LT350-BELT SCALE

Quick Reference Guide

REV 2.12

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LT350 BELT SCALE SYSTEM COMPONENTS

LT350BSI BELT SCALE INTEGRATOR

LT45SS SPEED SENSOR WHEEL

LT45BS WEIGH MODULE

WEIGH IDLER ASSEMBLY

LT350BSI BELT SCALE SPECIFICATION	
LT350BSI	Belt scale weight integrator and belt speed input
PLC Output Options	Programmable 4-20mA and Totalizer Pulse Output
Belt Scale Functions	Material Rate, Belt Speed (fixed or variable), Totalizer and statistical data logging plus a batch set point controller
Accuracy	± 0.5 to 2% over 4 to 1 weigh idler span, e.g. 2 weigh idlers = 1.5% accuracy
Belt Width	Universal
Belt Speed	Dynamic speed up to 50 feet per second or static constant belt speed parameter
Sampling Rate	1-500Hz, software selectable
Span Stability	2.5ppm/ Celsius
Zero Stability	6nV/Celsius
Calibration Method	Calibration through software menu system
Filtering	Programmable response filtering
Firmware Upgrading	In field Firmware upgrading using serial or Ethernet
Unit Conversion	Lb/kg/T/TN
Display	Full Graphics LCD display (White on Blue)
Scale Input ranges	20mV range
Load Cell Excitation	5VDC,8x350,16x700 ohm in total
Serial Ports	1 or 2 full duplex RS232/RS485
Ethernet TCP/IP	Ethernet 10/100 with PoE support – optional
Power	24VDC 300mA nominal
Temperature Range	-10ºC to +40ºC (14ºF to 104ºF)
LT350-BSI-xPSxx	Stainless Steel Panel Mount
LT350-BSI-xNDxx	Aluminum NEMA4 wall mount (internal 110-240AC power supply included)
Operating Class	Class III/IIIL @10 000div

GENERAL CALIBTRATION SETUP REFERENCE

The belt integrator runs automatically at startup. To exit the belt scale run mode press **STOP** repeatedly until prompted to exit to calibration mode – use the **MENU** key to navigate parameters. Once in calibration mode, press F1 to save changes to parameters and **START** to run the belt scale integrator.

DEFAULT FACTORY PASSWORD:

There are close to a hundred parameters that can be set by either typing in the corresponding command number or simply by pressing the **MENU** key and navigating to the parameter of interest using the up/down arrow keys.

Protecting important settings from unauthorized tampering is a valuable feature and as such, most calibration and setup parameters are protected by a password. The password only needs to be entered once and only after the **F1** key was pressed to save settings during the last session. Once the **F1** key was pressed in calibration mode to save the new settings, calibration mode will be exited and to enter calibration mode again, the user needs to enter the password again.

The factory password is [1234]. It is recommended that the user change this password to a unique 4 number combination in order to protect the integrity of the system scale calibration and settings using **COMMAND[98]**.

For most commands the user only needs to enter calibration mode once by providing the password where required.

LEGAL FOR TRADE APPLICATIONS:

Some parameters are protected by a password – which is a government requirement for applications that will use the scale for trading to the public by weight. Such applications require an audit trail history of parameter changes and settings.

NON LEGAL FOR TRADE APPLICATIONS:

Many industrial applications are strictly used for process control such as batching and monitoring weight. These types of implementations do not require legal for trade certification or inspection by government agencies.

IMPORTANT!!!

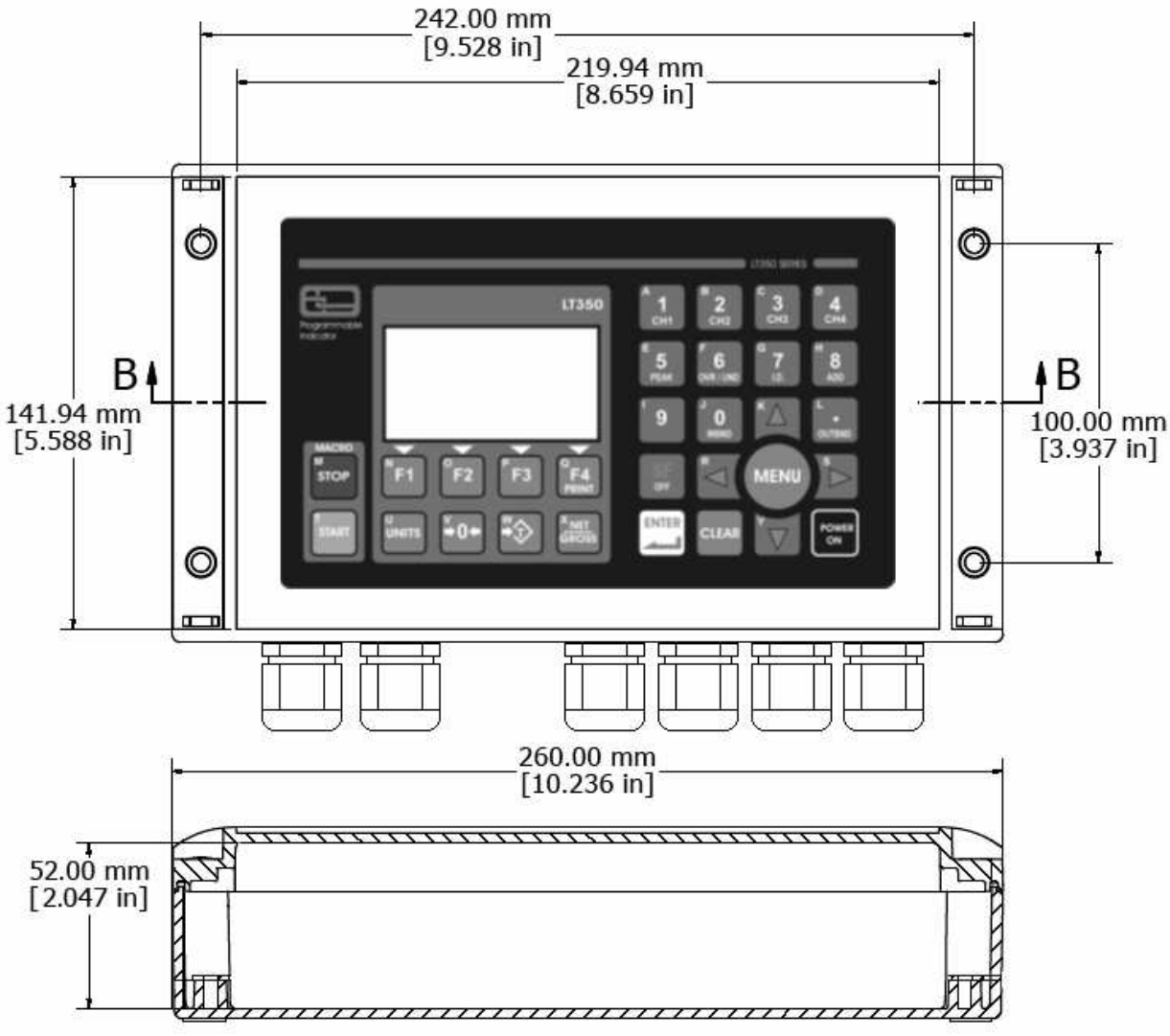
It is important to note that no settings are saved in calibration mode until the user presses the F1 key

Scale Handling

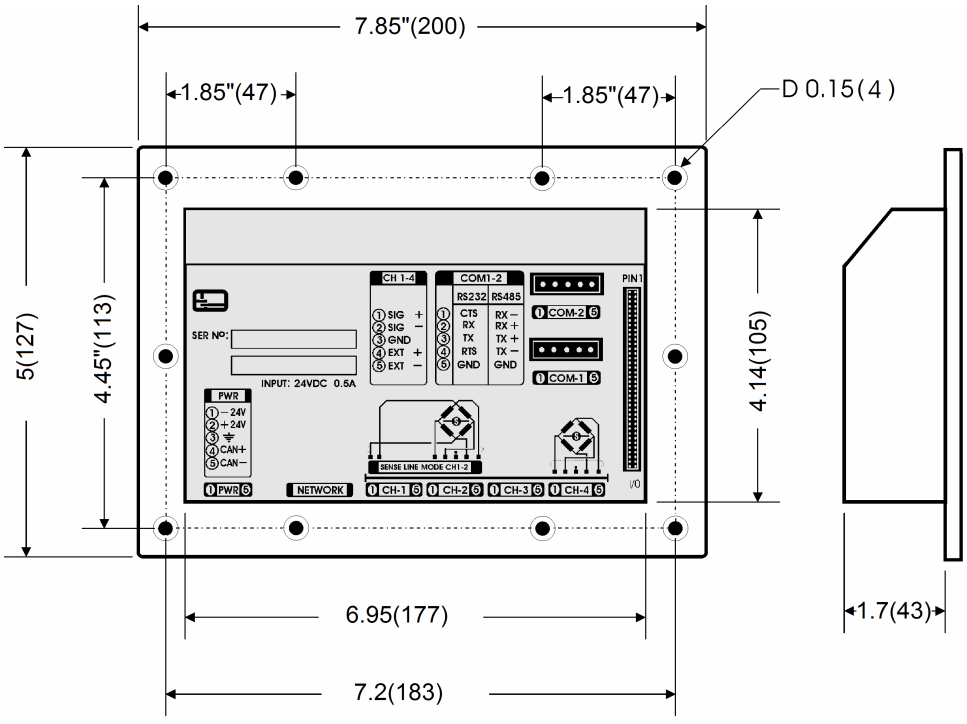
Observe the following precautions when handling the scale. Once the scale is installed on the idler frame, the weigh assembly becomes a very sensitive measuring instrument. Hitting the weigh idler assembly with a hammer or pressing against the weigh idler forcefully will damage the load cells.

- Do not pry on the weigh idler or the load cells directly.
- Do not stand or lean on the weigh idler scale.
- Lift the scale by the weigh blocks only. Do not lift the scale by the idler or idler mounting brackets.
- Never subject the scale to sudden impacts or shocks.

LT350BSI BELT SCALE INTEGRATOR - WALL MOUNT NEMA4X



LT350BSI BELT SCALE INTEGRATOR - PANEL MOUNT STAINLESS STEEL



PANEL CUTOUT (W/H): 6.95 (177) X 4.14(105)

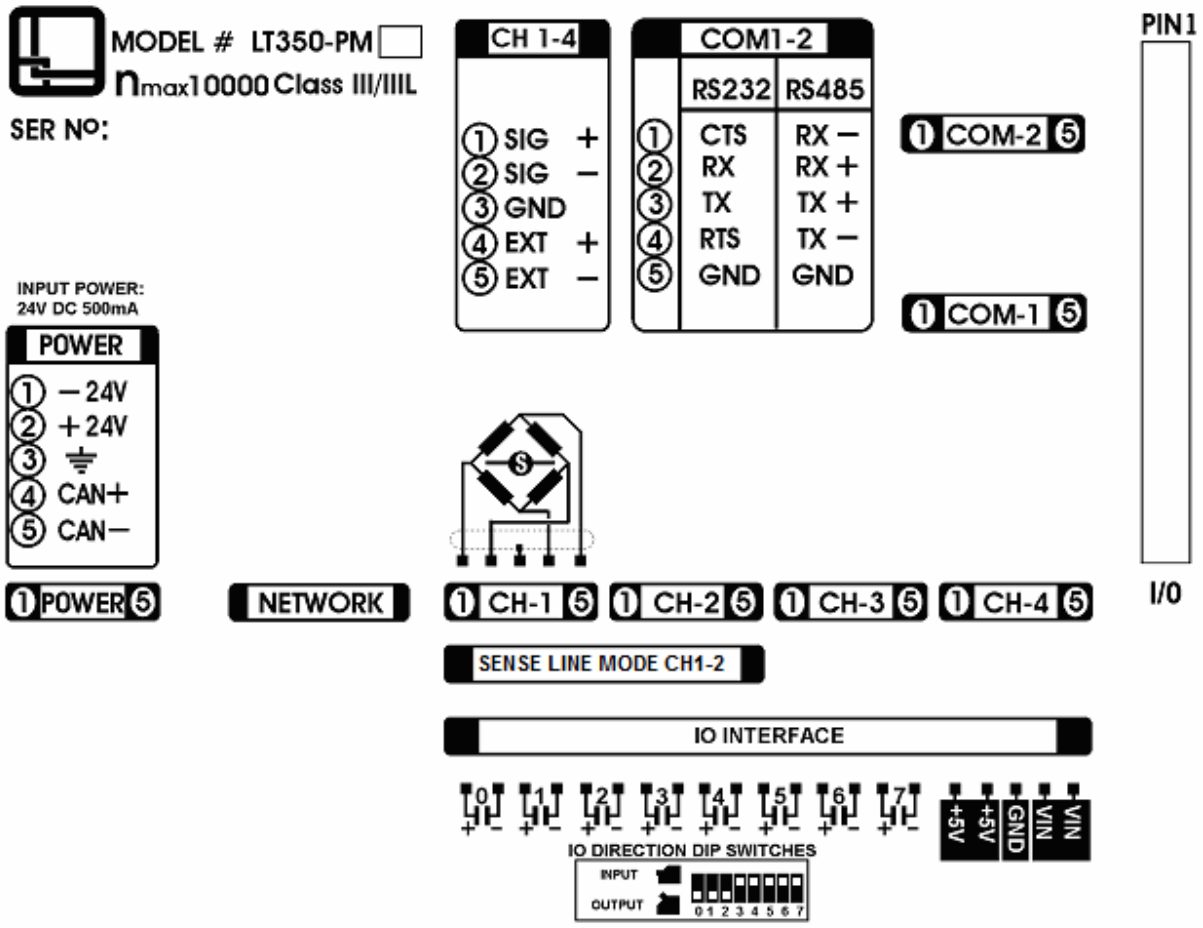
LT350BSI KEYBOARD FUNCTIONS

U UNITS	**UNITS** switch between lb and kg. With macros running units cannot be changed. Units can also be locked at startup.
V →0←	**ZERO** scale can be done with no motion and with the weight within the user programmable zero range. There is also a auto-zero function available.
W →T	**TARE** scale can be done with a positive weight on the belt scale.
X NET GROSS	**GROSS or NET** weight display based on a tare entry. The belt scale total can be tared by simply pressing the Tare key and cleared by pressing the CLEAR key
POWER ON	**POWER ON** feature is initially disabled – please see parameter 51 for more detail on how to enable this function.
MENU	**MENU** key is the main parameter navigation key. Once selected the user can use the up/down keys to navigate through all the parameters followed by an **ENTER** key and possibly a password.
ENTER	**ENTER** key will execute last command. Use the menu navigation keys to select a parameter followed by the **ENTER** key
CLEAR	**CLEAR** key can be used to clear entry field or exit the menu mode. To clear current tare entry for belt scale.
K ▲	Menu navigation key (single line scroll) and numeric up dial.
Y ▼	Menu navigation key (single line scroll) and numeric down dial.
R ◀	Menu navigation key or speed scroll – up.
S ▶	Menu navigation key or speed scroll – down.
MENU	Menu navigation keys - used to select a menu item and numeric dialing.
SF OFF	**SF** special function key used to switch between alphanumeric key entry

SCALE DISPLAY INDICATORS

BELT SCALE 99	Belt Scale network ID. If remote control is enabled this will be used to communicate with the unit.
	Run state. If batch set point IO control is enabled, the START and STOP keys will control the run state of the system.
	Indicates batch IO control is enabled active or idle
	Indicates that the special function key **SF** was pressed to select either lower or upper case characters for user input where applicable
	Indicate Weight stabilized
NET/GROSS	Indicate weigh mode NET or GROSS. A tare weight must be set.
→0←	Indicate scale at zero weight - center of zero
kg/lb	Indicate current units selected either kilograms or pounds
CAL	This icon indicates that the user changed calibration parameters and to save those parameters the user should end calibration by pressing the **F1** key.

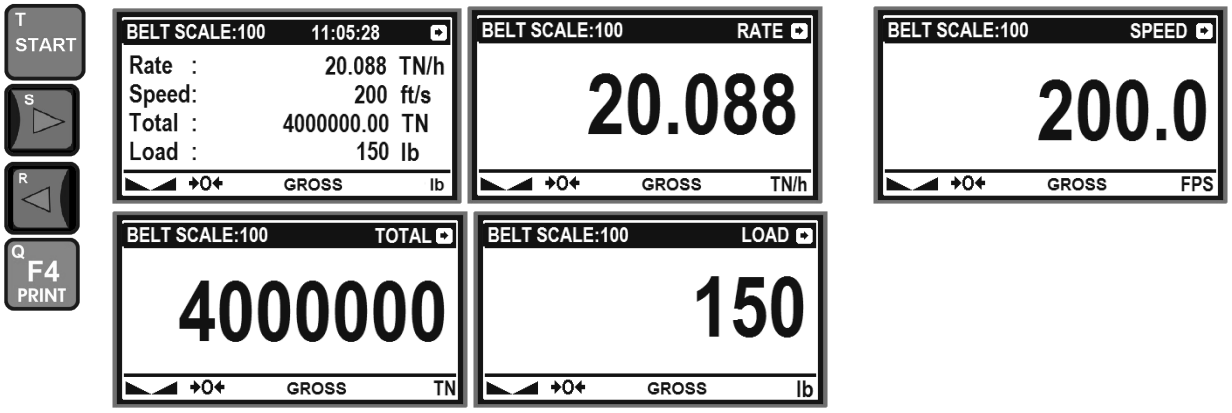
LT350 HARDWARE INTERFACE DIAGRAM

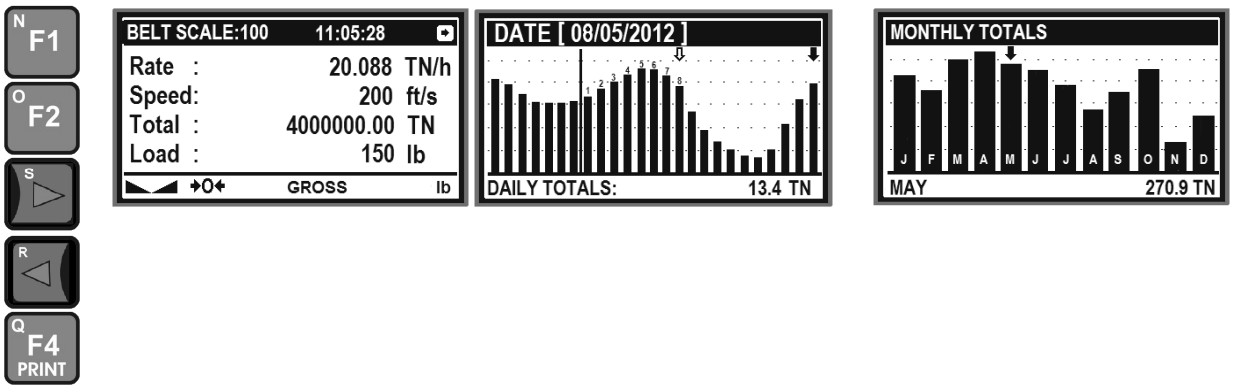


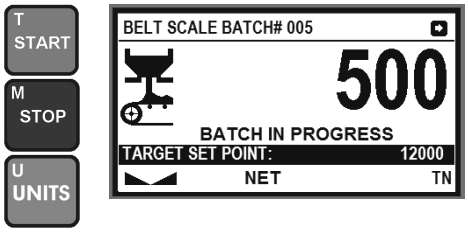
1 PWR 5	Power supply input. The indicator accepts a dc voltage between[16-48]Volts. If PoE is used, do not connect power here. Nominal power input should be 24Vdc @ 200mA
NETWORK	The controller supports three types of network configurations. Ethernet, Wi-Fi or USB. The Ethernet option also supports PoE (power over Ethernet).
SENSE LINE MODE CH1-2	The sense line mode is a special 6 wire load cell configuration. This configuration uses CH-1 as the sense lines and CH-2 as the weigh idler load cell inputs. This configuration is typically used to improve signal quality over long cable hauls. Command[93] should be used to enable sense line activation.
1 CH-1 5	Weigh Idler Load cell channels [1-4]. EXT+/- must be connected to the +5V and GND.
1 COM-1 5	The primary serial port can be configured as RS232 or RS422 and supports printing or strings using the ASCII.NET protocol
1 COM-2 5	The primary serial port can be configured as RS232 or RS422 and supports printing or strings using the ASCII.NET protocol

HOW TO NAVIGATE THE INTEGRATOR MENU FUNCTIONS

The belt integrator runs automatically at startup. To exit the belt scale run mode, press **STOP** repeatedly until prompted to exit to calibration mode – use the **MENU** key to navigate parameters. Once in calibration mode, press **F1** to save changes to parameters and **START** to run the belt scale integrator.

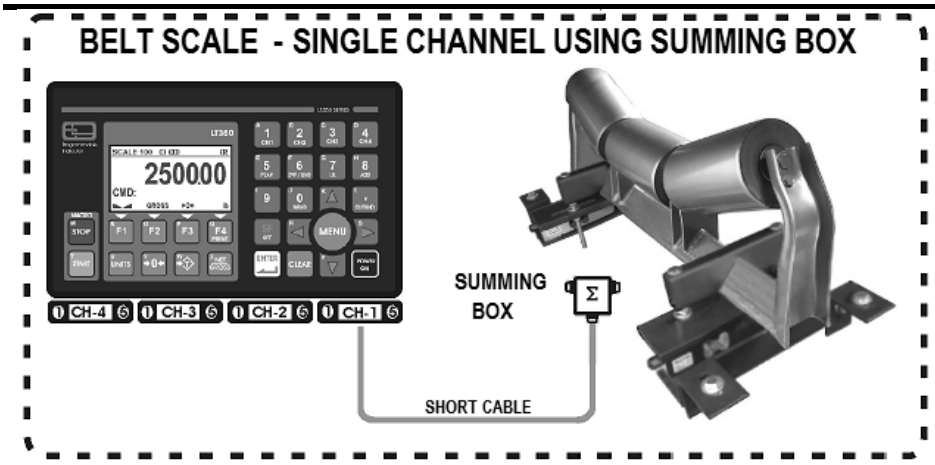






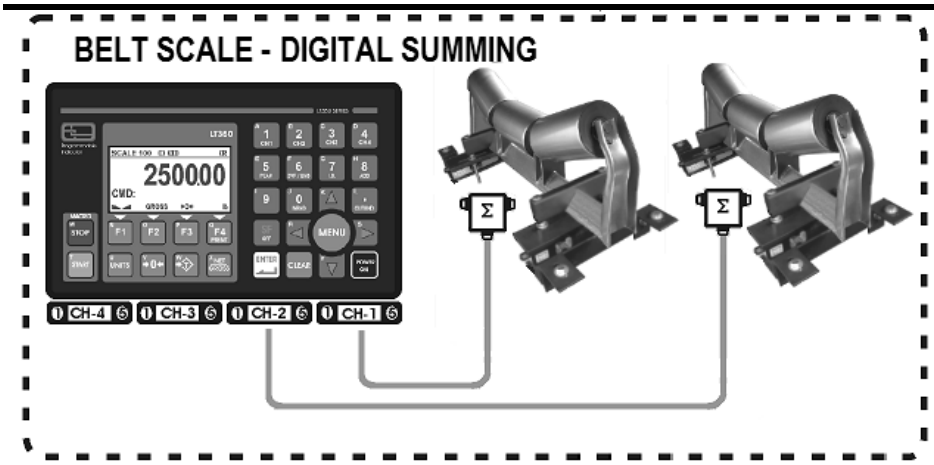
LT350BSI BELT SCALE CONFIGURATION OPTIONS

The LT350BSI single belt scale controller supports up to **[4]** weigh idlers. Most users simply use one input with a summing box attached. However up to 4 independent weigh idlers can be connected directly to the belt scale controller for higher accuracy.



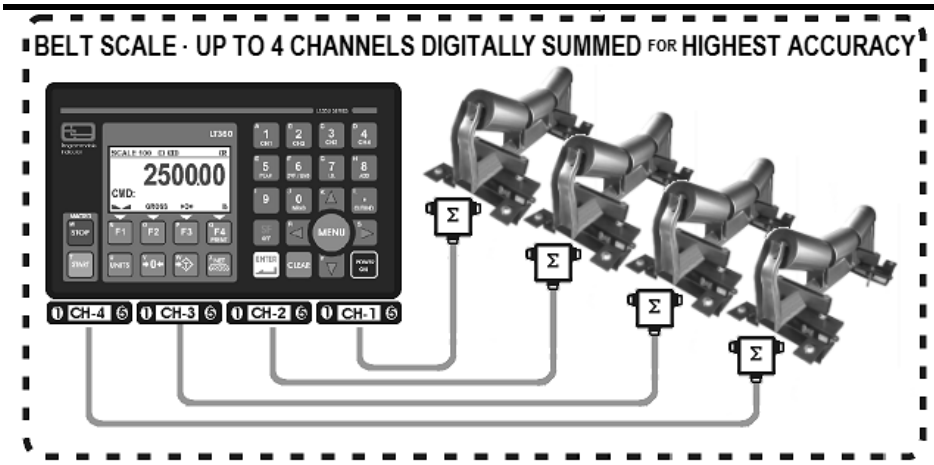
Advantages

- Short cable runs
- Easy setup
- Good for summing boxes
- Low cost
- Error < 2%



Advantages

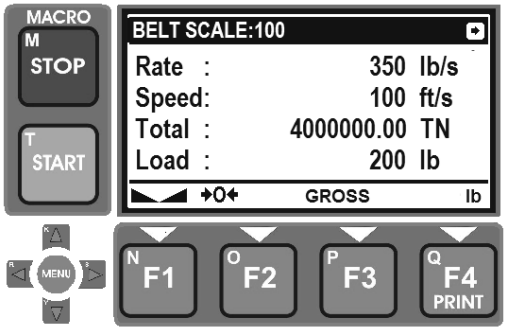
- Digital summing x2
- Digital trimming per idler
- Higher Accuracy
- Strong signal
- Individual diagnostics
- Good signal to noise
- Error < 1.5%



Advantages

- Digital summing x4
- Digital trimming per idler
- Very High Accuracy
- Ultra strong signal
- Individual diagnostics
- Excellent signal to noise
- Best accuracy
- Error < 0.5%

HOW TO SET INTEGRATOR PARAMETERS – PART 1



To set belt scale parameters, press **STOP** to exit the belt scale mode. Once in calibration mode, press the **MENU** key and use the UP/DOWN arrows to navigate to **BELT SCALE SETUP** or **CALIBRATION WIZARD**.

*To save changes to parameters once finished, press **F1** once you are back in the main calibration menu.*

Idler Allocation Channels [1-4]

This parameter is the number channels allocated to weigh idlers. Typically each weigh idler will be connected to channels 1 up to 4. Each weigh idler has generally two summed load cells. *If you opt for multiple idlers per single channel using a summing box - see section on multiple idlers to single channel.*

Number Of Idlers on Conveyor Belt [1-10]

This parameter will only be active if Idler Allocation was set to [1]. This parameter allows for multiple weigh idlers per single weigh channel e.g. a single channel cable connected to a summing box. *If you opt for multiple idlers per single channel using a summing box - see section on multiple idlers to single channel.*

Idler Spacing

This parameter defines the distance between weigh idlers. All weigh idlers should have the same equal distance between them entered in centimetres. This parameter forms part of the static weigh calibration.

Totalizer Reset

The master totalizer can be reset to zero or preset. The system password might be required to unlock this parameter. The totalizer rolls over at 10 million base counts (kg/lb). If the belt data log function is enabled the totalizer will only roll over at midnight with the start of a new day somewhere above 10 million. If the data logger is enabled, changing the totalizer during data logging will invalidate data log values which might require erasing the log data.

Material Test

The Material Test can only be performed once a static weight calibration has been completed and once the belt speed sensor has been installed and calibrated.

The belt scale allows for two calibration methods. Static weight calibration is the easiest method and is a combination of test weights applied to each weigh idler, belt spacing and speed calibration. The second optional calibration method is a Material Test calibration where a known amount of test material is fed on the moving belt scale followed by a correction factor to make the displayed total weight match the test material weighed he unit of rate parameter defines how the rate is displayed.

Reset Material Factor

The Material Factor is created as a correction factor once a Material Test calibration has been completed. When this number is at default (1) it indicates that no Material correction is required. The default value is always (1)

Speed Mode

This parameter selects between constant and variable speed modes. I the belt speed is constant and known, the user can simply enter the known constant speed. If a variable belt speed sensor is used the user will have to calibrate the speed sensor.

Speed Pulse Length

If the user selected variable speed mode, the user must enter the distance traveled by the belt in millimeters. The factory supplied LT45BSS belt speed sensor wheel has 8 pulses per revolution and with a wheel circumference of 400 millimeters we obtain a pulse length of 50 millimeters. This method can be used to calculate any wheel size with different pulse lengths.

Speed Calibration

Whether the user selected variable or constant speed mode, this parameter will be used to adjust the speed shown. Using the function keys to select the coarseness of the adjustments and adjusting the speed up or down. Once finished, the user must press ENTER to complete the adjustment.

Speed Time Units

This parameter defines how the belt speed is displayed on the LT350

- •Hr. - hour
- **•Min - minute (default)**
- •Sec – seconds

Rate Time Units

This parameter defines what unit of time the rate will be displayed in on the LT350.

- **•Hr. - hour (default)**
- •Min - minute
- •Sec – seconds

Rate Weigh Units

The rate weigh unit parameter defines how the rate is displayed.

- **•Tn(tonnes) - (default)**
- •kg/lb

Total Weigh Units

The integrated weigh total units as displayed.

- **•Tn (tonnes) - (default)**
- •kg/lb

Tonnes Type Units

The type of tonnes derived from the base weight unit.

- **TN (short ton) - (default)**
- T (metric ton)
- LT (long ton)

Measurement Units

The unit of measure parameter defines how the belt is measured. The default is Ft/Min.

- **Ft - feet (default)**
- M – meters

HOW TO DO A STATIC BELT SCALE CALIBRATION

The belt scale allows for two calibration methods. Static weight calibration is the easiest method and is a combination of test weights applied to each weigh idler, belt spacing and speed calibration. The second optional calibration method is a material calibration where a known amount of test material is fed on the moving belt scale followed by a correction factor to make the displayed total weight match the test material weighed – discussed later.

The static calibration sequence assumes that all the weigh idlers are connected to channels 1 up to 4 of the LT350 Belt Scale Integrator as outlined under configuration options earlier in this guide. Each weigh idler typically has its two load cells paired using a summing box.

To enter calibration mode, the user needs to exit belt scale mode by pressing the STOP key repeatedly until the user is prompted with the option of exiting belt scale mode into calibration mode.

Press **MENU** to navigate to the **CALIBRATION WIZARD** command using the up/down arrows.

The wizard will guide the user through the most relevant parameters. The wizard commands can also be accessed individually under the **BELT SCALE SETUP** menu selection. For new users it would be easier to use the wizard.

Once the belt speed mode option appears, the user will have the choice of either constant or variable belt speeds using a belt speed wheel sensor. Please see the section on belt speed sensor installation for more detail.

The user will also be prompted to enter the belt spacing distance in centimeters. **It is important that the space between each weigh idler be the same distance - this include the weigh idler to static idler spacing.**

The user will be prompted to remove all weights from each weigh idler for to dead load and zero the belt.

The user will then be prompted to attach test weights of equal weight to each weigh idler. The user must then enter the sum of all test weights as the target span weight, e.g. if there are 3 weigh idlers and each idler has a 100kg weight attached. The total weight to enter for the span is 300kg.

This completes the static belt calibration.

The final command asks the user whether to perform a material test calibration – this is optional and should be ignored if only a static weigh calibration is required.

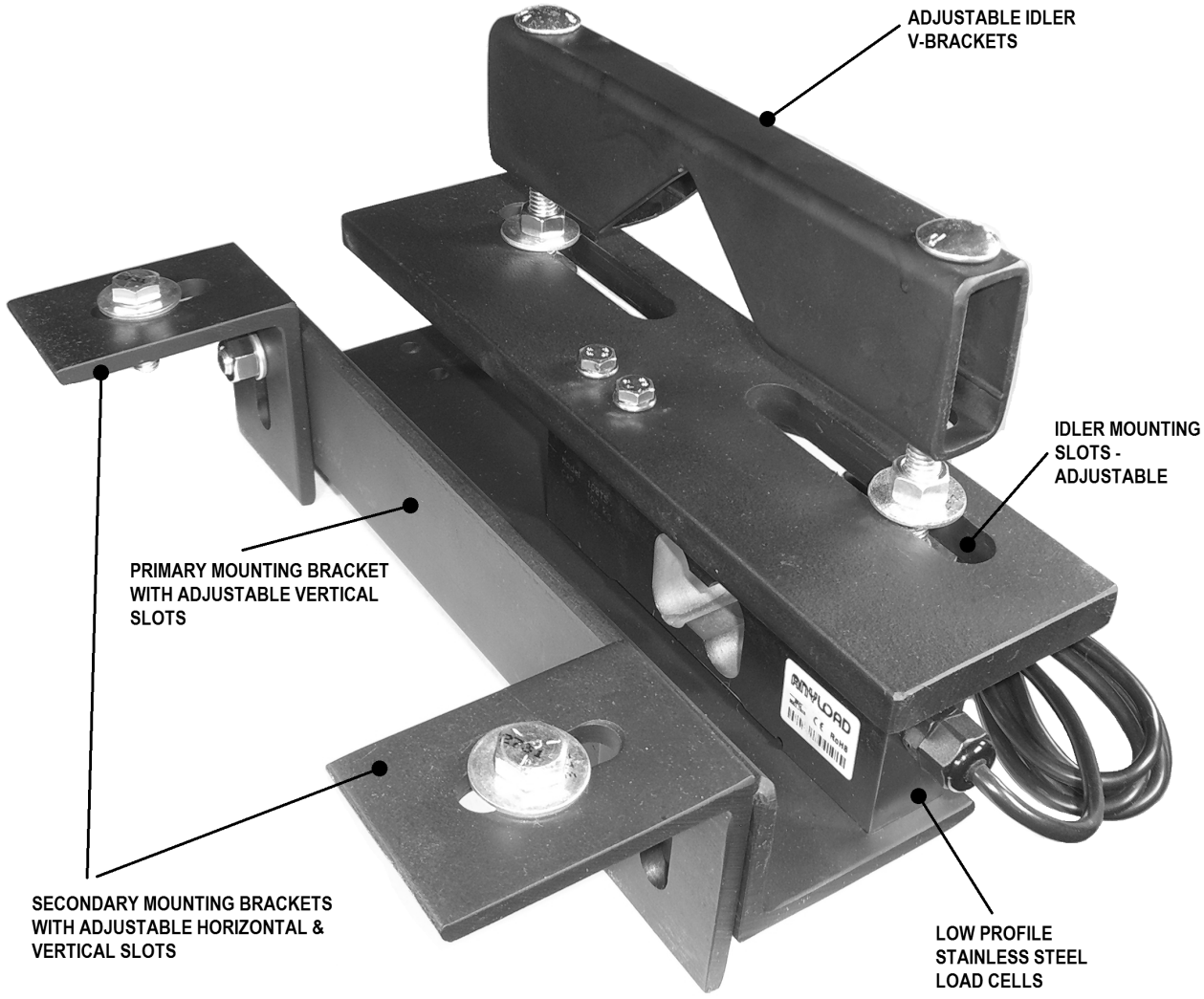
Once the wizard finished, the user can save the new settings by pressing **F1**

To return to belt scale mode press **START**

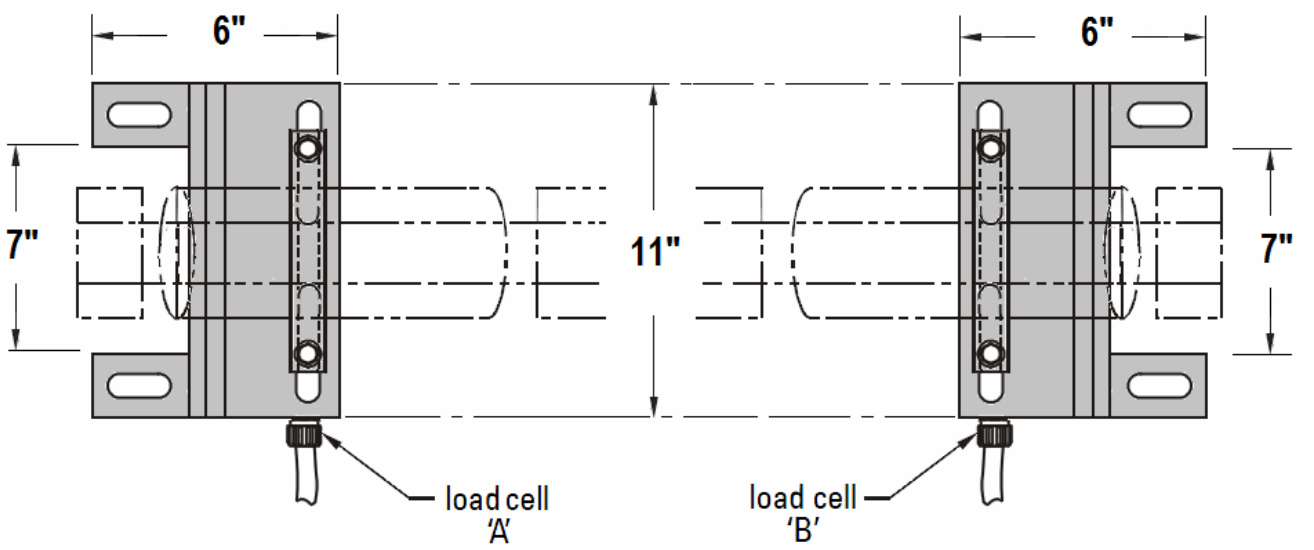
LT45BS WEIGH IDLER ASSEMBLY

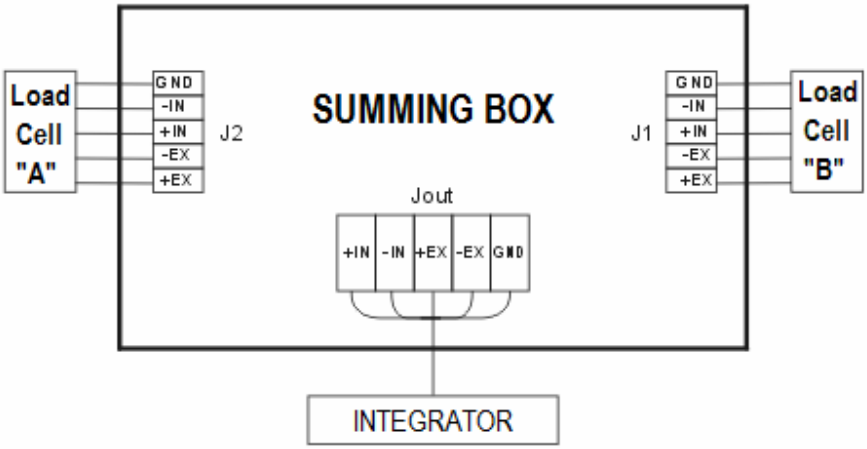
Each weigh idler consist of two LT45BS scale modules to make up the scale carriage. The scale bracket assembly is unique in that it does not require any modifications to existing idlers. The secondary brackets are spaced wide enough to make most types of idlers pass through unhindered. The optional secondary brackets can be removed if not required and the scale module can be mounted using the primary mounting bracket for a extremely low profile solution. **It is very important to note that the spacing distance between the weigh idlers should be exactly the same distance. Static Idler to weigh idler and weigh idler to weigh idler should be the same distance for proper calibration.**

Maximum allowable idler spine for fitting to the LT45BS belt scale carriage is:
Angled spine: 75 mm (3.)
Channel spine: 100 mm (4.)



HOW TO INSTALL AND CONNECT A SUMMING BOX



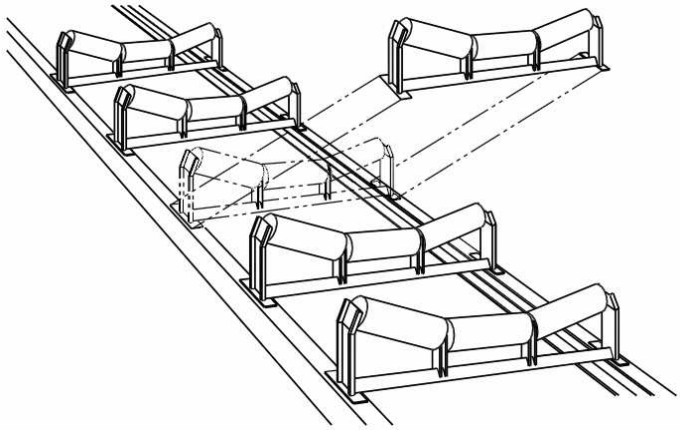


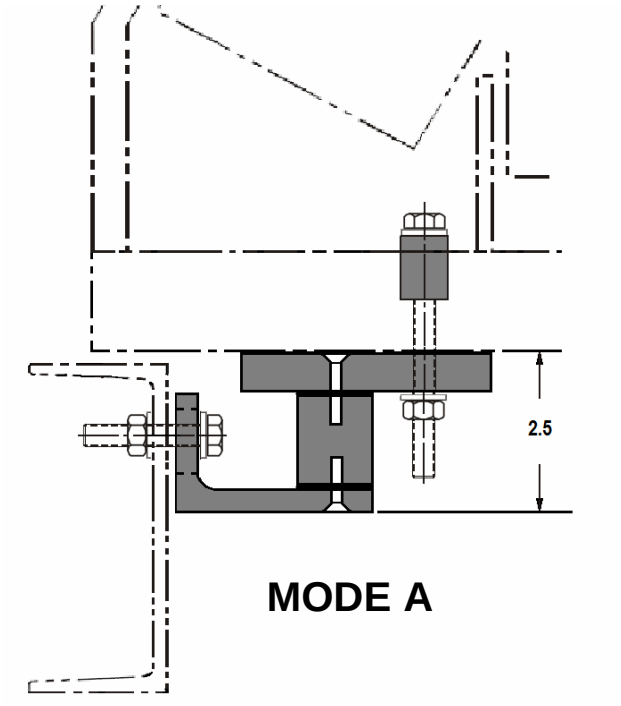
LT45BS SCALE IDLER ASSEMBLY

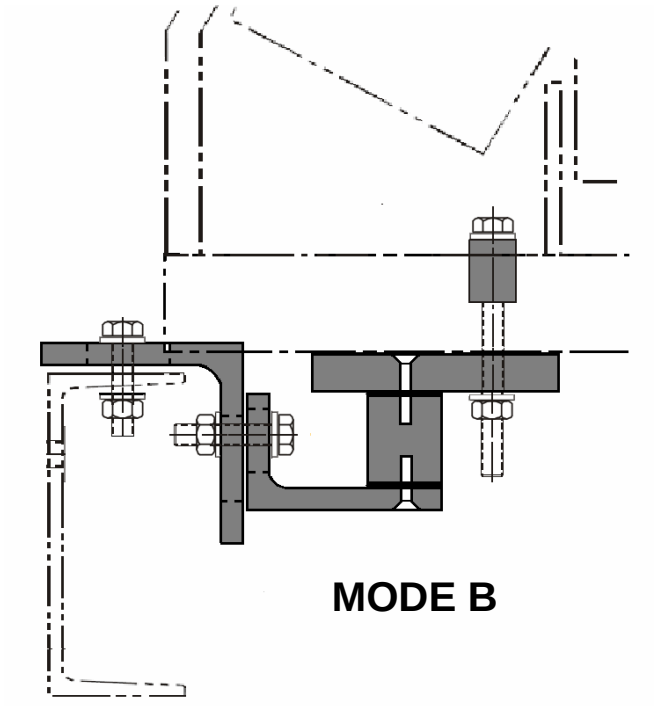
The LT45BS belt scale assembly is designed in such a way that requires no modification to the idler frame. The LT45BS assembly can be mounted in two modes as outlined below – depending on the space requirements and the type of belt scale frame. The LT45BS belt scale module supports two types of frame mountings as illustrated in diagrams modes A and B**. It is very important to note that the spacing distance between the weigh idlers should be exactly the same distance. Static Idler to weigh idler and weigh idler to weigh idler should be the same distance for proper calibration.**

Maximum allowable idler spine for fitting to the LT45BS belt scale carriage is:

Angled spine: 75 mm (3.)
Channel spine: 100 mm (4.)

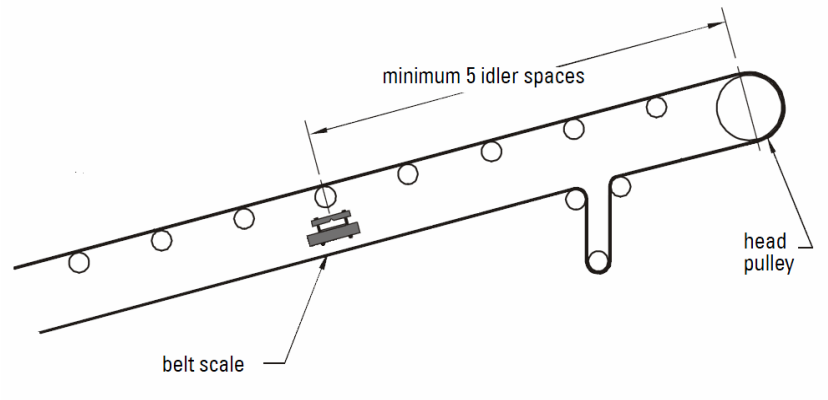


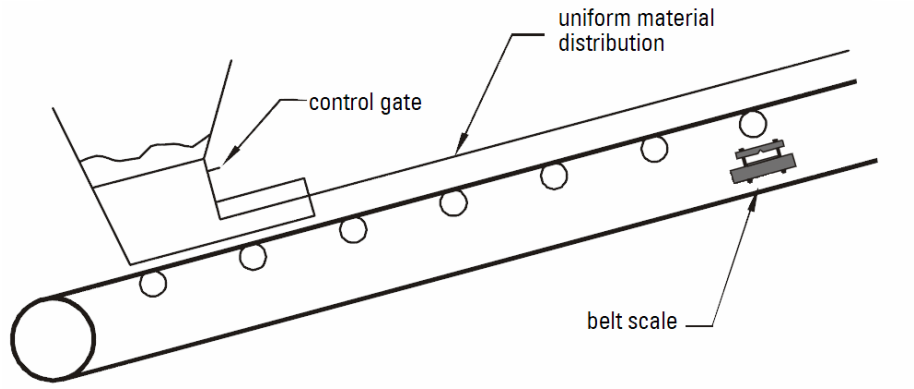


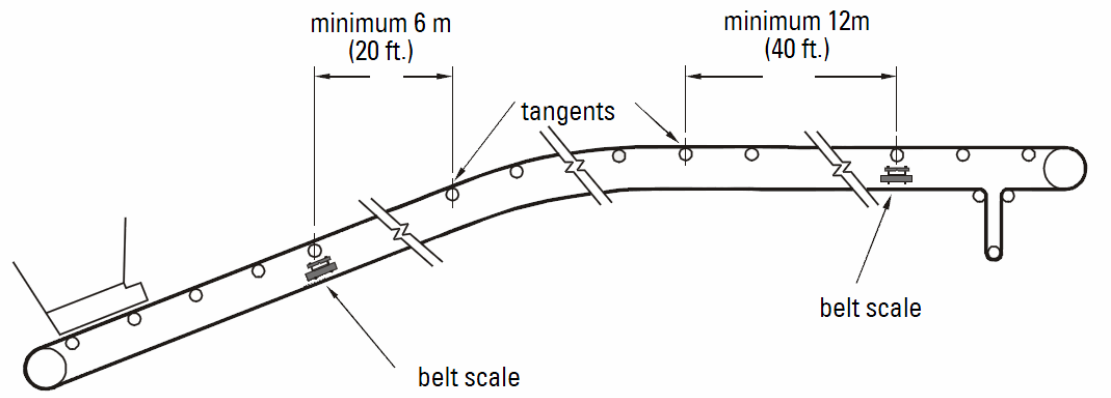


IDLER SPACING AND LOAD CELL PLACEMENT

The capacity of the belt scale is rated on the maximum continuous load that can be carried across any single weigh idler. The maximum capacity per weigh idler should be known prior to determining the components of the scale idler. **It is important that the spacing distance between weigh idlers be exactly equal in length. Static Idler to weigh idler and weigh idler to weigh idler should be the same distance for proper calibration.**





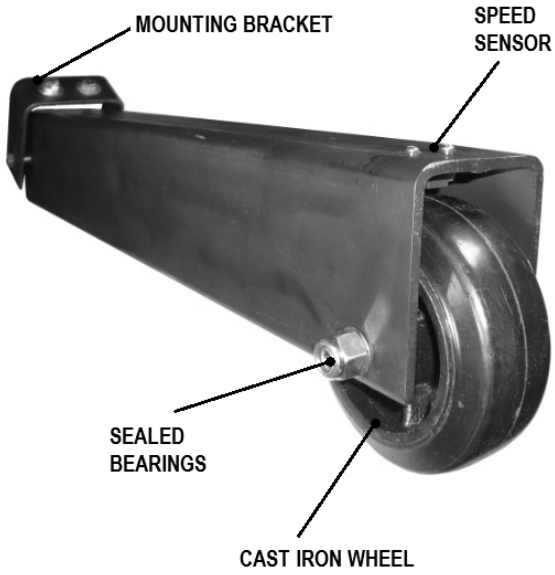


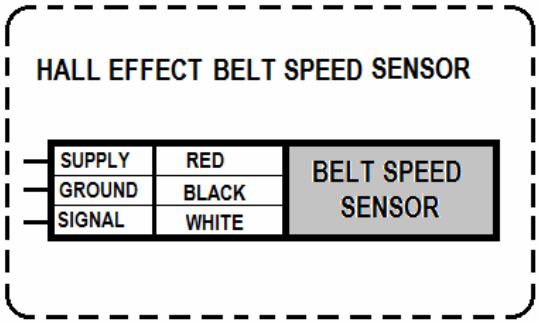
LT45SS SCALE SPEED SENSOR ASSEMBLY

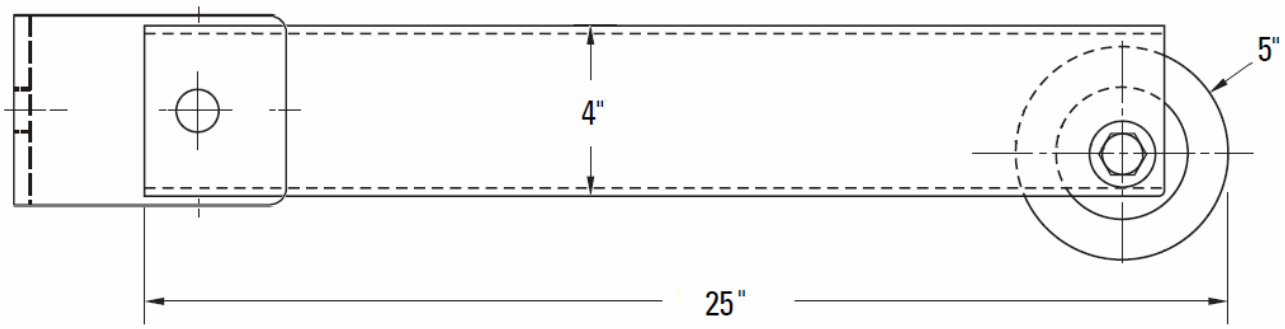
The LT45BSS belt speed senor assembly has a rugged cast iron rubber wheel with sealed bearings incorporated with a magnetic electronic 3 wire speed sensor that interfaces directly with the LT350-BSI integrator. The mounting bracket can easily be tied to a static idler or cross bar.

The belt speed wheel must maintain constant positive contact between the roll and the belt for proper operation. The speed sensor should never come in contact with material that is being conveyed along the belt nor the belt itself. The signal generated by the speed wheel is converted by the integrator into a value that represents belt travel distance.

The LT350-BSI integrator support either constant or variable belts speeds using the LT45SS speed sensor assembly. The speed sensor is rated up to 50 feet per second.







HOW TO CALIBRATE THE SPEED SENSOR – CONSTANT SPEED MODE

To set belt speed parameters, press **STOP** to exit to setup mode. Press the **MENU** key and use the UP/DOWN arrows to select **BELT SCALE SETUP**. These parameters need to be set before attempting a material test calibration.

Remember to save changes to parameters once finished using F1 once you are back in the main screen.

STEP 1
Select the belt Speed Mode parameter for constant speed mode.

STEP 2
If a constant speed is selected from the belt scale setup menu items, the user should connect **INPUT[7]** positive to the ground pin. This can also be used for a centrifugal contact sensor that simply indicates belt state. If **INPUT[7]** is left open the belt speed will be zero and totalizing will stop. The user can connect a dry contact relay to **INPUT[7]** that is activated by the power circuit of the belt motor contactor.

STEP 3
Select the belt speed Calibration parameter in the BELT SCALE SETUP sub menu and while running the belt at a know speed observe the current speed and adjust up or down until the displayed speed is the same speed as that of the belt.

	Pressing **F1** fine increments
	Pressing **F2** coarse increments
	Pressing **F3** to increase speed
	Pressing **F4** to decrease speed
	Pressing **ENTER** to save, abort or reset the current adjustments

HOW TO CALIBRATE THE SPEED SENSOR – VARIABLE SPEED MODE

To set belt speed parameters, press **STOP** to exit to setup mode. Press the **MENU** key and use the UP/DOWN arrows to select **BELT SCALE SETUP**. These parameters need to be set before attempting a material test calibration.

Remember to save changes to parameters once finished using F1 once you are back in the main screen.

STEP 1
Select the belt Speed Mode parameter for variable speed using the LT45-SS belt speed wheel assembly or similar.

STEP 2
Connect the belt wheel interface as shown in the speed sensor connection diagram

STEP 3

After the user selected variable speed mode, the user must enter the distance traveled by the belt in millimeters using the belt pulse length parameter under the BELT SCALE SETUP menu. The factory supplied LT45BSS belt speed sensor wheel has 8 pulses per revolution and with a wheel circumference of 400 millimeters we obtain a pulse length of 400/8 = 50 millimeters. This method can be used to calculate the pulse length for any wheel size with different pulse lengths.

Select the belt speed Calibration parameter in the BELT SCALE SETUP sub menu and while running the belt at a known speed observe the current speed and adjust up or down if so required.

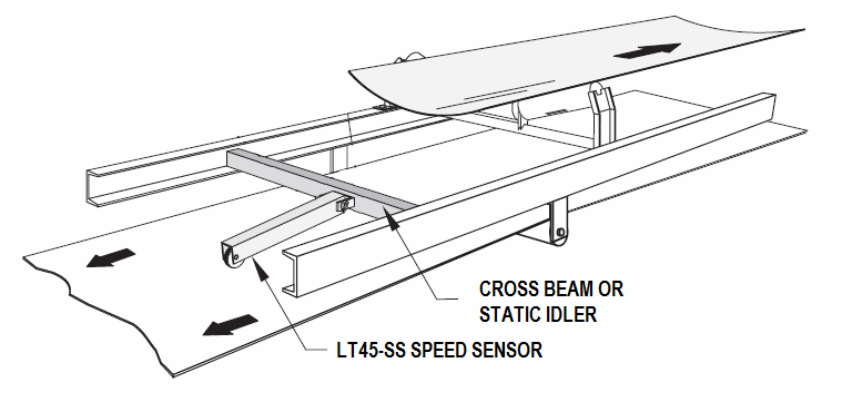
	Pressing **F1** fine increments
	Pressing **F2** coarse increments
	Pressing **F3** to increase speed
	Pressing **F4** to decrease speed
	Pressing **ENTER** to save, abort or reset the current adjustments

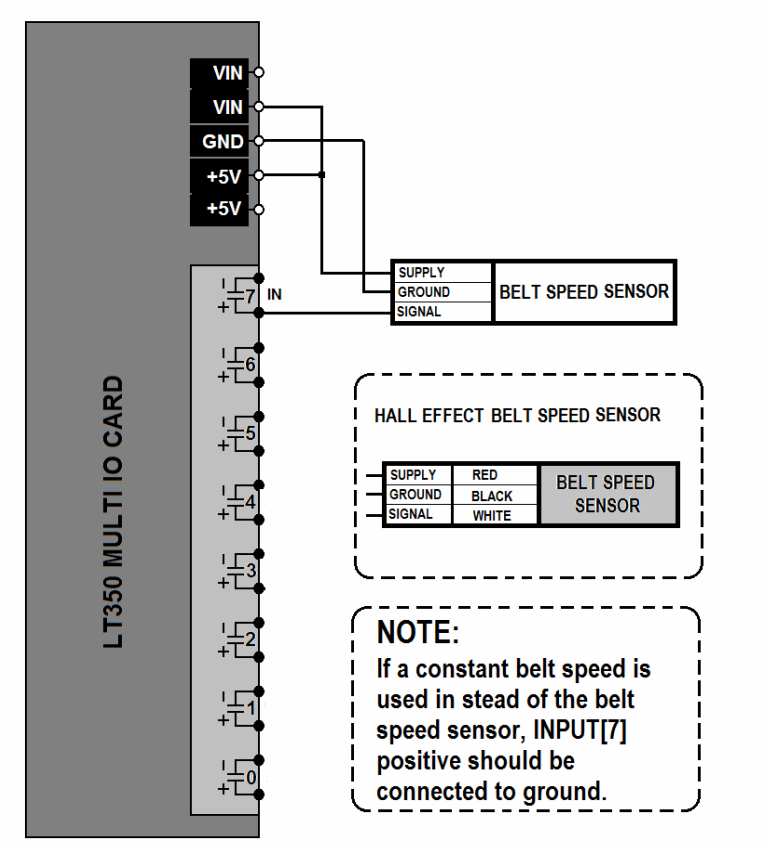
HOW TO WIRE THE SPEED SENSOR

The LT350-BSI belt scale integrator supports one belt speed pulse sensor input connected to **INPUT[7]** as outlined in the diagram below. The factory supplied LT45SS speed sensor assembly is a 5V, 3 wire device that gets power from the internal 5V supply line on the integrator. LT45SS wheel arm to the cross brace closest to the tail of the conveyor**.** The wheel assembly must be free to move in the vertical direction and must maintain contact with the belt at all times.

For long distances the speed sensor may be powered by an external 24V DC supply in stead of 5V.

If a constant speed is selected from the belt scale setup menu items, the user should connect INPUT[7] positive to the ground pin.



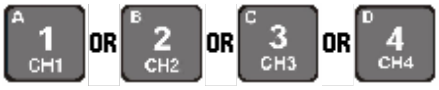


HOW TO PERFORM IDLER LOAD CELL ADJUSTMENTS

This command makes small adjustments to the span factors of each weigh idler channel traditionally done with analog potentiometers. For example, we have a 2 belt scale idler system that was calibrated to 200lb by placing a 100lb weight in the center of each weigh idler. The user then observes that by moving the same weight from one weigh idler to another, that the weight reading is off by a small margin. To correct for this small margins we use **COMMAND[15] – IDLER ADJUSTMENTS**

- The user then selects the weigh idler channel using keys[1,2,3 or 4] to be adjusted.
- The user then places the test weight on the above selected weigh idler.
- The user adjusts the weight using the F3 & F4 function keys until it reads the same as the test weight on the scale.
- The user then moves to the next weigh idler channel using keys **[1,2,3 or 4]**
- If this is not the last weigh idler channel repeat by going to step 3.
- The final step is to press **[ENTER] or [MENU]** to save or abort the changes made.

This command is only of use in applications with more than weigh idler channels allocated. Place the test weight as close as possible to the center of the weigh idler that is currently selected on the display.



To select the weigh idler channel to be adjusted

These keys select the coarseness of the adjustments

These keys are used to adjust the weight value for the weigh idler channel in question

Press the this key to exit without changes

The **[MENU]** key provides the following options:

- Save and exit
- Abort adjustments
- Reset current load cell channel
- Reset all load cell channels
- Return to adjustment menu

LT350BS SCALE LOAD CELL DIAGNOSTICS

Use the **MENU** key and up/down keys to navigate to **CHECK WEIGH IDLERS** and press **ENTER**

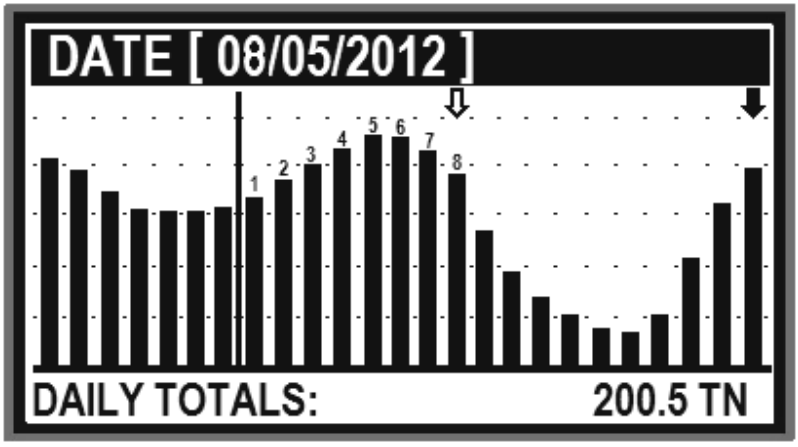
Press these keys to navigate through the weigh idler channel status screens

LOAD CELL STATUS INFORMATION	
Cell State :	Runtime diagnostic state of weigh idler or load cell
	PASS — The weigh idler or load cell , if allocated should be in the [PASS] state **UNUSED** — If a load cell channel is not allocated using command [3] it should show [UNUSED] **FAIL** — If a fault is detected with the load cell it will indicate [FAIL]
Raw Counts:	Raw counts pertains to the currently selected load cell or summed weigh idler and is the value before converted to a weight quantity. Raw analog to digital counts can be between **[0 – 1000 000].**
Correction:	Correction is applied in a belt scale that has more than one weigh idler channels. Due to conveyor scale structural factors it is sometimes required to apply corrections to certain weigh idlers channels by using the correction command **[15].** The factory default is **[1.000]**
Weight:	Display the current weight across all weigh idlers of the belt scale
Idlers/Scale:	The number of weigh idlers per LT350BSI belt scale with up to 4 weigh idler channels. The scale allocation command **[3]** is used to allocate the number of weigh idler channels **[1-4]**

HOW TO USE THE DATA LOG FUNCTION

The data log function calculates and stores the daily totals for up to 12 months. The data log function is a very useful function to track productivity and the rate of material moved over up to one year. The data log function must first be enabled by accessing calibration parameter **[10] DATA LOG SETUP**. The data log function only works while the integrator is running **[START].** For best results, the integrator should be permanently powered up, free from power failures and with the integrator running continuously.

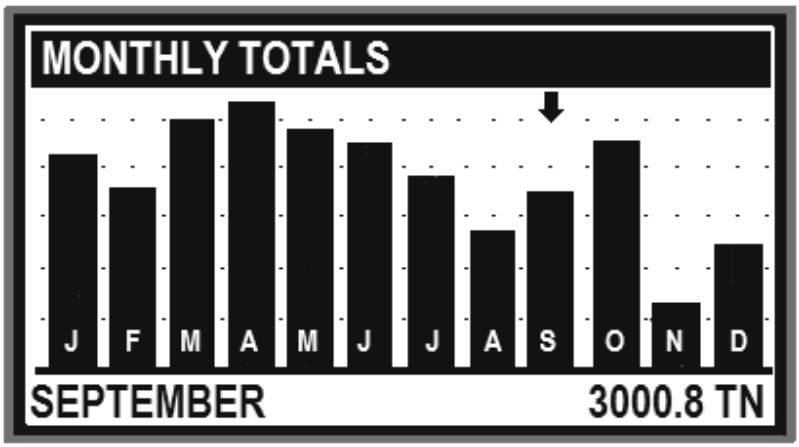
Pressing **F1** from the main display of the integrator will plot in real time the last 30 days of daily totals. The user can print the list of daily totals by pressing **PRINT** or **F4**. The user can view any month of the year by pressing the numeric key index of the month on the keypad.



The user can view the daily totals by moving the arrow to the date of interest. The graph indicates that the daily total for 08/05/2012 was 200.5 TN. New data is always added on the right while older data is shifted to the left. A vertical line indicates the month separator. **Press CLEAR to exit the graphics plot function**

The above function allows the user to scroll and display totals of the last 30 days by using the left and right arrows. While in scroll mode the display will flash the cursor and the date to indicate that the currently displayed daily total is historical and not real time. After a 5 second timeout the display will reset itself to displaying the current daily total at the very right side of the screen. The user can view any month of the year by pressing the numeric key index of the month on the keypad.

Pressing **F2** from the above display will allow the user to view and scroll left or right through each monthly total for the last 12 month as indicated by the cursor. The user can press **ENTER** to view the daily total graph of the currently selected month. The user can print the sum totals for each month by pressing **PRINT** or **F4 (printer mode must be selected as output protocol on the serial port)**

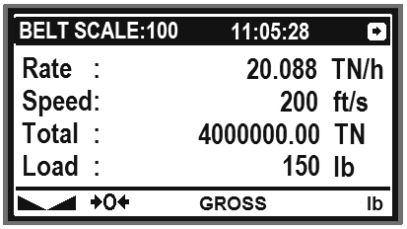


The data view function will display daily totals for all valid entries. Invalid data entries will be displayed as empty fields.

Press CLEAR to exit the monthly data view function.

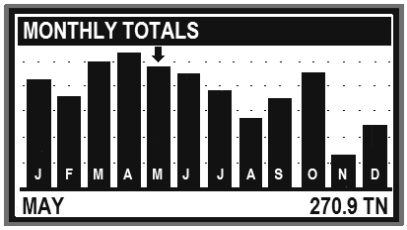
HOW TO PRINT DATA LOG REPORTS

The data log reports are printed on a serial port that has its protocol set to TICKET PRINTING. The log data can be printed to any RS232 serial printer with a minimum column width of 32 characters or more. The data log function must first be enabled by accessing calibration parameter **[10] DATA LOG SETUP**. The serial port for COM1 or COM2 needs to be configured for TICKET PRINTING and must have the correct baud rate selected. For each display the **PRINT** or **F4** key can be pressed to request a report.



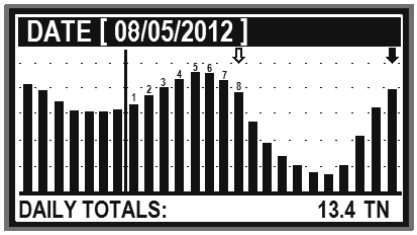

```
DATE: 21/05/2013
TIME: 11:05:28
--------------------------------
Rate:          20.2 Tn/h
Speed:        200.5 ft/s
Total:    4 000 000 Tn
Load:          156 lb

--------------------------------
Daily Total:     12 Tn
--------------------------------
```




```
MONTHLY TOTALS (05)
--------------------------------
JAN  :        268.3 Tn
FEB  :        260.1 Tn
MAR  :        272.6 Tn
APL  :        300.5 Tn
MAY  :        270.9 Tn *
JUN  :        263.0 Tn
JLY  :        255.6 Tn
AUG  :        249.2 Tn
SEP  :        254.1 Tn
OCT  :        260.5 Tn
NOV  :        229.4 Tn
DEC  :        241.8 Tn

--------------------------------
TOTAL:      3216.0 Tn
--------------------------------
```




```
DAILY TOTALS MONTH: 05
--------------------------------
01/05/2013 :      7 012 lb
02/05/2013 :     10 800 lb
03/05/2013 :     20 001 lb
04/05/2013 :     30 001 lb
05/05/2013 :     65 001 lb
06/05/2013 :     40 001 lb
07/05/2013 :     16 200 lb
08/05/2013 :     13 800 lb
09/05/2013 :     10 200 lb
10/05/2013 :      6 012 lb
11/05/2013 :      2000 lb
12/05/2013 :       300 lb
13/05/2013 :       300 lb
14/05/2013 :       900 lb
15/05/2013 :      2600 lb
16/05/2013 :      4 002 lb
17/05/2013 :      5000 lb
18/05/2013 :      5 012 lb
19/05/2013 :     10 300 lb
20/05/2013 :     11 200 lb
21/05/2013 :     12 200 lb
--------------------------------
TOTAL:         272 842 lb
--------------------------------
```

HOW TO CONFIGURE THE TOTALIZER PULSE OUTPUT

The Totalizer Pulse Output is programmable to any totalized weight interval – the weight pulse is battery backed up and will be valid even in the event of a power failure. If the belt scale is switched off, the LT350 will store/recall the last state of the totalization. The Pulse Output is active on IO POINT[0].

This weight value must be entered in base units, lb or kg. The user can also change the pulse length in increments of seconds. This is useful for a PLC to determine if the pulse is valid by measuring the pulse length.

To set belt scale parameters, press **STOP** to exit to setup mode. Press the **MENU** key and use the UP/DOWN arrows to select **TOTAL PULSE SETUP(43)**.

*Remember to save changes to parameters once finished using **F1** once you are back in the main screen.*

Enable Totalizer Pulse

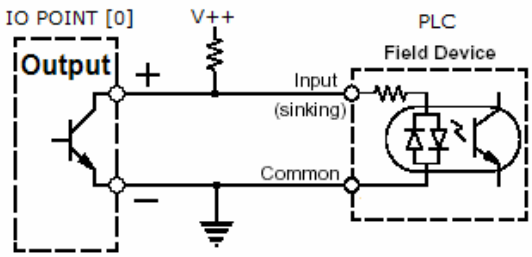
This parameter enables the Totalizer Pulse Output on IO Point[0]. When this mode is enabled, the Batch function will be disabled. The Totalizer and the Batch functions cannot work at the same time.

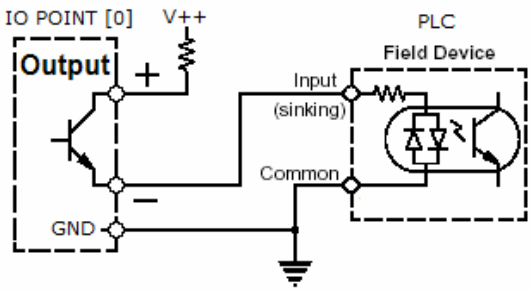
Pulse Weight Value

This weight value must be entered in the calibration base units, (lb/kg). The weight pulse is battery backed up and will be valid even in the event of a power failure. If the belt scale is switched off, the LT350 will store/recall the last state of the totalizer.

Pulse Length Timer

The pulse length gets entered in increments of seconds. A pulse length of [0] equates to 500ms. The pulse length is useful for a PLC to determine if the pulse is valid by measuring the exact pulse length.





HOW TO CONFIGURE THE INTERNAL CURRENT LOOP OUTPUT

The 4-20mA current loop interface can be configured to transmit belt rate, speed or the belt weight parameter. The user needs to enter the parameter minimum at 4mA and maximum at 20mA. If the belt mode is stopped or the value drops below the minimum value, a current less than 4mA will be transmitted to signal a fault condition. The 4-20mA is galvanically isolated and needs to be supplied with a power source of typically 24V DC from the target device such as a PLC. The receiver should measure the 4-20mA across a 100-200 ohm resistor as outlined in the diagram below.

To set belt scale parameters, press **STOP** to exit to setup mode. Press the **MENU** key and use the UP/DOWN arrows to select **CURRENT LOOP SETUP(37)**.

*Remember to save changes to parameters once finished using **F1** once you are back in the main screen.*

Current Loop: Enable Current Loop Mode

This parameter enables the current loop output.

Current Loop: Minimum Value at 4mA

This is the parameter minimum value at 4 mA entered in base calibration units (kg/lb).

Current Loop: Maximum Value at 20mA

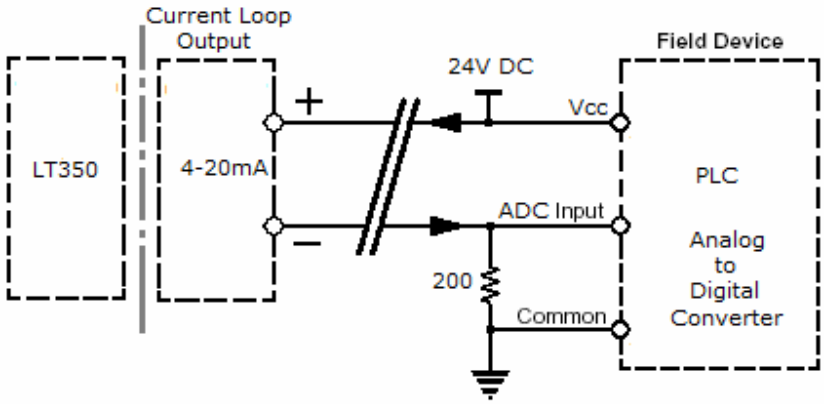
This is the parameter maximum value at 20 mA entered in base calibration units (kg/lb).

Current Loop: Parameter index

The belt parameter to use: rate(0), speed(1) weight(2)

Serial Port Setup

COM2	Baud rate:	9600
COM2	Protocol :	Current Loop
COM2	Poll Mode:	TX Continuously



HOW TO CONFIGURE THE EXTERNAL CURRENT LOOP OUTPUT

The external 4-20mA is a DIN-rail module that receives RS232 information on its input and transmit 4-20mA on its output and unlike the internal interface can work on either COM1 or COM2 (internal version only works on COM2).

The external 4-20mA current loop gets configured exactly the same way as the internal module to transmit belt rate, speed or weight parameters. The user needs to enter the parameter minimum at 4mA and maximum at 20mA. If the belt mode is stopped or the value drops below the minimum value, a current less than 4mA will be transmitted to signal a fault condition. The 4-20mA is galvanically isolated and needs to be supplied with a power source of typically 24V DC from the target device. The receiver should measure the 4-20mA across a 100-200 ohm resistor as outlined in the diagram below.

To set parameters, press **STOP** to exit to setup mode. Press the **MENU** key and use the UP/DOWN arrows to select **CURRENT LOOP SETUP(37)**.

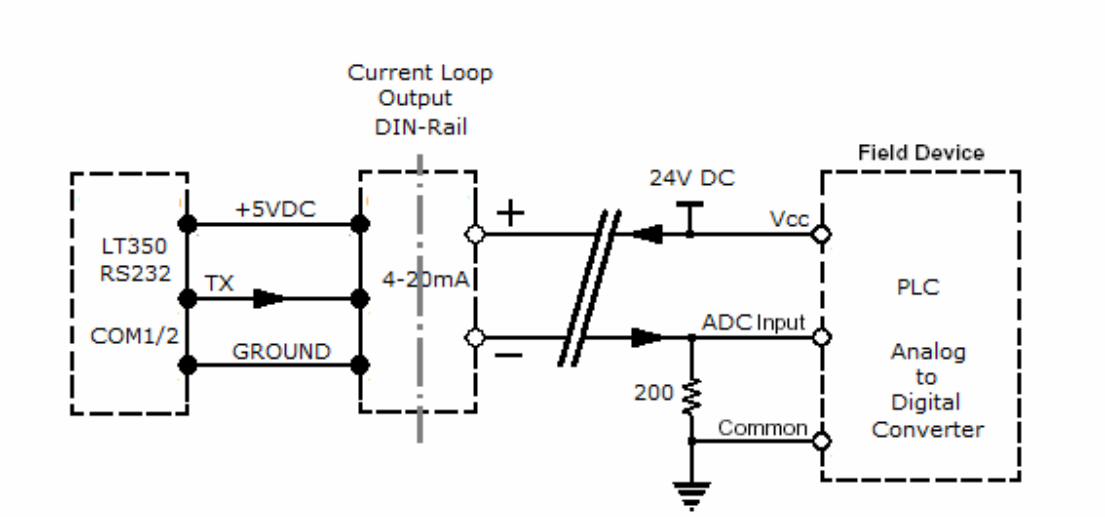
*Remember to save changes to parameters once finished using **F1** once you are back in the main screen.*

The external current loop interface can work on COM1 or COM2 and depending on the COM port used, the serial settings need to be set as follows

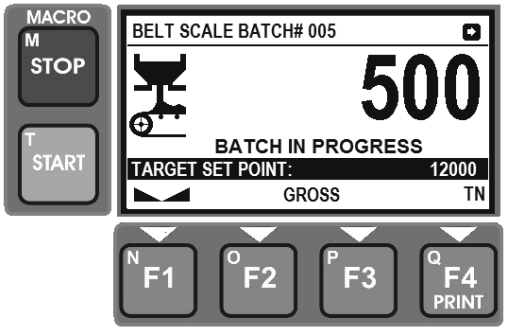
Serial Port Setup

COM1 or 2 Baud rate: 9600
COM1 or 2 Protocol : Current Loop
COM1 or 2 Poll Mode: TX Continuously

Please see the internal current loop setup procedures for how to configure the current loop parameters.



HOW TO CONFIGURE SET POINT PARAMETERS



To set belt scale batch parameters, press **STOP** to exit to setup mode. Press the **MENU** key and use the UP/DOWN arrows to select **BELT BATCH SETUP**. These parameters set warning delay and belt startup timers. Once enabled, press **START** to begin batching using **F3** for the set point.

*Remember to save changes to parameters once finished using **F1** once you are back in the main screen.*

Enable Batch Mode

This parameter enables batch mode. Once the batch mode is enabled, the user needs to press **F3** to set the weigh set point. The user must then press **START** to activate a batch. If the printer is enabled on **COM1**, batch related data will be printed at the start and end of each batch draft. The batch process can be paused by pressing **STOP**. IO Point [0] controls the feeder bin gate.

Belt Start-up Timer

This parameter specifies the number of seconds to wait for the belt to come up to speed before opening the material supply gate. The same time period is applied after the set point is reached to give the belt enough time to clear material from the belt. IO Point [1] controls the belt motor.

Warning Start Timer

This parameter can be used for an alarm to warn that the belt is about to start after the following number of seconds**.** IO Point [2] controls start alarm.

IO Point[3] External Start Input

This IO point behaves exactly the same as the **START** key on the front panel. Can be wired for remote control.

IO Point[4] External Stop Input

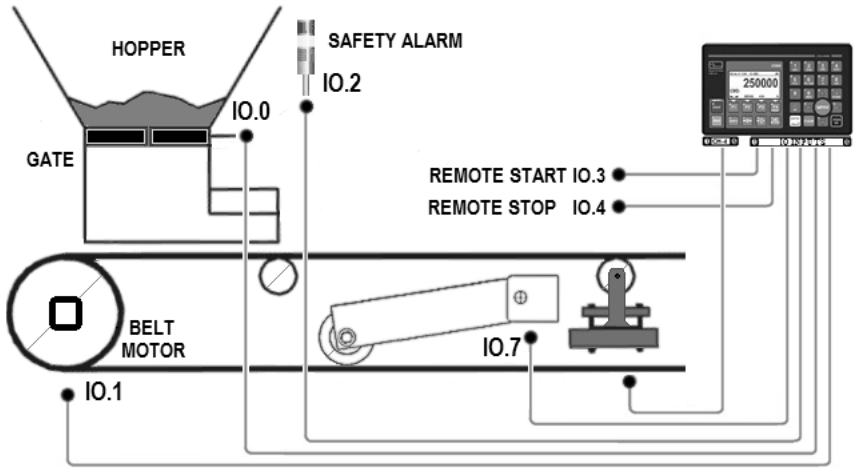
This IO point behaves exactly the same as the **STOP** key on the front panel. Can be wired for remote control.

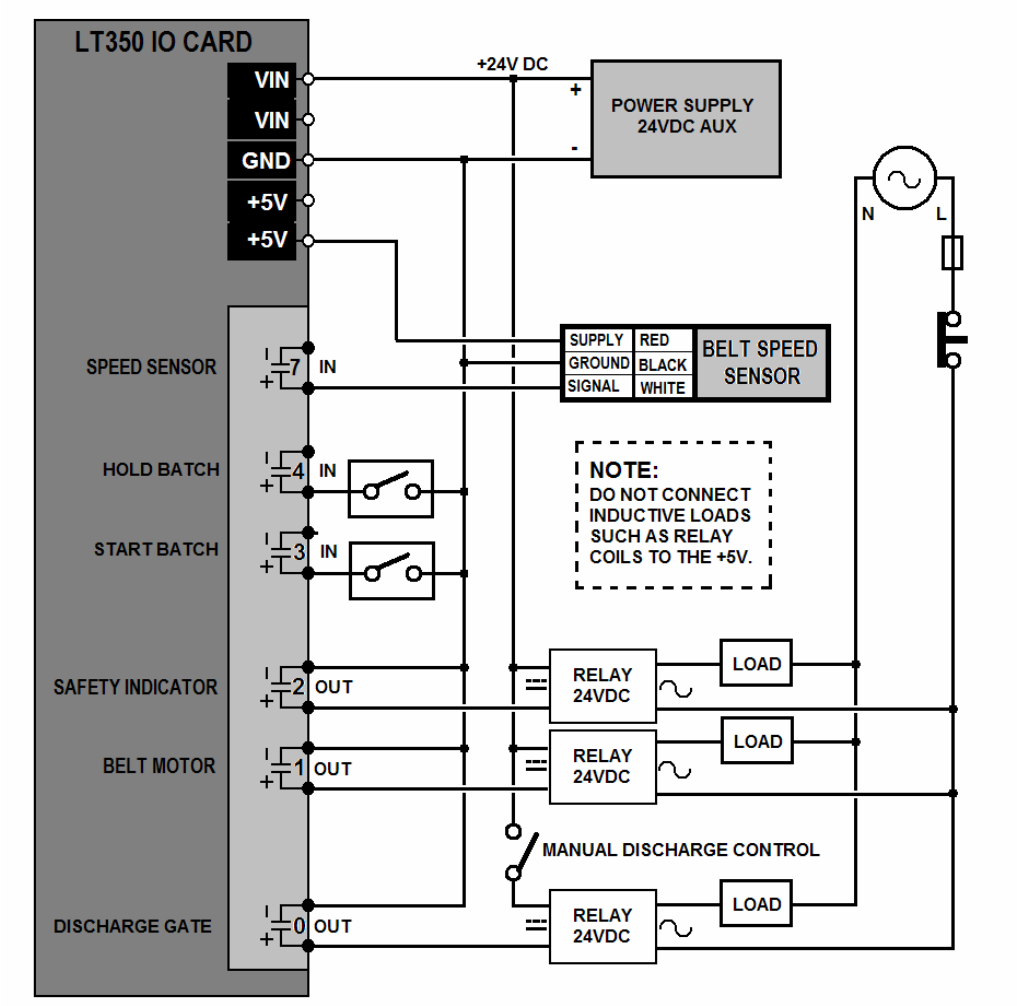
The batch counter is battery backed up as well as the belt set point which allows the system to recover from power interruptions. In order to reset the batch counter, the user need to enter calibration mode as described earlier on and disable and re-enable the batch function – this will also reset the batch counter. The batch counter is used with the printer reports when the COM port is configured as a printer port.

F3 is used to enter the set point for the belt batch function. The user can switch between base units lb or kg to Tonnes by pressing the **UNITS** key.

NOTE: If the Totalizer Pulse Output is enabled, the batch function will be disabled.

HOW TO WIRE THE SET POINT INTERFACE





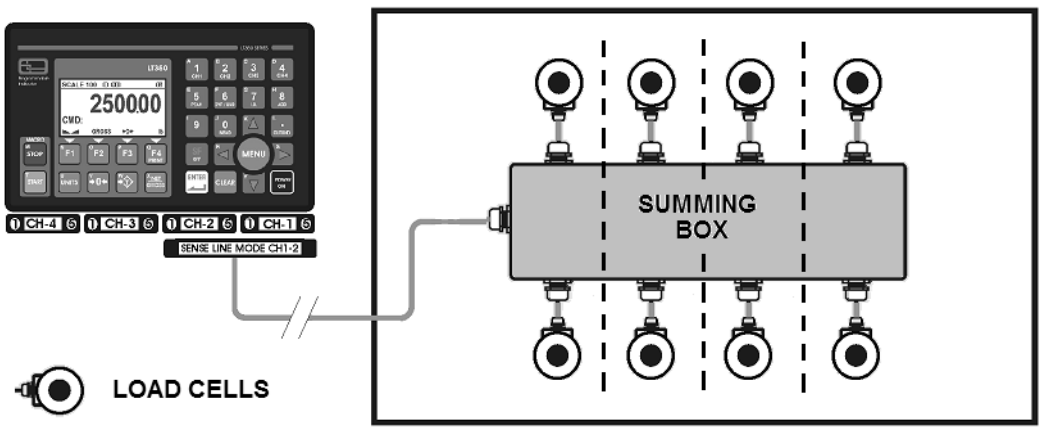
HOW TO TRIM A SUMMING BOX

This is a general guideline for connecting multiple weigh idler load cells using a summing box. Each weigh idler typically has two load cells connected together using a two channel summing box. The output of each weigh idler summing box is then connected to the LT350 scale channels 1 up to 4.

If you opt for multiple idlers per single channel using a summing box - see section on multiple idlers to single channel below.

Trimming is a process of equalizing the output from multiple individual load cells, or from pairs of cells if using a summing box per weigh idler. When all errors except cell mismatch and cable extensions or reductions have been corrected, continue with the trimming procedures as follows :

1. Set all potentiometers fully counter-clockwise to give maximum signal output from all cells for the weigh idler to be adjusted.
2. Zero the indicator and place calibration test weights over each scale idler in turn. The amount of test weights used depends on the scale configurations; for specific recommendations, refer to Handbook 44 Field Manual. It is recommended to use a weight of at least 25% of the scale capacity not exceeding the maximum capacity of any individual load cell rating.
3. Record the value each time weight is placed on the scale and allow the scale to return to zero to check the friction on other mechanical problems. Select the weigh idler which has the lowest value as your reference point – this weigh idler will not be trimmed.
4. Now repeat the same test weight over each weigh idler and trim each with its potentiometer down to the correct weight. Above sequence might have to be repeated.
5. Tighten all wiring connections and plugs. Pull excess cable out of the enclosure and tighten cord grip assemblies to make it watertight.
6. Connect thick copper rod on outside of metal enclosure to earth ground of the scale chassis for a lightning bypass.



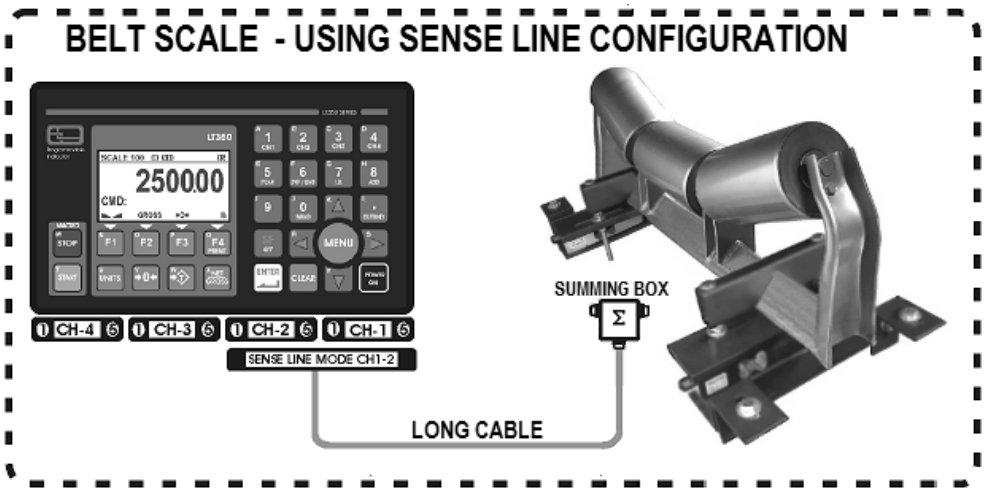
LT350BSI BELT SCALE - SENSE LINE MODE

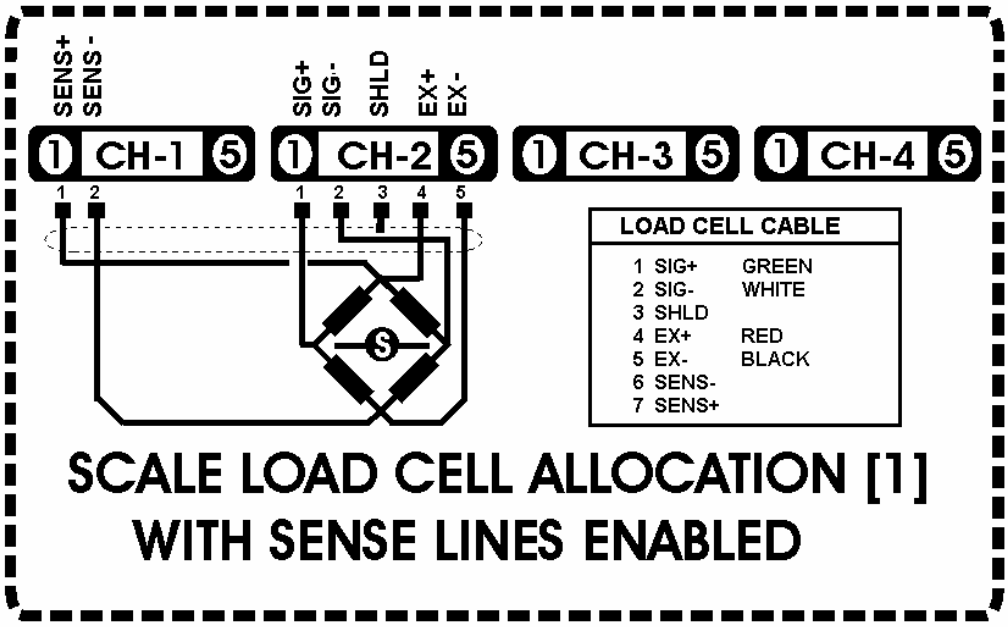
COMMAND[52] enables sense line mode, the CH1 becomes the sense line input while CH2 becomes the weigh idler scale input, while CH3 and CH4 are not used if sense lines are enabled.

If you opt for multiple idlers per single channel using a summing box - see section on multiple idlers to single channel.

This configuration is typically used for applications in an electrical noisy environment, or for long cable drops to minimize signal degradation. The user can also place a summing board at the end of the cable to facilitate a multiple weigh idler configuration.

NOTE: SENSE+/- must be paired with EX+/- at the summing box terminal end.





HOW TO SETUP MULTIPLE WEIGH IDLERS TO SINGLE CHANNEL

A single channel can be configured to connect to multiple scale idlers [1-10]. This is accomplished by using the **Calibration Wizard** during calibration. Select the Calibration Wizard in calibration mode.

If you plan to use the 6 wire COMMAND[52] sense line mode, select it first before entering the wizard. See sense line mode for more details.

Using the Calibration Wizard in calibration mode

- make sure you select (1) channel for the scale idlers channels
- when asked how many weigh idlers you have installed on your belt enter the number of weigh idlers [1-10]

Guide for connecting multiple idlers to one channel with or without sense line mode

- If idler has more than one load cell - connect to a summing box
- Connect all weigh idlers to a summing box with one trim pot per weigh idler
- Preset the trimming pots as per summing box manual
- Connect summing box 4 wire to single channel - typically for short cable runs
- Connect summing box 6 wire to sense line mode - long cable runs
- Proceed to software calibration

Guide for calibrating the static weight for the weigh bridge.

- Remove weights from all idlers and do a dead load zero calibration
- Place equal weights on all weigh idlers and span calibrate to the sum of all weights.
- Remove weights from weigh idlers and add a weight to each weigh idler respectively
- Trim pot for each idler to the target weight as required
- Finally place all weights on each weigh idler and perform a span calibration again
- Repeat this sequence if so required

NOTE:

The weight displayed in the main calibration mode display is the summed weight for all weigh idlers and can be used to check each weigh idler during calibration.

However the weight displayed during the belt scale runtime display is the sum of all weigh idlers divided by the sum of the number of weigh idlers on the conveyor belt displayed as an average.

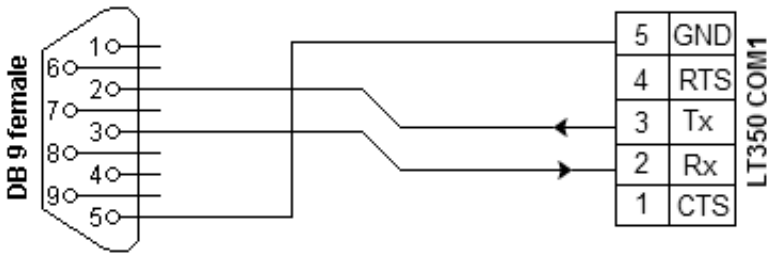
HOW TO SETUP SERIAL RS232 TO TRANSMIT WEIGHT DATA

To transmit a RS232 ASCII string containing weight information on a serial port do following:

- **COMMAND[26]** – check that the serial port is setup for RS232 mode.
- **COMMAND[27]** – serial baud rate 1200,4800,9600,14400,38400,57600 or 230400
- **COMMAND[28]** – protocol string format. The LT350 Belt scale data include speed, rate and total related data.
- **COMMAND[29]** – This command dictates whether the string is transmitted automatically or polled via an ASCII command set.

Windows HyperTerminal can be used to capture serial data strings at the same baud rate

Computer	LT350 COM1	Function
2	2	Rx ← Tx
3	3	Tx → Rx
5	7	Signal ground



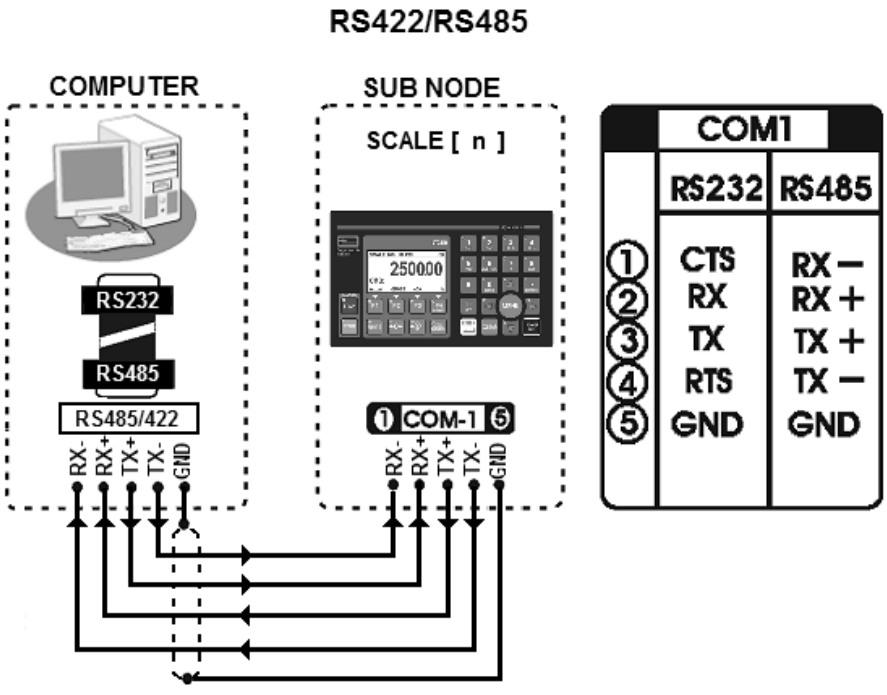
NOTE: *Many PCs today only support RS232 via USB which requires a USB to SERIAL cable*

HOW TO SETUP RS22/485 TO TRANSMIT WEIGHT DATA

To change between RS232 and RS485 mode, the user must first unplug the COM1 cable. This configuration allows for long distance transmission over 100 meters. Unplug serial port, change to RS485 and then do the correct wire setup as outlined below before re-connecting:

- **COMMAND[26]** – Disconnect serial port connector and then set COM1 for RS485 mode. Port may get damaged if a cable is left plugged in that is not an RS485 type.
- **COMMAND[27]** – serial baud rate 1200,4800,9600,14400,38400,57600 or 230400
- **COMMAND[28]** – protocol string format. The LT350 Belt scale data include speed, rate and total related data.
- **COMMAND[29]** – This command dictates whether the string is transmitted automatically or polled via the ASCII command

Windows HyperTerminal can be used to capture serial data strings at the same baud rate



NOTE: *A RS232 to RS422 converter is required for the computer*

HOW TO SETUP TCP/IP TO TRANSMIT WEIGHT DATA - I

This setup assumes that a TCP/IP network port is installed on the LT350. The CAT5 network cable can also be the power source to power the LT350 – see PoE:

COMMAND[35] – Submenu for internet setup

INTERNET NETWORK PARAMETERS	
IP address:	Sets the device IP address when DHCP is off. Factory default is [192.168.1.200] *This address needs to be obtained from the network administrator.*
Subnet Mask:	Sets the device subnet mask address when DHCP is off. Factory default is [255.255.255.000] *This address needs to be obtained from the network administrator.*
Default Gateway:	Sets the default gateway address. Factory default is [192.168.1.1] *This address needs to be obtained from the network administrator.*
DHCP Mode:	If a DHCP server is available on you network you can have an IP address allocated by the server – try not to use DHCP where possible. *You should try to obtain an extended lease on the IP address from the network administrator – typically a real life person.*
Protocol Mode:	protocol string format. The LT350 Belt scale data include speed, rate and total related data.
String Poll Mode:	This command dictates whether the string is transmitted automatically or polled via the ASCII command set.
Wireless SSID:	You should set this SSID to the same as your wireless router SSID. The factory SSID is:**[Connect]**
Node ID:	The node ID [1-100] will be set to the value displayed on the display screen e.g. SCALE 100. If you use the discovery software tool to search for network enabled connected nodes on the internet, the node ID will be used to identify your device. This is particularly important if you will be using DHCP.

Windows HyperTerminal can be used by selecting WinSock to capture the data strings by specifying the IP address at Port 502

(continued on next page)

HOW TO SETUP TCP/IP TO TRANSMIT WEIGHT DATA II

It is highly recommended to use a separate intelligent Ethernet Switching Router that learns and only forwards data between the two parties that communicate, instead of broadcasting it all across the entire network, slowing everything down – do not use a simple repeating hub.

To setup a LT350 indicator using TCP/IP over CAT5 cable and an Ethernet router, using **COMMAND[35]** Submenu for internet setup.

- Get a static IP address for your LT350 and enter it by selecting IP address in the sub menu in the form of [196.168.200].
- Get the Network mask for the network you connecting to – enter it at the sub menu, Network Mask. Most networks use the default of [255.255.255.000]. This information is readily available on any computer connected to the network – simply copy this information. This information is also available in the network router setup pages.
- Get the Default Gateway information and enter it at the sub menu, Default Gateway. This information should be the same as any computer connected to the network or on the network router.
- DHCP for industrial purposes should be avoided. If the network administrator does not allow static IP addresses for some reason. Try to negotiate a “long lease” for the DHCP assignment.

Alternatively, connect to the indicator through an Ethernet Switch using a standard CAT5 cable (never connect the indicator direct to the PC) web interface to setup the network address information.

- The network setup interface requires a login and password. The default login and password is as follows: LOGIN = **[root]** and PASSWORD = **[dbps]**
- You will then be directed to the TCP/IP address settings. Fill in the IP address, Network Mask and Default Gateway.
- Save the settings and request the LT350 to reboot with new settings – may take a long time, up to 20 seconds for reboot.
- The green LED (furthest from the display) must flash during boot up and then remain off during normal operation.
- The yellow LED (closest to the display) should stay on as soon as a CAT5 cable is connected. It should flicker during data transmissions.

HOW TO SET SCALE FILTER PARAMETERS

The belt scale sensitivity can be adjusted for systems with vibration issues. Increasing the default values for more stable data. If a more responsive scale with high sensitivity is required the values of the filter parameters can be lowered. It is a good idea to always start with the default settings and start tuning the system accordingly.

PARAMETER (40) - SCALE AVERAGING FILTER

The scale averaging can be adjusted from (1 - 10) where 1 is no filtering with a very sensitive scale response. A value of 10 signify the largest filtering value. A high value is typically used for scale structures with lots of vibration.

PARAMETER (41) - SCALE FAST STEP THRESHOLD

This parameter is the difference between the new and the last sample and use it as a threshold point from (1-100). If the difference is larger than the threshold value we assume a fast step action to occur. Assume a belt that is settling at some weight level for some time. The averaging sample buffer will eventually be set at this weight. This condition might be interrupted by a full scale weight change. However, if we have selected a heavy scale averaging value in parameter (40), it will take some time, as long as a few second even, to update the averaging value to the new step level of the belt weight. The fast step threshold sets a value whereby the averaging filter will be re-populated with the new average weight value - we call this a fast step condition. To prevent the occurrences of false fast step triggers, we can increase the threshold (1-100) to a level that will hopefully eliminate the chances of a false fast trigger or spike.

PARAMETER (42) - SCALE FAST STEP ON/OFF

This parameter enable or disable the fast step parameter (41). Fast step is normally enabled with system default. If the fast step is disabled and you have heavy averaging set with parameter (40) you might notice that your system responds very sluggishly for large weight changes or step conditions and the only way to solve this is to lower the averaging value in parameter (40).

PARAMETER(53) – SCALE UPDATE RATE

This parameter determine the analog to digital channel scan rate (default 20 scans per second).

APPENDIX A: String - LT350 BSI TYPE 1

[<][C][T][TTTTTTTTTTTT][,][U][:][D][C][C][>]

0 1
[<] [C] *(belt number)*
2 3 15 16
[T] [T] [,] [U] *(belt Total)*
17 18
[:] [D] *(belt status)*
19 20 21
[C] [C] [>] *(belt checksum)*

0	**<**	1 byte	String start delimiter
1	**C**	1 byte	Belt scale channel number [1-4]
2	**T**	1 byte	Parameter start delimiter
3	**T**	12 bytes	**Belt Total – 12 digits**
15	**,**	1 byte	Parameter separator
16	**U**	1 byte	Total units: L(lb), K(kg) or T(tonnes)
17	**:**	1 byte	Parameter start delimiter
18	**D**	1 byte	System state Diagnostics **[SPACE]** Indicates normal operation **O** Indicates scale over capacity **N** Indicates scale negative **M** Indicates motion on scale **Z** Scale at zero weight [Z] or not at zero [SPACE] **H** Integrator halted
19	**C**	1 byte	Upper checksum hex byte for inverted checksum of bytes 0-18
20	**C**	1 byte	Lower checksum hex byte for inverted checksum of bytes 0-18
21	**>**	1 byte	String end delimiter
22	**CR**		
23	**LF**		

APPENDIX B: String - LT350 BSI TYPE 2

[<][C][T][TTTTTTTTTTTT][,][U][S][SSSSSSSS][,][U][:][D][C][C][>]

0	1			
[<]	**[C]**			*(belt number)*
2	3	15	16	
[T]	**[T]**	**[,]**	**[U]**	*(belt total)*
17	18	26	27	
[S]	**[S]**	**[,]**	**[U]**	*(belt speed)*
28	29			
[:]	**[D]**			*(belt state)*
30	31	32		
[C]	**[C]**	**[>]**		*(checksum)*

0	**<**	1 byte	String start delimiter
1	**C**	1 byte	Belt scale channel number [1-4]
2	**T**	1 byte	Parameter start delimiter
3	**T**	12 bytes	**Belt Total – 12 digits**
15	**,**	1 byte	Parameter separator
16	**U**	1 byte	Total units: L(lb), K(kg) or T(tonnes)
17	**S**	1 byte	Parameter start delimiter
18	**S**	8 bytes	**Belt speed**
26	**,**	1 byte	Parameter separator
27	**U**	1byte	Belt speed units: f**t/s, ft/m, ft/h, M/s, M/m, M/h**
28	**:**	1 byte	Parameter start delimiter
29	**D**	1 byte	Belt State **[SPACE]** Indicates normal operation **O** Indicates scale over capacity **N** Indicates scale negative **M** Indicates motion on scale **Z** Scale at zero weight [Z] or not at zero [SPACE] **H** Integrator halted
30	**C**	1 byte	Upper checksum hex byte for inverted checksum of data 0-29
31	**C**	1 byte	Lower checksum hex byte for inverted checksum of data 0-29
32	**>**	1 byte	String end delimiter
33	**CR**		
34	**LF**		

APPENDIX C: String - LT350 BSI TYPE 3

[<][C][T][TTTTTTTTTTTT][,][U][S][SSSSSSSS][,][U][R][RRRRRRRR][,][U][:][D][C][C][>]

0	1				
[<]	**[C]**				*(belt number)*
2	3	15	16		
[T]	**[T]**	**[,]**	**[U]**		*(belt total)*
17	18	26	27		
[S]	**[S]**	**[,]**	**[U]**		*(belt speed)*
28	29	37	38		
[R]	**[R]**	**[,]**	**[U]**		*(belt rate)*
39	40				
[:]	**[D]**				*(belt state)*
41	42	43			
[C]	**[C]**	**[>]**			*(checksum)*

0	**<**	1 byte	String start delimiter
1	**C**	1 byte	Belt scale channel number [1-4]
2	**T**	1 byte	Parameter start delimiter
3	**T**	12 bytes	**Belt Total – 12 digits**
15	**,**	1 byte	Parameter separator
16	**U**	1 byte	Total units: L(lb), K(kg) or T(tonnes)
17	**S**	1 byte	Parameter start delimiter
18	**S**	8 bytes	**Belt speed**
26	**,**	1 byte	Parameter separator
27	**U**	1byte	Belt speed units: f**t/s, ft/m, ft/h, M/s, M/m, M/h**
28	**R**	1 byte	Parameter start delimiter
29	**R**	8 bytes	**Belt rate**
37	**,**	1 byte	Parameter separator
38	**U**	1byte	Belt speed units: **kg**/s/m/h, **lb**/s/m/h, **T**/s/m/h
39	**:**	1 byte	Parameter start delimiter
40	**D**	1 byte	Belt State **[SPACE]** Indicates normal operation **O** Indicates scale over capacity **N** Indicates scale negative **M** Indicates motion on scale **Z** Scale at zero weight [Z] or not at zero [SPACE] **H** Integrator halted
41	**C**	1 byte	Upper checksum hex byte for inverted checksum of data 0-40
42	**C**	1 byte	Lower checksum hex byte for inverted checksum of data 0-40
43	**>**	1 byte	String end delimiter

APPENDIX D: **String - LT350 BSI TYPE 4**

[<][C][T][TTTTTTTTTTTT][,][U][S][SSSSSSSS][,][U][R][RRRRRRRR][,][U][L][LLLLLLLL][,][U][:][D][C][C][>]

0 **[<]**	1 **[C]**				*(belt number)*
2 **[T]**	3 **[T]**	15 **[,]**	16 **[U]**		*(belt total)*
17 **[S]**	18 **[S]**	26 **[,]**	27 **[U]**		*(belt speed)*
28 **[R]**	29 **[R]**	37 **[,]**	38 **[U]**		*(belt rate)*
39 **[L]**	40 **[L]**	48 **[,]**	49 **[U]**		*(belt load)*
50 **[:]**	51 **[D]**				*(belt state)*
52 **[C]**	53 **[C]**	54 **[>]**			*(checksum)*

0	**<**	1byte	String start delimiter
1	**C**	1 byte	Belt scale channel number [1-4]
2	**T**	1 byte	Parameter start delimiter
3	**T**	12 bytes	**Belt Total – 12 digits**
15	**,**	1 byte	Parameter separator
16	**U**	1 byte	Total units: L(lb), K(kg) or T(tonnes)
17	**S**	1 byte	Parameter start delimiter
18	**S**	8 bytes	**Belt speed**
26	**,**	1 byte	Parameter separator
27	**U**	1byte	Belt speed units: f**t/s, ft/m, ft/h, M/s, M/m, M/h**
28	**R**	1 byte	Parameter start delimiter
29	**R**	8 bytes	**Belt rate**
37	**,**	1 byte	Parameter separator
38	**U**	1byte	Belt speed units: **kg**/s/m/h, **lb**/s/m/h, **T**/s/m/h
39	**L**	1 byte	Parameter start delimiter
40	**L**	6 bytes	**Belt Load**
48	**,**	1 byte	Parameter separator
49	**U**	1byte	Belt Load: kg, lb
50	**:**	1 byte	Parameter start delimiter
51	**D**	1 byte	**Belt State**
52	**C**	1 byte	Upper checksum hex byte for inverted checksum of data 0-51
53	**C**	1 byte	Lower checksum hex byte for inverted checksum of data 0-51
54	**>**	1 byte	String end delimiter

UNIT CONVERSION TABLE

Primary Units	Multiplication Factor	Secondary Units	
Pounds (lb)	0.453592	kilograms	kg
	0.0005	Short tons	TN
	0.000446	Long tons	LT
	0.000453	Metric tons	T
Primary Units	**Multiplication Factor**	**Secondary Units**	
Kilograms (kg)	2.20462	pounds	lb
	0.001102	Short tons	TN
	0.000984	Long tons	LT
	0.001000	Metric tons	T
Primary Units	**Multiplication Factor**	**Secondary Units**	
Short Tons (TN)	2000.00	pounds	lb
	907.185	kilograms	kg
	0.892857	Long tons	TN
	0.907185	Metric tons	T
Primary Units	**Multiplication Factor**	**Secondary Units**	
Metric Tons (T)	2204.62	pounds	lb
	1000.00	kilograms	kg
	1.10231	Short tons	TN
	0.984207	Long tons	LT
Primary Units	**Multiplication Factor**	**Secondary Units**	
Long Tons (LT)	2240.00	pounds	lb
	1016.05	kilograms	kg
	1.1200	Short tons	TN
	1.01605	Metric Tons	T