) reading is displayed for each connected load cell. Each load cell should show a similar mV value. When the belt is empty, the load cells should typically show between 2 an 5 mV depending on the capacity of the load cells and weight of the empty belt. If the reading is

2. **Speed Sensor**

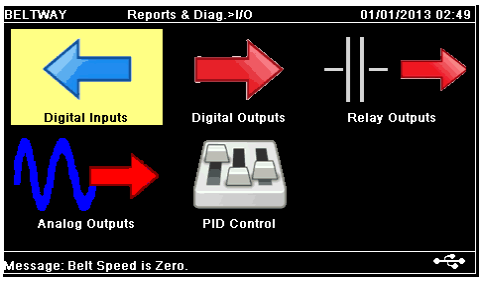
The scale speed sensor will send back a signal measured as frequency (Hz) while the belt is running. If the signal shows 0Hz while the belt is running there is an issue with the speed sensor, wiring or integrator. Please refer to the trouble shooting section for more details on diagnosing the problem.

3. **Angle Sensor**

The Angle Sensor measures the conveyor angle. The angle sensor is suited for mobile or portable applications where the conveyor changes angle frequently. The value can be positive or negative depending on which side of the conveyor it is installed. The angle sensor range is from -45 to 45 degrees. However, most conveyors have an angle less than 25 degrees.

I/O

Selecting the I/O menu allows you to view the current status of the input and output functions for the scale. These selections can only viewed and cannot be changed or edited while in this menu.



IO options include the following:

1. **Digital Inputs**
2. **Digital Outputs**
3. **Relay Outputs**
4. **Analog Outputs**
5. **PID Control**

- **Digital Inputs**
  You are able to view the status of the 4 Digital Inputs and what they are assigned to.
  The default is **Unassigned / OFF**

- **Digital Outputs**
  You are able to view the status of the 3 Digital Outputs and what they are assigned to.
  The default is **Unassigned / OFF**

- **Relay Outputs**
  You are able to view the status of the 3 Relay Outputs and what they are assigned to.
  The default is **Unassigned / OFF**

- **Analog Outputs**
  You are able to view the selected status of the 2 Analog Outputs.
  The default is **Output 4-20mA / ON**

- **PID Control**

You are able to view the status of the various PID loop settings.
Defaults are as Follows:
PID Channel – 1
PID Action – Reverse Action
PID Setpoint – Local Setpoint
PID Set Rate – OFF
Proportional Term – 1
Integral Term – 1
Derivative Term – 1

Voltages

The Voltages menu simply displays the Supply voltage for the load cells and speed sensor. The load cell supply voltage should be approximately 9 volts dc and speed sensor supply voltage should be 5 volts dc.

Communication

The Communication menu shows the current status of all communications ports.

1. **RS-485 Port 1 - ON when Sensor Board is connected to Integrator board**
2. **RS-485 Port 2 - ON when two Integrator boards are connected for blending**
3. **RS-232 Port 1 - Printer Port - Always ON**
4. **RS-232 Port 2 - Scoreboard Display Port - Always ON**
5. **Ethernet Port - ON only when an Ethernet connection is established between the integrator and another Ethernet device such as a remote display or cellular modem.**

Calibration

1) Trim Factor

The Trim Factor is a factor used in the weight calculation and has no unit value.

2) Zero Value

This is the weight of the empty belt measured in the selected units during setup. Measured in Pounds (lbs.) or Kilograms (kgs)

3) Belt Length

This is the measured length of the belt as measured during the length calibration. This is shown in meters (M) or feet (Ft.).

Administration

The administration menu is available to manage various parameters as well as to provide additional protection for the scale settings and functions by means of an administrator's password. This is commonly used at locations where settings could be changed by accident by non-trained personnel affecting scale performance and accuracy as well as causing data or connectivity issues.

The administration section will run you through the setup of the following scale functions:

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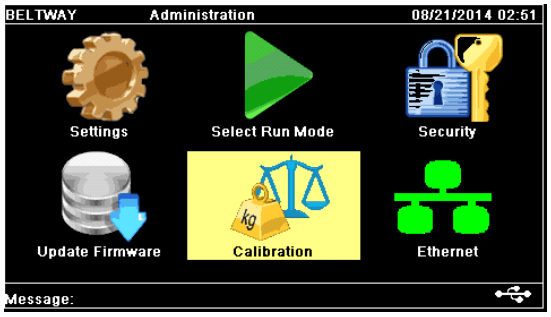


1. Settings
2. Selection Run Mode
3. Security
4. Update Firmware
5. Calibration
6. Ethernet

Settings

1. Scale Name

This is where you can assign a name to the scale. The scale name appears on printed tickets and USB reports.

2. Plant Name

This is where you can assign a name to the scale. The scale name appears on printed tickets and USB reports.

3. Product Name

This is where you can assign a name to the scale. The scale name appears on printed tickets and USB reports.

4. Current Date

Set the current local date where the scale is located. You can configure the following:

- **Format the Date** (mm/dd/yyyy or dd/mm/yyyy)
- **Enter the Date** (default is mm/dd/yyyy)
- **Day of the Week** (Monday-Sunday)

When editing the date the default format is mm/dd/yyyy. This can be altered afterwards in the format section.

5. Current Time

Set the current local time based on the scale located. You can configure the following:

- **Format the Time** (12hr or 24hr)
- **Enter the Time** (12hr or 24Hr)
- **Select AM or PM** (AM or PM)

6. Auto Zero

The Auto Zero function automatically adjusts the zero calibration value of the scale. It is designed to compensate for small changes in the dead load due to material accumulation, belt tension, or weather conditions. The Auto Zero tolerance can be adjusted from 0 to 1 %. It should be turned off when the belt load is extremely low.

7. Zero Rate Limit

The Zero Rate Limit is a function which will prevent weight accumulation on the scale total if the rate of an empty belt is below a set rate limit. This function is useful if you have a conveyor that shakes or vibrates excessively due to mechanical issues causing an unstable rate on the scale. The load sensed and rate displayed by the scale would possibly fluctuate positive and negative due to the mechanical issues of the conveyor. You would then set the zero rate limit to the rate that the scale is showing when running with an empty belt. This positive rate displayed with a belt running empty would be ignored and not accumulated or add to the total.

8. Negative Rate Error

The negative rate error is a way of logging messages when the rate being displayed exceeds the programmed negative rate value for a programmed period of time. This error can also be programmed to an alarm output on the I/O Board.

9. Backup / Restore

a. Backup

The Backup function will “backup” the following files so they can be restored at a later time.

- **Settings Parameters**
- **Totals**
- **Calibration**

Please make sure you have a flash drive installed into the USB’s top port on the inside of the door before starting this procedure.

10. Test Mode

Test Mode allows the scale to simulate production when the belt can't be run.
Both speed and load test modes must be enabled to simulate tons per hour and weight accumulation.

Run Mode

Select Run Mode settings allow you to determine the mode in which you wish to use the scale.

1. **Weight / Rate**
2. **Load Out**
3. **Blending**
4. **Rate Control**
5. **Weight**

Security

Selecting the Security menu allows you to lock out unauthorized access to certain settings and functions. You can also setup an Administrator password which needs to be entered before these functions can be unlocked and performed.

You can Lock, Unlock the use of functions and setup a password for the following:

1. **Setup Wizard** – Lock / Unlock feature use.
2. **Calibration** – Lock / Unlock feature use.
3. **Zero Calibration** – Lock / Unlock feature use.
4. **Setup Devices** – Lock / Unlock feature use.
5. **Admin** – Lock / Unlock feature use. Lock turns the Admin Code ON.
6. **Clear Weight** – Lock / Unlock feature use.
7. **Passwords** – Define a new unique Admin Password.

- **ADMIN**

  This turns on the need for an Admin Password when unlocking features for use.

Please note that even though the features are tagged and listed as locked they will **not** be locked unless ADMIN is locked.

- **PASSWORD**

  Use the Password section to define a new ADMIN password to be used to unlock the and Lock the various sections of setup and calibration listed above.
  The default password is "password". Call Belt-Way for assistance if you can't access the password protected functions.

Update Firmware

The Update Firmware menu walks you through 2 items:

1. Identifying the current firmware installed on the integrator
2. Procedure of installing new firmware onto the integrator.

During a firmware update the existing scale settings and parameters will be automatically saved and restored after the firmware update is complete so you will not have to setup and calibrate the scale again.

The firmware may not be backward compatible depending on the changes made from one version to the next.

Contact Belt-way Scales to confirm compatibility between firmware versions.

Calibration

Selecting Calibration will allow you to view or edit the current values stored for the following calibrations

1. **Trim Factor**

The Trim Factor is a simple multiplier that controls the weight calculation of the scale. The default value is 1.000. When all scale parameters are correct, the scale should be accurate with a trim number very close to 1.000. Increasing the trim number makes the scale weigh heavier and decreasing the trim number makes the scale weigh lighter.

2. **Zero Number**

The Zero Number is the actual weight (in pounds or kilograms) measured by the scale when the conveyor belt is completely empty. A properly calibrated zero number will ensure there is very little weight addition or subtraction when the belt is running empty.

3. **Belt Length**

The Belt Length represents the length of the conveyor and is used for the zero and span calibration processes. The belt length establishes the length of the belt for one revolution; therefore the scale knows how long the calibration procedures need to take for single and multiple revolutions. It is recommended that this measurement be logged via a Belt Length calibration. If you know the exact belt length then this value can be entered here. This number is length based and is represented in the units from when the scale was setup, either in Feet (ft.) or Meters (m).

Use care when adjusting these calibration parameters!
Improper values will cause the scale to be inaccurate!

Ethernet

The Ethernet menu is where you will setup the scale for network connectivity with other Ethernet devices including the Belt-Way remote display and Plant-Connect modems. The native protocols are Modbus TCP Server and FTP Server. Contact Belt-Way for an extensive list of data available through Modbus and further instructions for using the FTP server.

The green indicator  will appear at the bottom of the screen when an Ethernet connection is made to the integrator. The settings available for configuration are as follows:

1. DHCP Client

Enable DHCP – The server will assign an IP address to the scale. This IP address could change periodically as it is assigned by the DHCP server. The scale **MUST** be connected directly to a DHCP router for this setting to function properly.

Disable DHCP – You must assign a static IP address to the scale. This IP address would be the same and will not change unless manually edited here.

2. IP Address

This is where you would enter the IP Address for the scale. If you selected “Disable DHCP” above in (1) then this would be your static IP address that would be used.

3. Subnet Mask

This is where you would enter the Subnet Mask for the local network that the scale is connected to. If you selected “Disable DHCP” above in (1) then this Subnet Mask would be used for the local network.

4. Gateway

This is where you would enter your Gateway IP Address for the local network that the scale is connected to. If you selected “Disable DHCP” above in (1) then this Gateway IP Address would be used for the local network.

5. Modbus Slave ID

The Modbus Slave ID will normally remain at the default of 255 unless it must be changed to communicate with a networked PLC or software application.

Troubleshooting

There are various reasons a scale will not function properly. All scale components (speed sensor, load cells, and angle sensor) must be in working order. The first step to diagnose a scale issue is check the status of the sensors to make sure they sending correct signals to the integrator. Perform these steps with the belt stopped and empty

1. - Check Voltages under the Reports & Diag menu.

Navigation Tip	
	Press the **MENU** key.
	Navigate to the REPORTS AND DIAGNOSTICS icon and press **ENTER** key
	Navigate to the DIAGNOSTICS icon and press **ENTER** key
	Navigate to the VOLTAGES icon. Then press **ENTER** key.
	The Load cell supply voltage should be close to 9 volts. **The +5V should be close to 5 volts.** **Contact Belt-Way for technical assistance if either value is incorrect.**

2. - Check Sensor readings under the Reports & Diag menu.

	Navigate to the REPORTS AND DIAGNOSTICS icon and press **ENTER** key
	Navigate to the DIAGNOSTICS icon and press **ENTER** key
	Navigate to the SENSORS icon. Then press **ENTER** key.
	Each connected load cell should show a small number (between 2 and 5). If any load cell varies greatly from the other load cells or shows a negative mV reading there may be a problem. Proceed to the manual check steps or contact Belt-Way for assistance. **Scroll to the bottom of the screen to see speed sensor and angle sensor information.**

3. - Manually Check Supply Voltage, Millivolt, and Ohm Values

1. **Supply/Excitation Voltage Check**
   - **Leave the load cells plugged in with the integrator powered on .**
   - Measure the Voltage between the **RED** and **BLACK** load cell wires
   - The reading should be approximately 9 VDC

2. **Milli-Volt Check**
   - Set your **meter dial & leads** to measure **Millivolts mV.**
   - Measure between the **White (-) and Green (+).**
   - The **Positive** lead **MUST** touch the **White** wire and Negative lead **MUST** touch the **Green** wire.
   - The reading should be a small positive number. Between 1 and 7 mV is common.
   - A negative or zero reading shows the load cell is not function properly.
   - Inspect the mechanical installation of the load cell assembly to ensure there is no material build-up or binding around the load cell.
   - Have a second person pull down on the load cells to see if the mV reading increases.
   - If no mechanical problems are found the load cell may need to be replaced.

3. **Ohms Check**

   - **Unplug the load cell connector from the terminal strip.**
   - Set your **meter dial & leads** to measure OHMS (Ω) **.**
   - **Measure between** BLACK(-) & RED (+).
     The reading should be approximately 420 Ohms.
   - **Measure between** White(-) & Green(+).
     The reading should be approximately 350 Ohms.

     If these measurements are good the load cells pass the resistance test.
     This means that there is no problem with the cable or internal load cell circuit.

For Further assistance please call the office 815 625-5573

Maintenance

1. General Scale Maintenance Check list

Maintenance Item	Task	Daily	Weekly	Monthly	As Needed
Weighbridge					
Approach, Scale & Retreat Idlers	Check rollers for Flat spots, Collapsed bearings and make sure the rollers Turn freely. Replace as needed	X			
Scale Idler	Make sure there is No material built up material jammed between the Idler and conveyor frame. Make sure the Scale idler is not bent or twisted. Replace as needed	X			
Scale Frame	Make sure there is No material jammed in load cell assemblies and that the scale is square on pipes and free of any binding on the pipes.	X			
String Line	Make sure nothing mechanical has been altered. Especially when rollers are replaced. The idlers need to be the same type & angle. They also need to be square and equally spaced. +/- 1/16th Inch			X	
Return Rollers	Make sure they are in good condition and in position. They must also be clean & free from any material build up.	X			
Scale Speed Wheel	Check for wear & flat spots and that the wheel turns freely. Make sure wheel remains in contact with belt at all times when running, Compare measured speed to Actual and adjust if necessary.	X	X	X	
Belt Condition	Make sure belt is in good condition and repair or replace as needed.			X	
Belt Tension	Make sure belt tension is NOT too tight or Loose.	X		X	
Belt Tracking	Make sure belt tracking is good, especially across the weighbridge area.	X			
Check Scale Parameters & Actual Readings	Make sure the scale parameters are still matching to the actual measurements.			X	
Zero Calibration	Conduct a ZERO Calibration	X			
Span Calibration	Conduct a Span Calibration			X	X
Material Test	Conduct a Material Calibration test and Adjust.			X	X

*** If any items were addressed it is always good to conduct a ZERO & TRIM (SPAN) calibration**

2. Routine Calibration and Verification Procudures

Routine calibrations consist of conducting:

- ZERO Calibration 2-3 times / day or when needed based on stability of empty belt weight over time
- Span Calibration with test weights (when needed)
- Material tests (when needed)

3. Physical & Mathematical Verification using Tests Weights

A. Pre checks / measurements

- Measure ACTUAL belt speed. (be very accurate) **meters/minute ____ m/min (ft/m)**
- Measure ACTUAL Weigh Span (be very accurate) **meters or feet _____m or Ft**
- Measure ACTUAL Test weight on a LAB scale (be very accurate)**kg or pounds ____Kg or Lbs.**

How to Calculate Actual Belt Speed without a Tachometer Using a Stop Watch

A. Mark the belt at 1 point
B. On the conveyor mark 2 reference points A & B (20 ft apart) **20** ft
C. Start and run the belt empty
D. Time in seconds how long it takes the mark from point A to B. **D** = _____**seconds**
E. Time in seconds how long it takes the mark on the belt to do 1 rev. **E** = _____**seconds**
F. Used if you cannot see the belt from where the integrator is mounted for "set Zero"

This formula is the same for Feet (ft). Replace Meters with Ft. measurement.

Calculate belt speed by using the following formula

$$\text{Belt Speed (ft/min)} = \frac{\text{20 feet}}{\text{Time from A to B in seconds}} \times \text{60 Seconds}$$

B. Verify the scale Span & Test weight setting reads the same as Actual Measured in #1

- Make sure the idler distance matches **ACTUAL** measured span.
- Make sure the Test weight matches **ACTUAL** measured Test Weight.
- Correct if needed.
- Press weight rate.

C. Verify the scale belt speed reads the same as Actual Measured belt speed in #1

- Make sure Belt speed is the same as Measured belt speed in #1
  If belt speed is not the same then the pulley diameter may be manually adjusted to make the speed match.

D. Calculate the TPH using ACTUAL MEASUREMENTS from conveyor

- **USE MEASURED VALUES FROM STEP #1**
- USE the following formula to calculate what rate you should be running after calibration.

METRIC

$$\frac{\textbf{Test Weight} \text{ in (kilograms)}}{(\textbf{½ X Weigh Span}) \text{ in (meters)}} \times \frac{60}{1000} \quad \textbf{Belt Speed} \text{ (meters per Minute)}$$

ENGLISH

$$\frac{\textbf{Test Weight} \text{ in (pounds)}}{(\textbf{½ X Weigh Span}) \text{ in (feet)}} \times \frac{60}{2000} \quad \textbf{Belt Speed} \text{ (feet per minute)}$$

Example:

- **Test weight = 100lb**
- **Belt speed = 300 fpm**
- **Idler spacing is**  **4 ft.** **Scale**  **4 ft.**  **total idler distance = 8 ft.**

((100 lbs / 4 ft) X 350 fpm X 60 minutes) / 2000 = 225 TPH CALCULATED Rate

E. Perform a ZERO Calibration

- Make sure the belt is **EMPTY and has NO Test weights or bar** on the scale.
- Conduct a **ZERO** calibration per the service manual.

F. Perform a Calibration with Test Weights

- Install weights with bar on scale and run belt empty with no material.
- Conduct a Test Weight calibration per the service manual.
- 

G. Compare TPH after test weight calibration to #4 CALCULATED RATE TPH.

- If the rate on the scale matches the **CALCULATED RATE AND THE TRIM NUMBER IS CLOSE TO 1.000** then your scale is calibrated. This is a mathematical verification and should get bet scale calibration +/- 2%. A material test with a certified scale is the best method of scale verification.
  If it does not match then a trim factor adjustment is necessary. This is common as this will compensate in conveyor issues, slippage and conveyor angle.

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 here under 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.

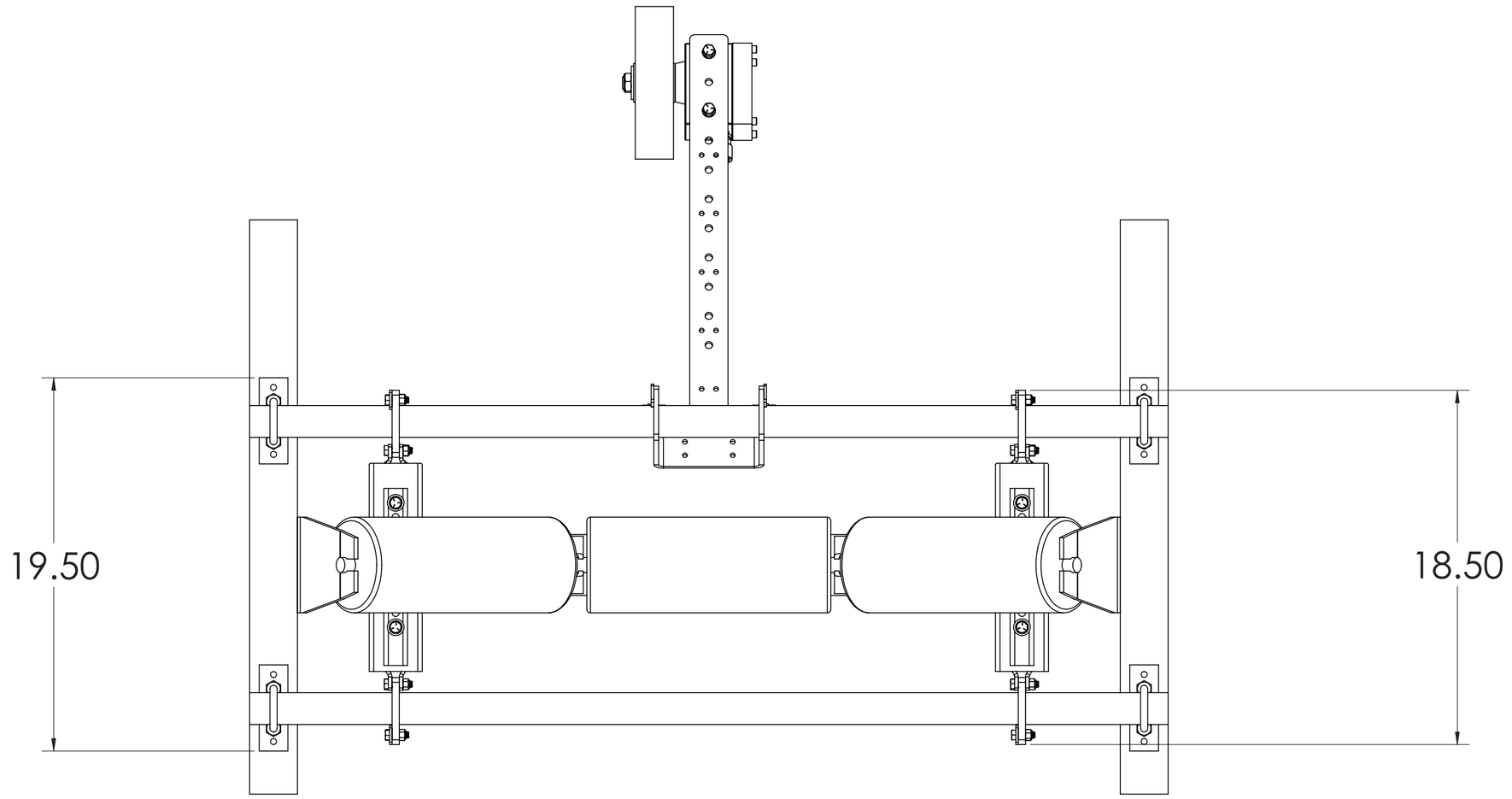
This warranty gives you specific legal rights. You may also have other rights which vary from state to state. For products purchased outside the United States, see your distributor for warranty.

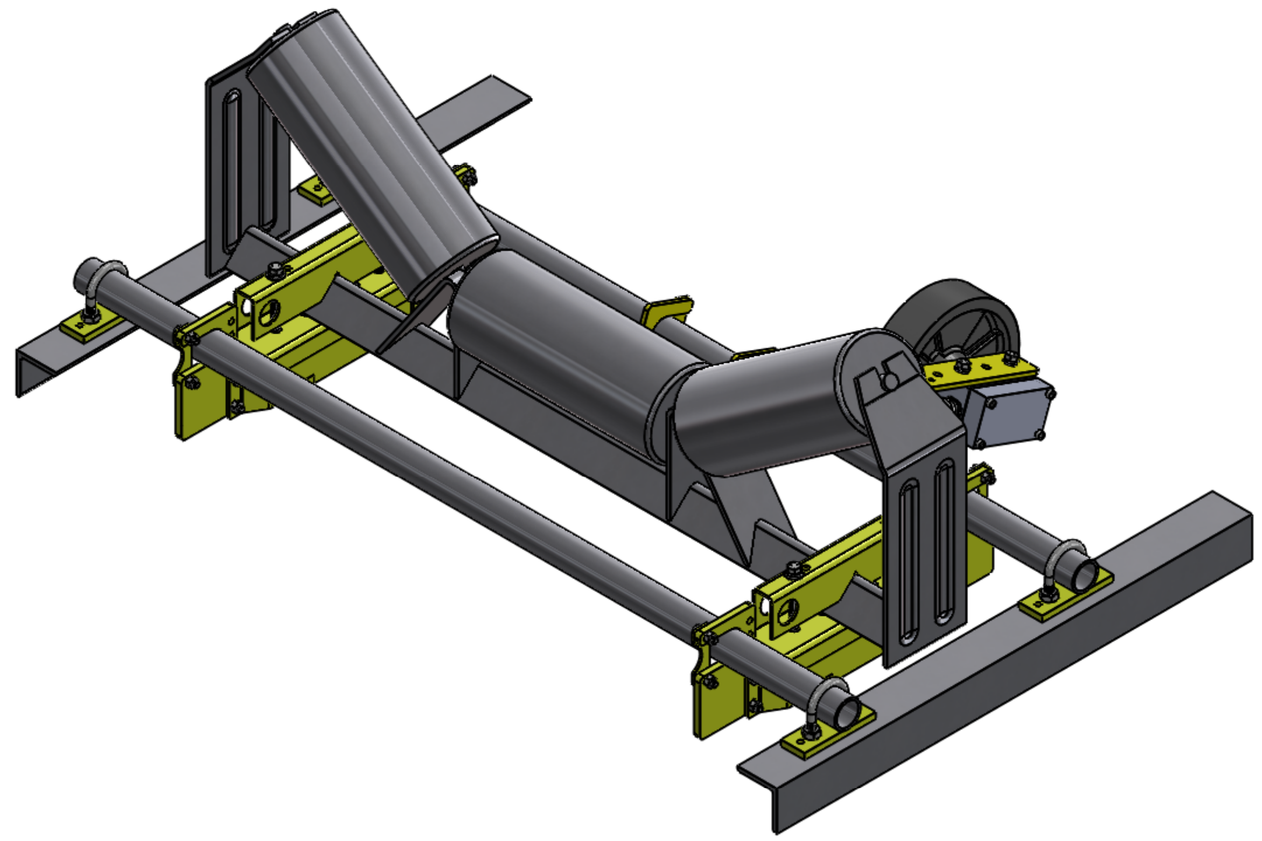
Limitations and Disclaimer

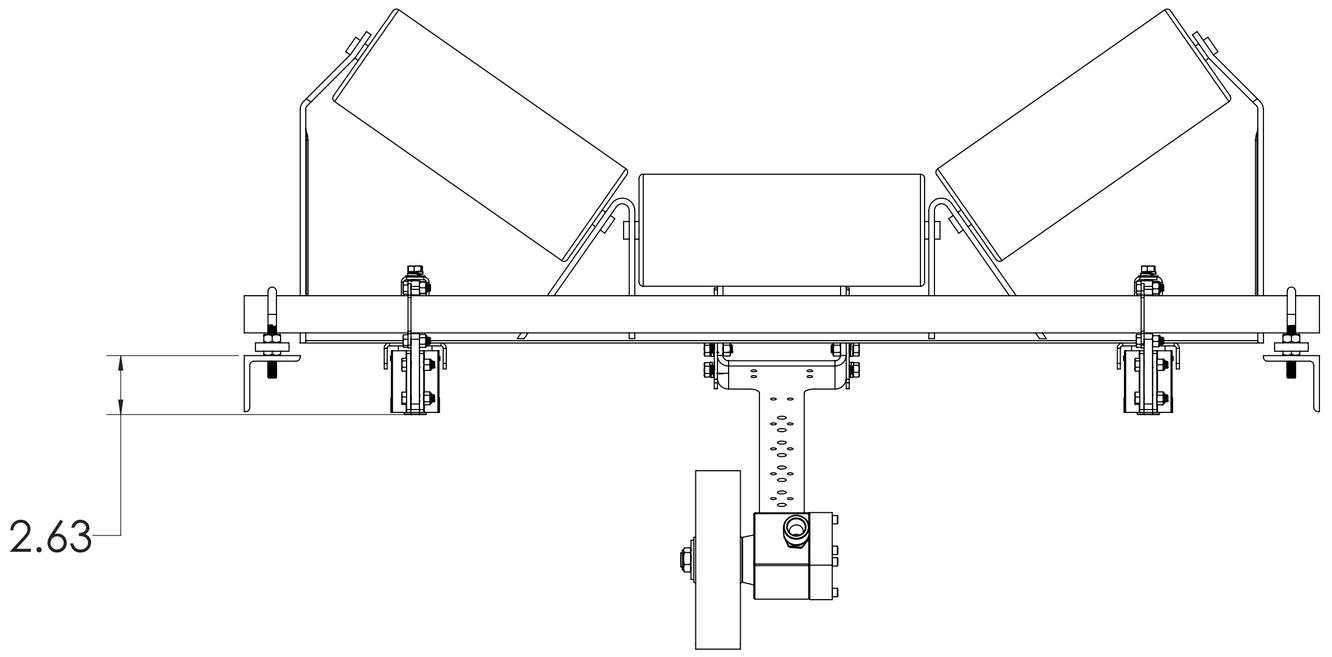
BELT-WAY SCALES, INC. MAKES NO REPRESENTATION OR WARRANTY OF ANY OTHER KIND, EXPRESS OR IMPLIED, WITH RESPECT TO THE PRODUCTS, WHETHER AS TO MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER MATTER, ANY SUCH WARRANTIES BEING HEREBY EXPRESSLY EXCLUDED. BELT-WAY SCALES, INC. DOES NOT AUTHORIZE ANYONE TO MAKE ANY OTHER WARRANTY EXCEPT AS STATED HEREIN.

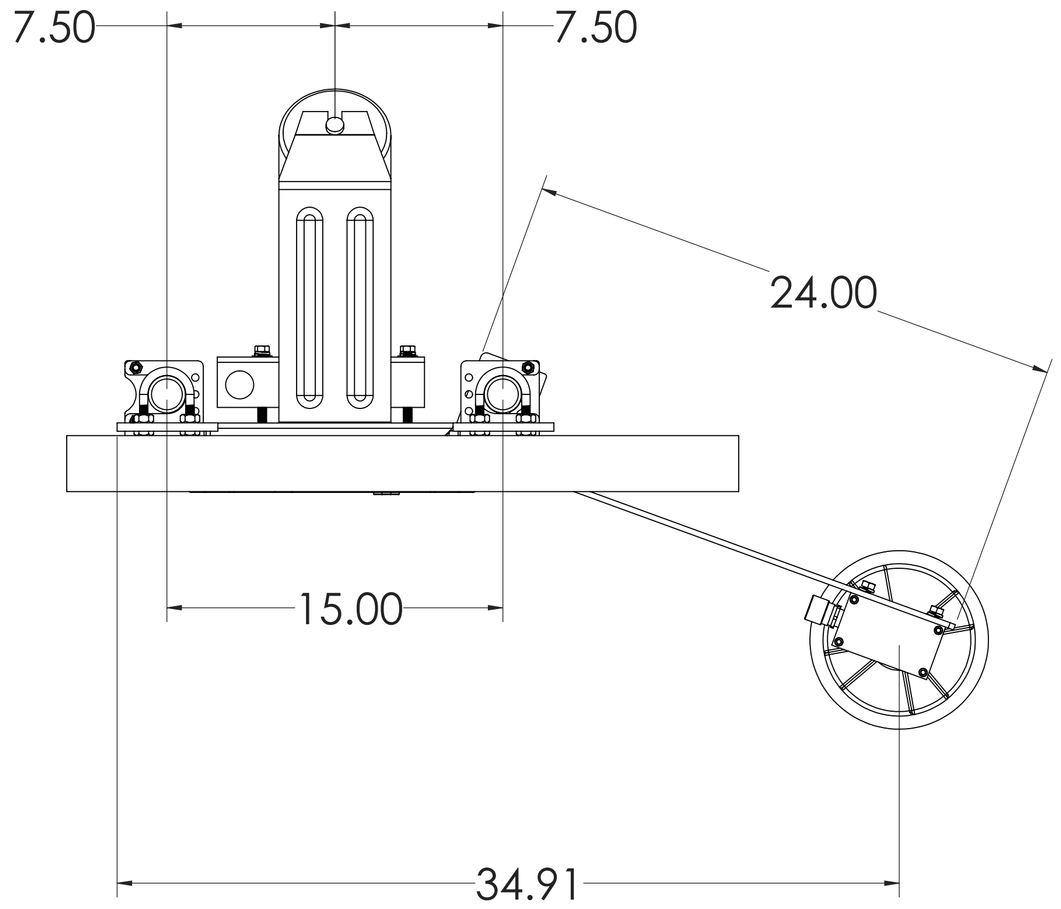
Exclusion of Consequential Damages

BELT-WAY SCALES, INC. SHALL IN NO EVENT BE RESPONSIBLE FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES CAUSED BY ANY PRODUCT SOLD HEREUNDER, WHETHER ON THEORIES OF BREACH OF EXPRESS OR IMPLIED WARRANTIES UNDER THE UNIFORM COMMERCIAL CODE, STRICT LIABILITY, NEGLIGENCE OR ANY OTHER LEGAL THEORY REGARDLESS OF WHETHER THE LOSS RESULTED FROM ANY GENERAL OR PARTICULAR REQUIREMENT OR NEED WHICH BELT-WAY SCALES, INC. KNEW ABOUT OR HAD REASON TO KNOW ABOUT AT THE TIME OF THE SALE OF SUCH PRODUCTS.







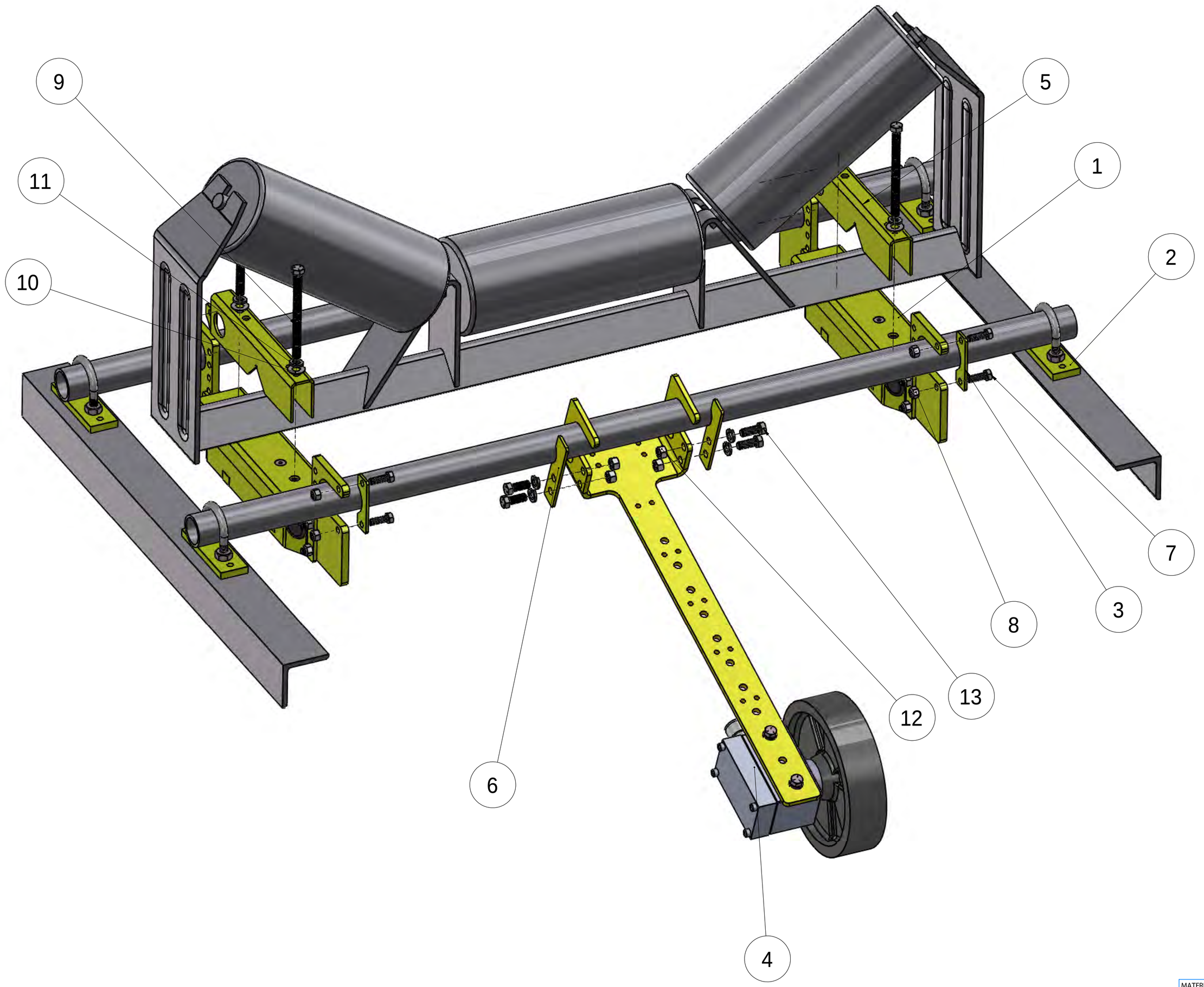


MATERIAL:		UNLESS OTHERWISE SPECIFIED BREAK ALL SHARP CORNERS TOLERANCES: 1 PLACE DECIMAL ± .050" [1.27mm] 2 PLACE DECIMAL ± .010" [0.25mm] 3 PLACE DECIMAL ± .005" [0.12mm] ANGLULAR DIMS ± 0° 30' 125 INDICATES 500 MAXIMUM FINISH REQ'D ON SURFACES WITHOUT A SYMBOL DRILLED AND COUNTERBORED HOLE DIAMETERS: -.005" / +.015" [-0.13mm / +0.4mm]	BELT–WAY SCALES IN MOTION WEIGHING SOLUTIONS 1 BELTWAY RD. ROCK FALLS, IL 61071
FINISH:			CUSTOMER
QUANTITY:	HEAT TREAT:		SIZE D / DATE 6/18/15 / PART NUMBER
MANUFACTURER:		DRAWN BY	DESCRIPTION: SCALE MOUNTED ON CONVEYOR / REV A
JOB NUMBER:		CHECKED BY	SCALE 1:5 / SHEET 1 OF 2

SolidWorks

FILE LOCATION: B:_Published\Belt Scale\Scale on Conveyor\Solidworks\

Friday, June 19, 2015



ITEM NO.		DESCRIPTION	QTY.
1		Load Cell Assembly	2
2		Leveling Plate	4
3		Universal Strap	4
4		Speed Sensor With Arm	1
5		V-Block	2
6		Speed Sensor Hanger Strap	2
7		Steel Cap Screw 5/16"-18 x 1"	8
8		Nylon Lock Nut 5/16"-18	8
9		Steel Cap Screw 3/8"-16 x 5"	4
10		Flat Washer 3/8 316SS	4
11		Lock Washer 3/8 316SS	8
12		Hex Nut 3/8"-16	4
13		Steel Cap Screw 3/8"-16 x 1"	4

MATERIAL:

FINISH:

QUANTITY: | HEAT TREAT:

MANUFACTURER:

JOB NUMBER:

SolidWorks

UNLESS OTHERWISE SPECIFIED

BREAK ALL SHARP CORNERS

TOLERANCES:
1 PLACE DECIMAL ± .050" [1.27mm]
2 PLACE DECIMAL ± .010" [0.25mm]
3 PLACE DECIMAL ± .005" [0.12mm]
ANGULAR DIMS ± 0° 30'

125 INDICATES 500 MAXIMUM FINISH REQ'D ON SURFACES WITHOUT A SYMBOL

DRILLED AND COUNTERBORED HOLE DIAMETERS: -.005" / +.015" [-0.13mm / +0.4mm]

DRAWN BY

CHECKED BY

BELT-WAY SCALES

IN MOTION WEIGHING SOLUTIONS
1 BELTWAY RD. ROCK FALLS, IL 61071

CUSTOMER

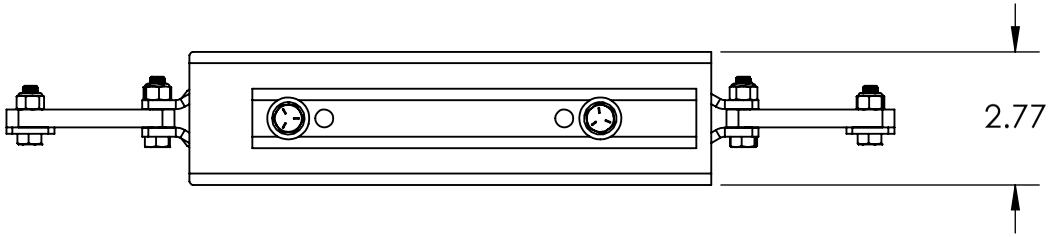
SIZE D | DATE 6/18/15 | PART NUMBER

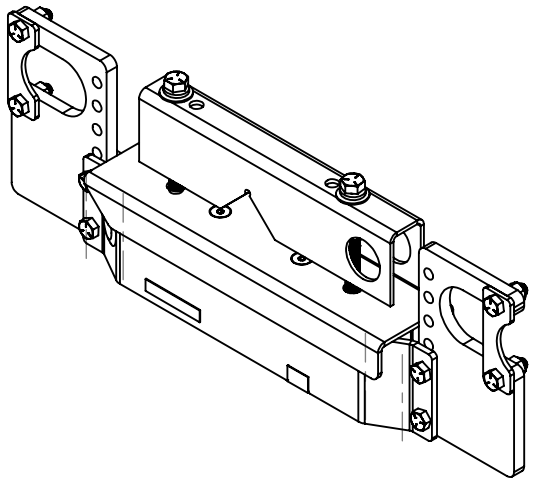
DESCRIPTION: SCALE MOUNTED ON CONVEYOR | REV A

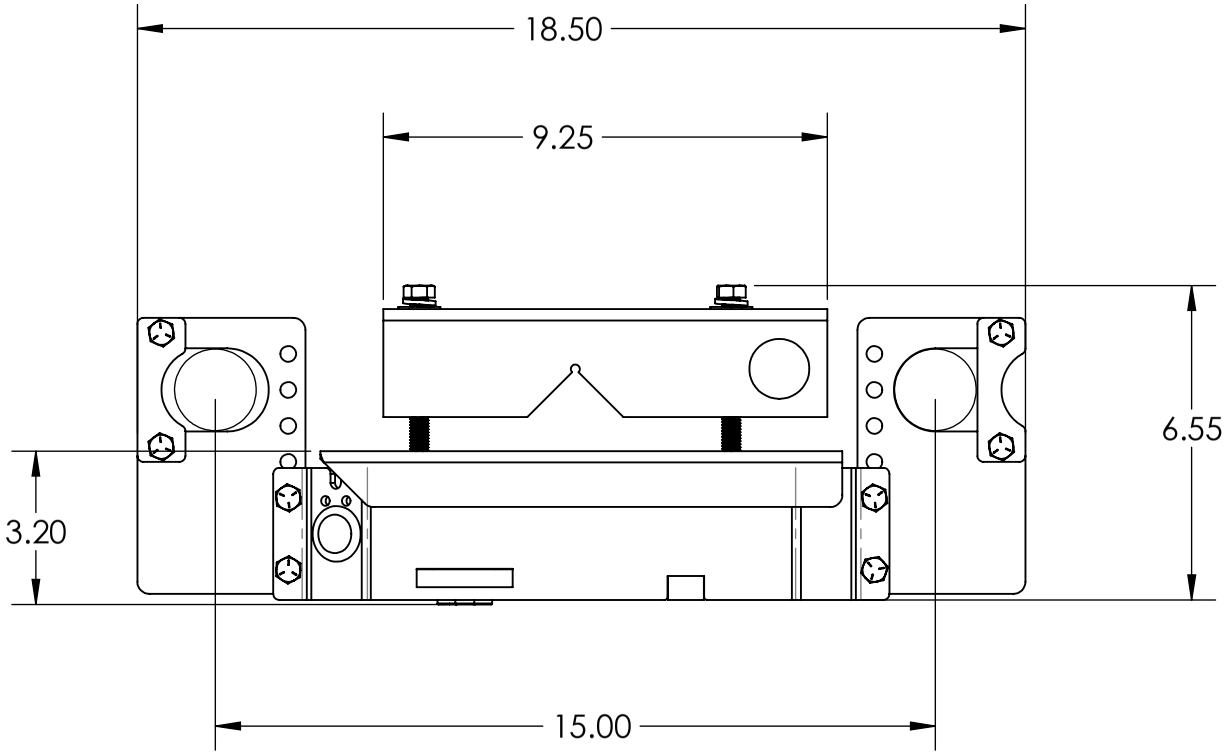
SCALE 1:3 | SHEET 2 OF 2

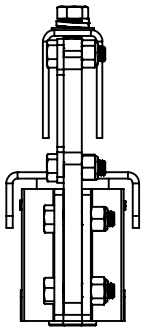
FILE LOCATION: B:_Published\Belt Scale\Scale on Conveyor\Solidworks\

Rody June 18, 2015









LOAD CELL SHOULD BE MOUNTED ON TWO PIPES 15 INCHES APART

NOTES:
1) UNITS = INCHES

BELT-WAY SCALES

IN MOTION WEIGHING SOLUTIONS

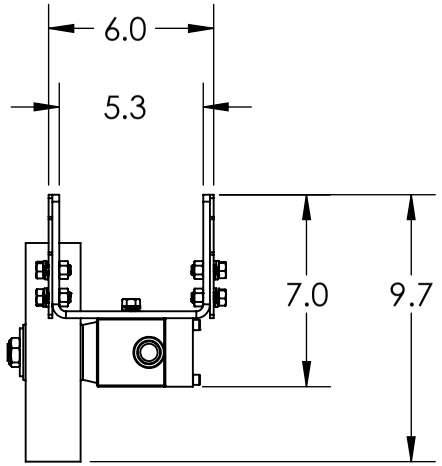
1 BELTWAY RD. ROCK FALLS, IL 61071

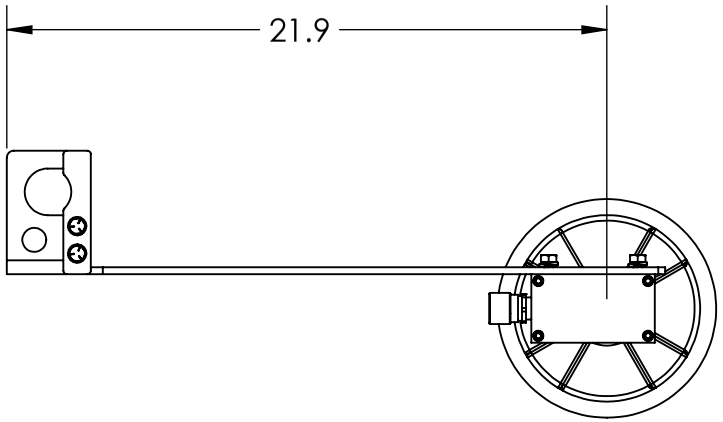
DESCRIPTION

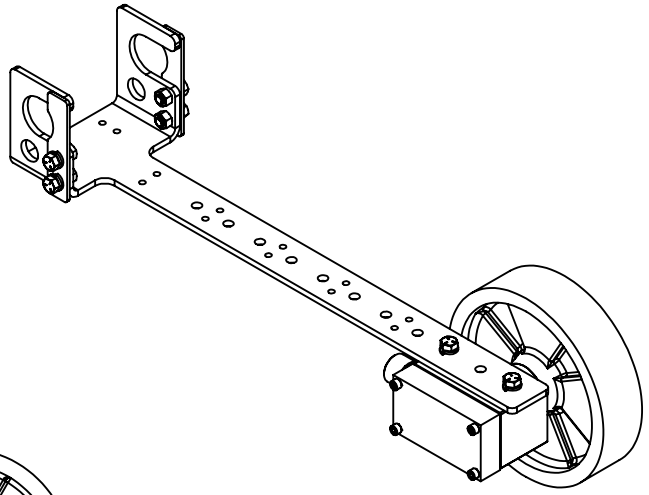
LOAD CELL ASSEMBLY

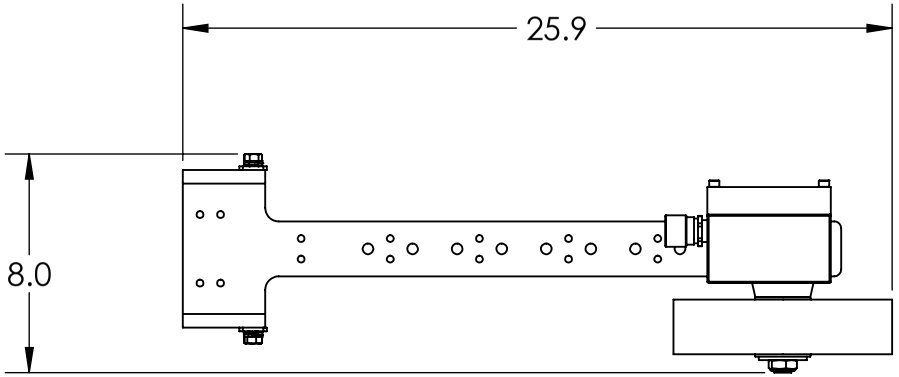
PART NO.

SHEET 1 OF 1









NOTES:
1) UNITS = INCHES

BELT-WAY SCALES

IN MOTION WEIGHING SOLUTIONS

1 BELTWAY RD. ROCK FALLS, IL 61071

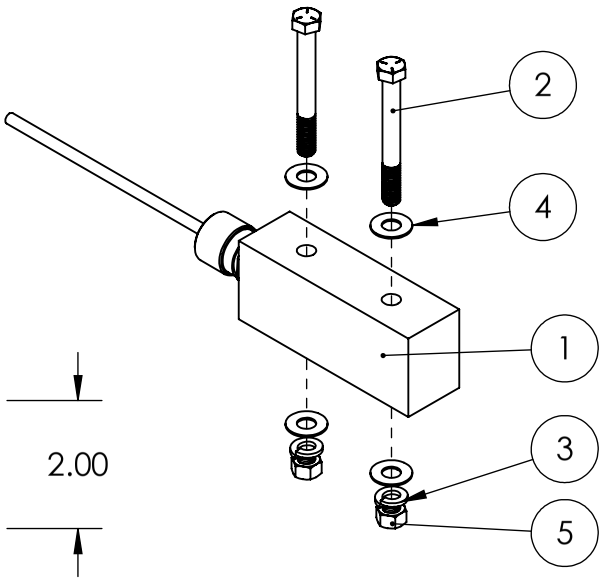
DESCRIPTION

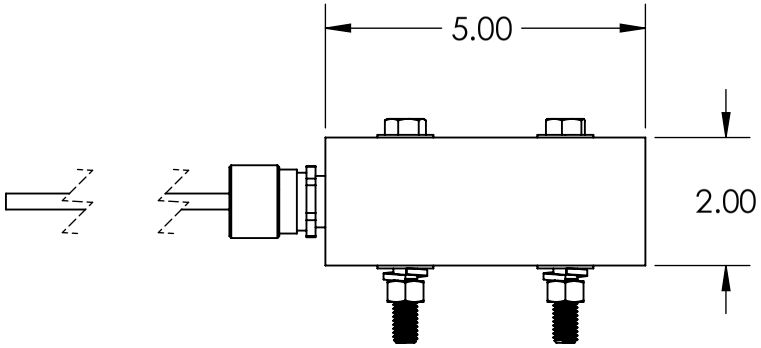
Model 9 Speed Sensor - With Arm

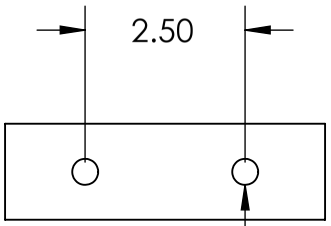
PART NO. ASM0336

SHEET 1 OF 2

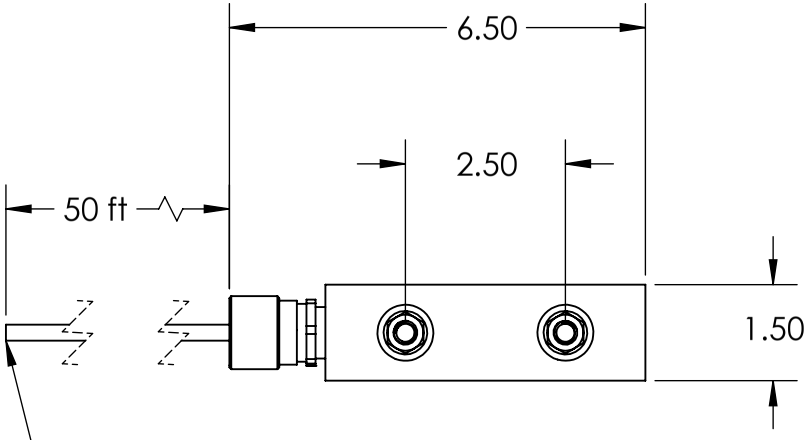
ITEM NO.	DESCRIPTION	QTY.
1	Angle Sensor Assembly	1
2	Hex Head Cap Bolt 3/8-16 x 3-1/4	2
3	Lock Washer 3/8"	2
4	Flat Washer 3/8"	4
5	Hex Nut 3/8-16	2







2X ∅ .406 THRU ALL
13/32" DRILL



MOUNTING HOLE PATTERN

NOTES:
1) UNITS = INCHES
2) ANGLE SENSOR ENCLOSURE IS ANODIZED CLEAR

BELT-WAY SCALES

IN MOTION WEIGHING SOLUTIONS

1 BELTWAY RD. ROCK FALLS, IL 61071

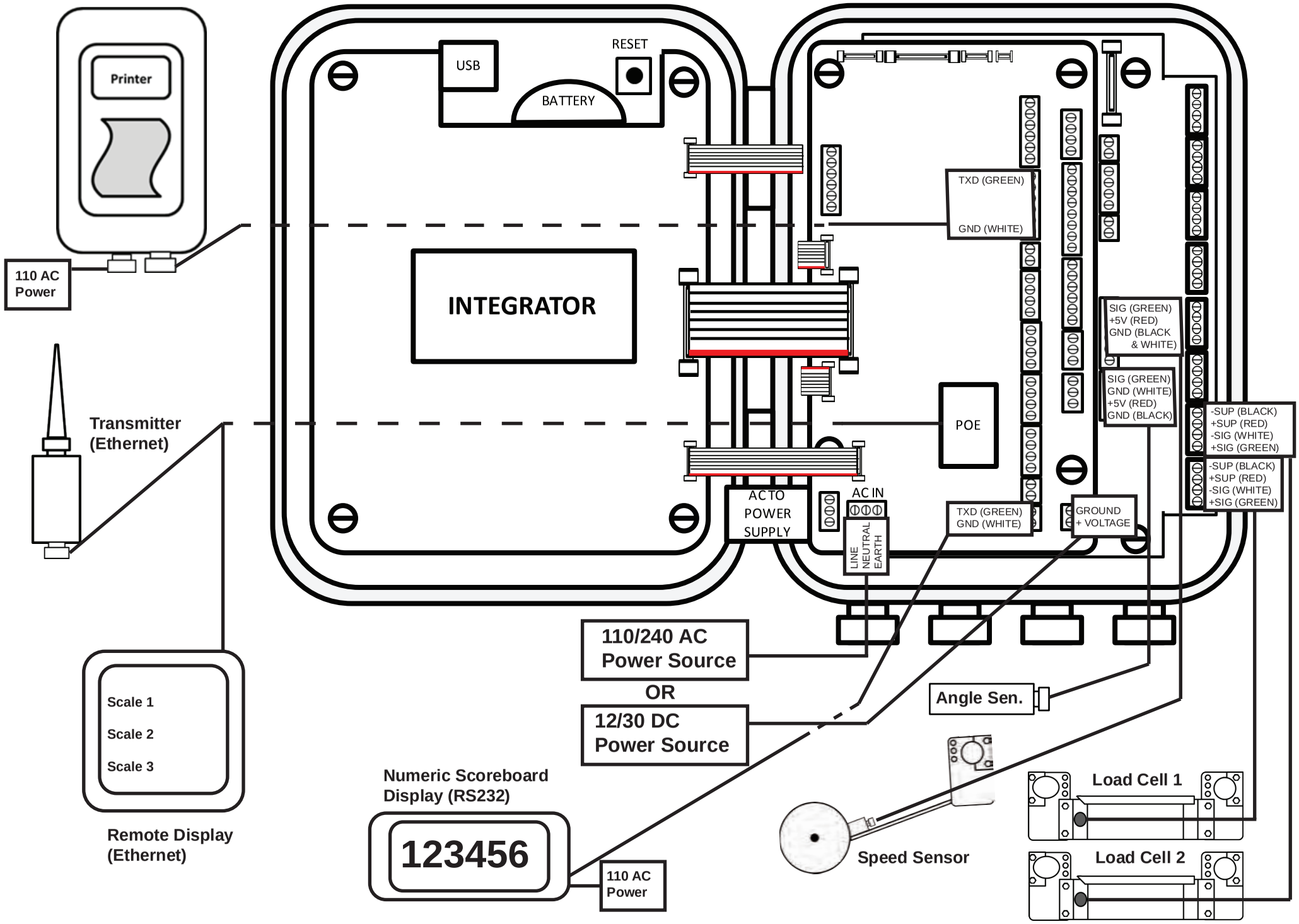
DESCRIPTION

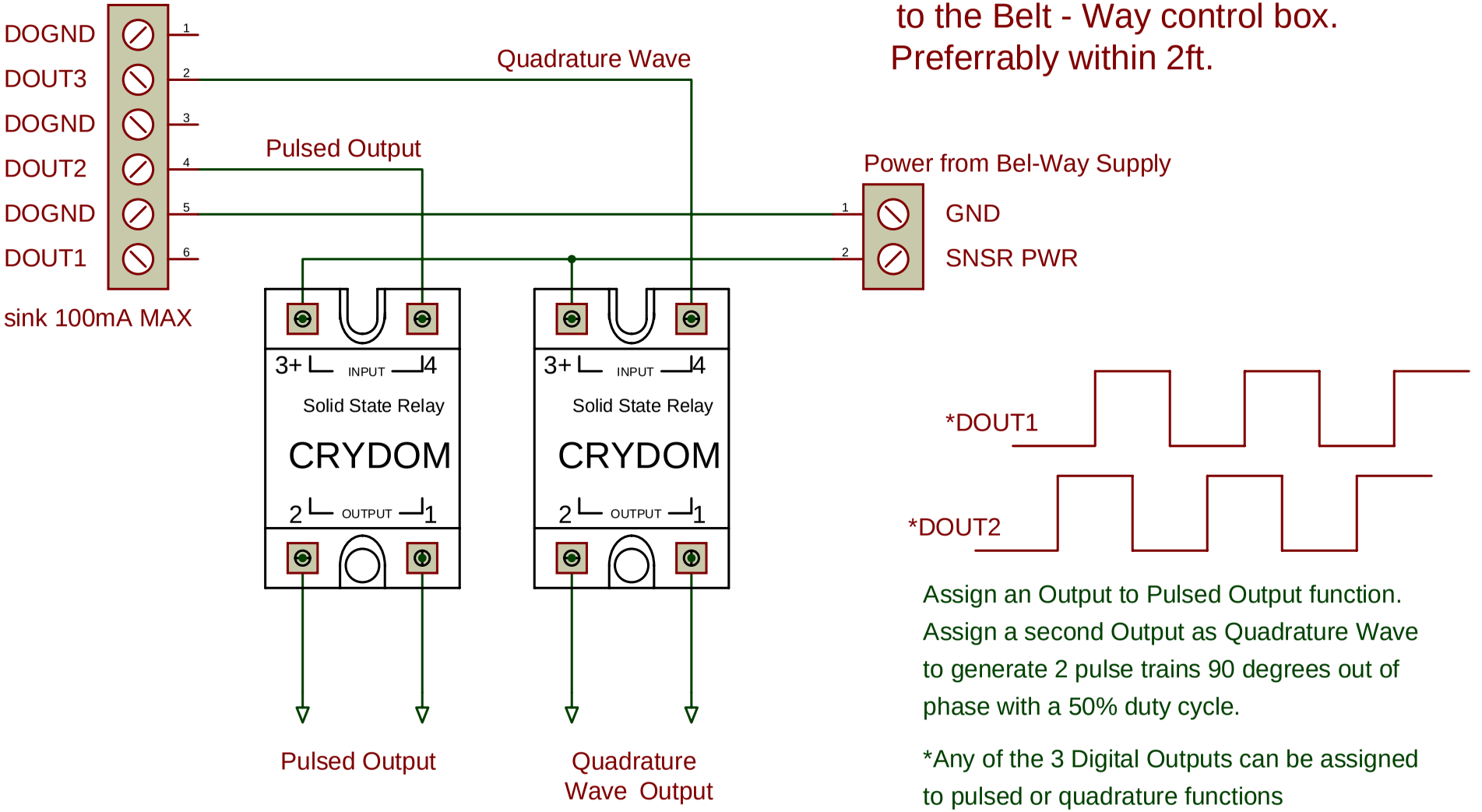
ANGLE SENSOR - MODEL 3

PART NO. ASM0338

SHEET 1 OF 1

Belt Scale Components and Accessories





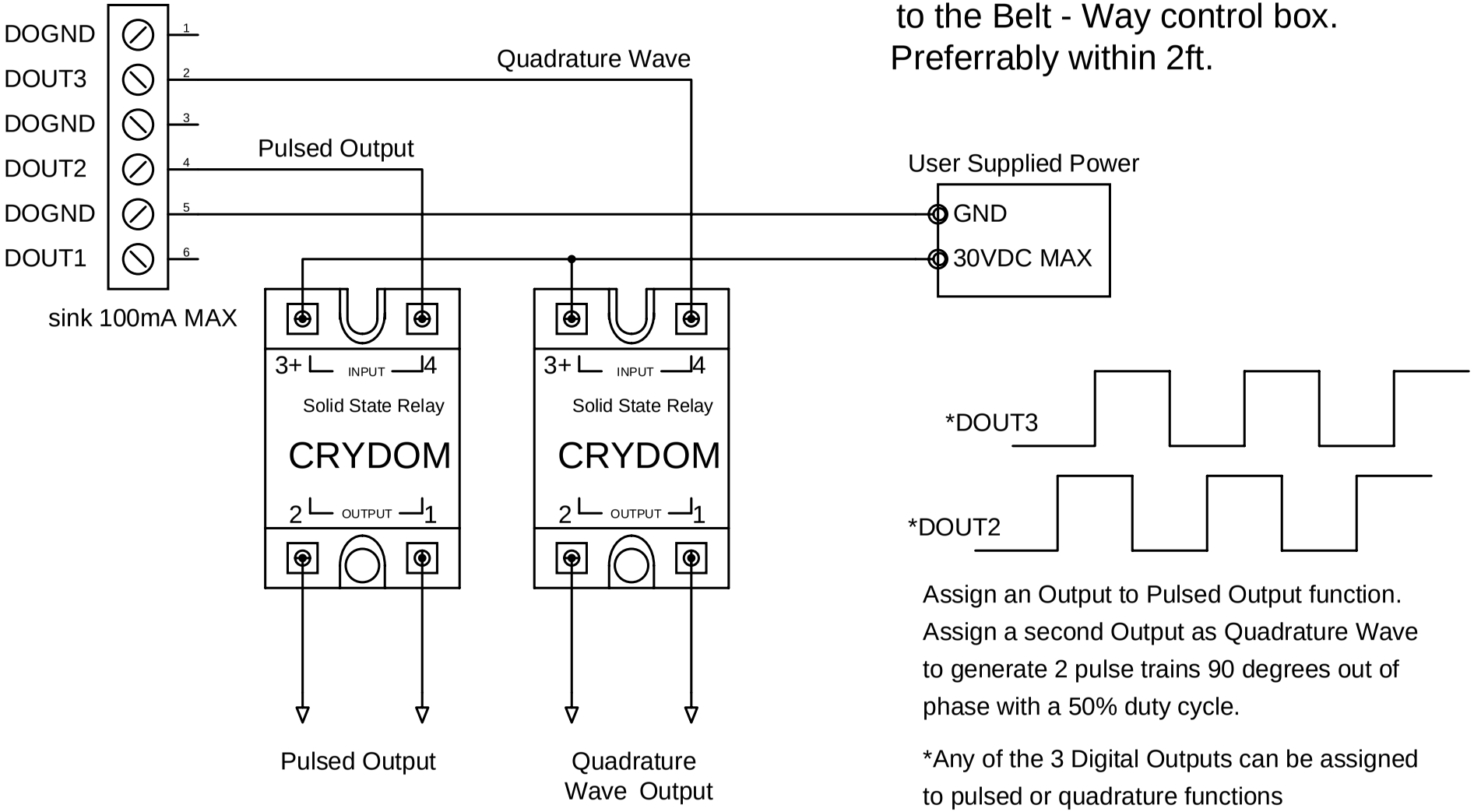
Keep all relays as close as possible to the Belt - Way control box. Preferrably within 2ft.

Assign an Output to Pulsed Output function. Assign a second Output as Quadrature Wave to generate 2 pulse trains 90 degrees out of phase with a 50% duty cycle.

*Any of the 3 Digital Outputs can be assigned to pulsed or quadrature functions

DATE: 02/25/15 PAGE: 1/1	TITLE: BW Powered SSR - Pulse Out REV1.2 BY: TjM

Keep all relays as close as possible to the Belt - Way control box. Preferrably within 2ft.



Assign an Output to Pulsed Output function. Assign a second Output as Quadrature Wave to generate 2 pulse trains 90 degrees out of phase with a 50% duty cycle.

*Any of the 3 Digital Outputs can be assigned to pulsed or quadrature functions

DATE: 02/25/15 PAGE: 1/1	TITLE: User Powered SSR - Pulse Out REV1.2 BY: TjM