

# **PWi / N800 STI Supplemental Manual**

**Revision: B**

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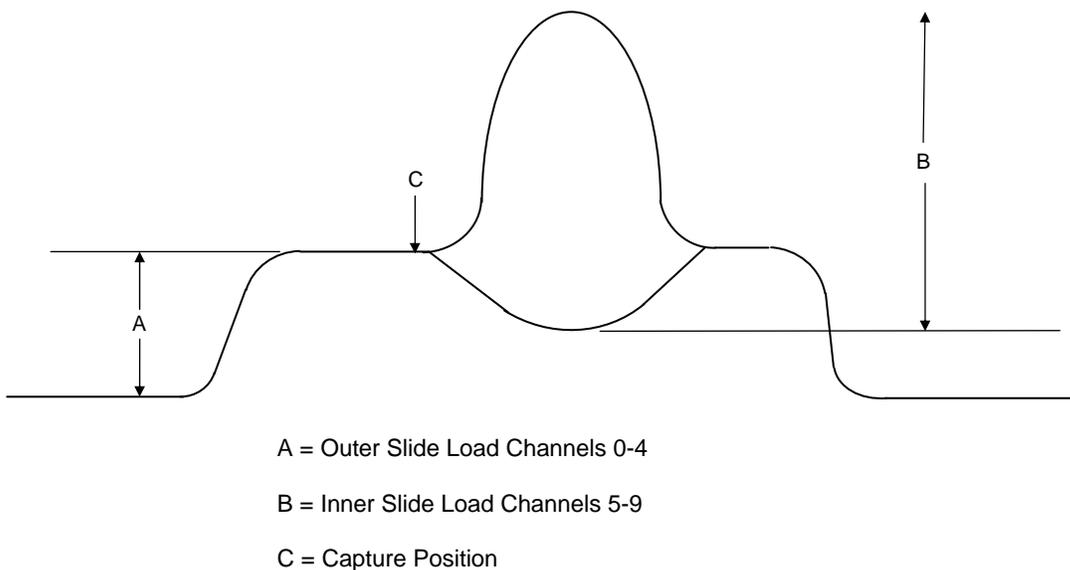
# 1: STI DESCRIPTION

Getting usable punch load information from a top-drive double action press has always been difficult. Because of the way these presses are designed, the outer slide load drops off as the punch does its work. This is a problem for standard load monitors because they cannot show this outer slide drop off and thus the true inner punch load. The PWi / N800 STI tonnage mode solves this problem by displaying the actual inner slide load and the actual outer slide load.

The STI tonnage mode is specially designed for top-drive double action stamping presses. Most tonnage monitors are used on underdrive presses. On these presses the only place to get usable signals is with sensors on the pull rods. With top-drive double action presses it is often impossible to find space on a moving member where the sensors can be mounted. The STI tonnage mode overcomes this problem by providing useful load information with just four frame-mounted sensors.

STI stands for Slide Tonnage Isolation. The signal on the frame of a top-drive double action press contains load information from both the outer slide (blankholder) and the inner slide (punch). This composite signal is separated electronically to faithfully isolate the inner slide signal from the outer slide signal. The PWi / N800 displays show the load distribution and total of the outer slide (channels 0-4), and the load distribution and total of the inner slide (channels 5-9). This allows you to see the actual inner punch load.

**Figure 1.1: Typical Composite Load Signature**



## 2: STI OPERATION

Most of the tonnage-related features of the PWi / N800 such as job storage, benchmark and setpoint learning, and alarms, may still be used while operating in STI tonnage mode.

However, you should note the following exception:

- STI tonnage mode works best on presses with a maximum speed of 45 strokes per minute.

### **Enabling STI tonnage mode:**

STI tonnage mode is selected on the *Configuration* → *MODE* menu. Simply push  to select the mode, push  or  to change the mode setting to **STI**, and push  to accept.

**Figure 2.1: The Mode Menu**



The following notes apply when the PWi / N800 is set to STI Mode:

- STI Mode requires 4 sensors wired to 8 sensor inputs to work properly. Therefore, while the mode is set to STI, the number of channels in the *CHAN (Channel)* menu is set to 8 and cannot be changed.
- Because STI Mode separates the load signal into an outer slide portion and an inner slide portion, the PWi / N800 operates in an 8-channel configuration. As a general rule, data for the outer slide (blankholder) is shown on the 7-segment displays and data for the inner slide (punch) is shown on the LCD. Refer to the **Understanding the Displays** section (8-channel configuration) in the User's Manual.

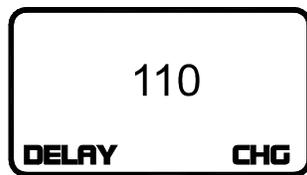
Note: Some custom programs will interchange the inner and outer slide displays depending on the customer's requirements. In these cases, the inner slide (punch) is shown on the 7-segment displays while the outer slide (blankholder) is shown on the 7-segment displays.

- While in STI Mode, the main operation menu will display **STI** next to the home icon as a reminder.
- Due to the nature of STI Mode, the reverse tonnage for the inner slide will always be zero. Reverse tonnage is still available for the outer slide.

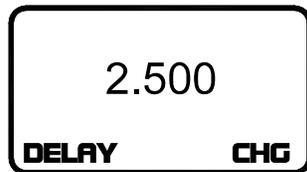
**Setting the capture (delay) position/time:**

The capture position or time is the press position where the blankholder is clamping, before the punch comes in (see item C in **Figure 1.1**). This value depends on the trigger method used. If the unit is triggered by a resolver, the delay value will be the press angle. If the unit is triggered by threshold or by a probe, the delay value will be the time in seconds. To set the capture position or time, navigate to the *Configuration* → *DELAY* menu and push  to select the current delay value, use the up or down arrow buttons to change the value, and push  to accept. For resolver-based systems, 110° to 140° are typical capture position angles. For time-based systems (threshold or probe triggering), the capture time will vary widely, depending on the speed of the press.

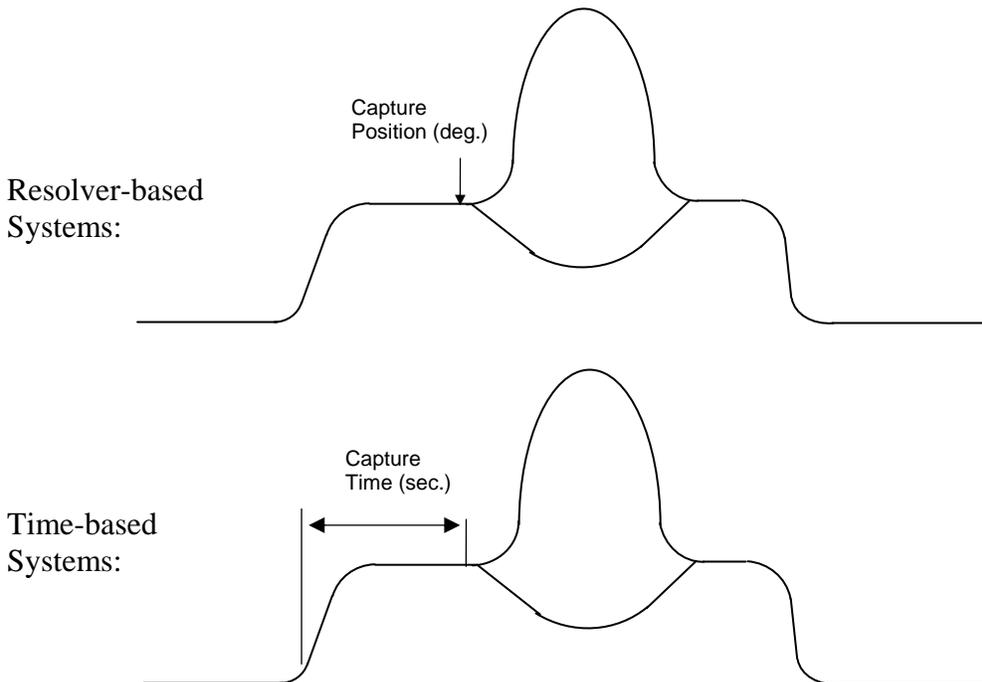
**Figure 2.2: The Delay Menu**



Capture position in degrees for resolver-based systems.



Capture time in seconds for time-based systems.

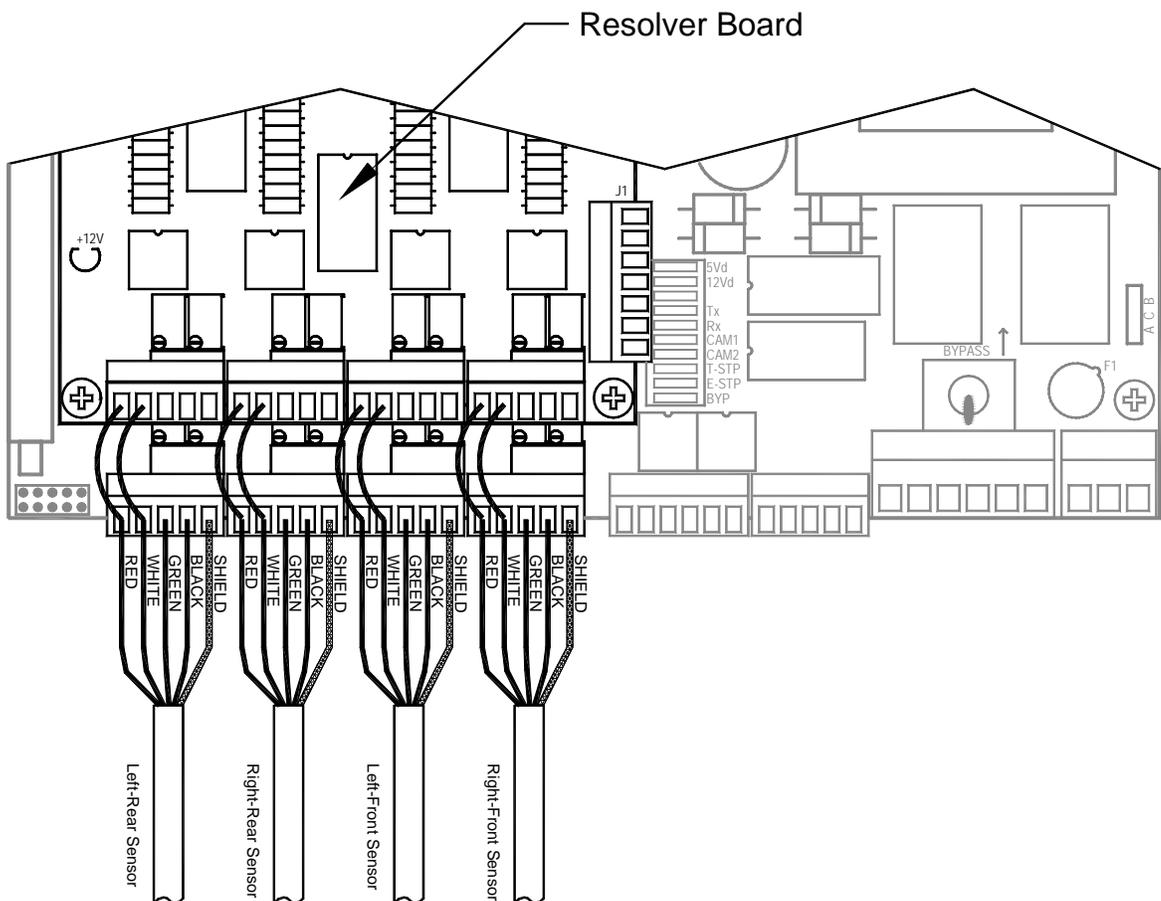


### 3: STI SENSOR INSTALLATION

Follow the installation instructions in the PWi / N800 Installation Manual to install the tonnage sensors. Then follow the steps below:

- 1) Wire the (4) sensors to the outer slide channels (CH1-4) according to the Installation Manual. The left-rear sensor should go to CH1, the right-rear sensor should go to CH2, the left-front sensor should go to CH3, and the right-front sensor should go to CH4.
- 2) Wire the CH1 red and white signal wires in parallel to the CH6 red and white terminals. Follow the diagram below.
- 3) Repeat step #2 for each of the remaining channels.
- 4) The unit can now be calibrated.

**Figure 3.1: Sensor Wiring for STI Installation**

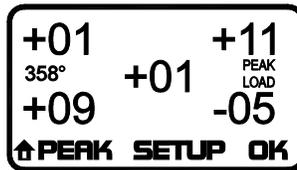


## 4: CALIBRATION

In order to calibrate the PWi / N800 you will need stands, spacers, shims, and eight load cells in order to load both the inner and outer slides at the same time. Use the following steps for proper tonnage calibration:

### 1) Place the PWi / N800 in Setup Mode

- A. On the Main Operation screen, place the unit in Setup mode. This will eliminate the possibility of nuisance alarms during the calibration procedure.



### 2) Set Press Capacity

- A. Enter the Configuration Menu by toggling Dip-Switch 1 to the down position (refer to the User's Manual for dip switch location).
- B. Navigate to the *Configuration* → *CAP (Capacity)* menu.
- C. Determine the capacities for the outer slide and the inner slide, as specified by the press manufacturer. Enter the outer slide capacity in the center 7-segment display (each of the corners' capacities may be adjusted individually, if needed). Then, use the  button to cycle through the channels until the inner slide total (center of LCD) is selected. Enter the inner slide capacity (each of the corners' capacities may be adjusted individually, if needed). Refer to the Capacity Menu section of the User's Manual for more detail.

### 3) Set the Mode to Peak

- A. Navigate to the *Configuration* → *MODE* menu.
- B. Set the mode to **PEAK**. Do not turn on STI mode at this time.

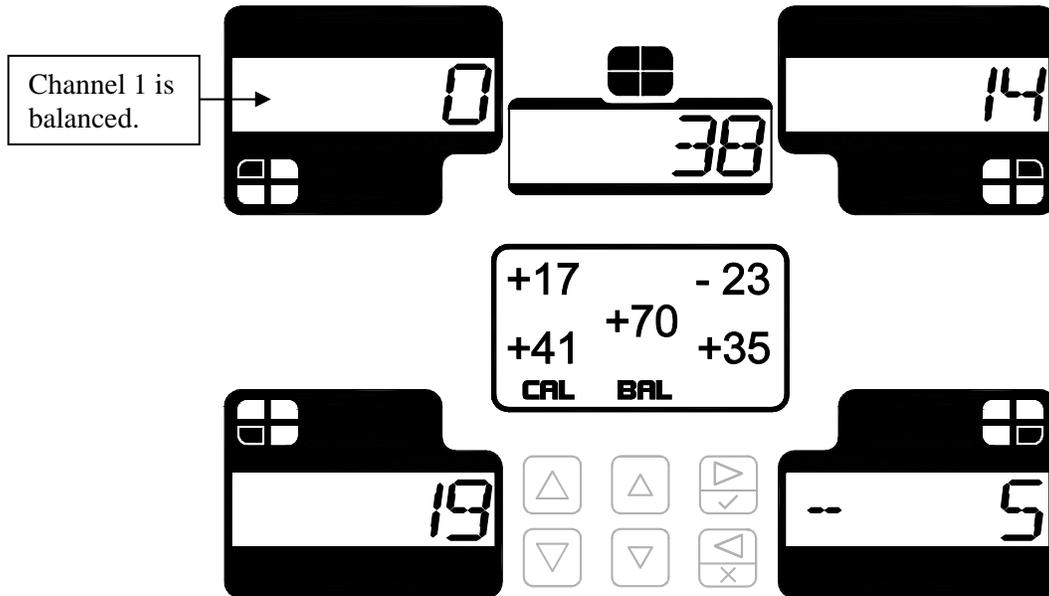
### 4) Calibrate the Outer Slide (Channels 1-4)

#### A. Balance the Tonnage Sensors

- i. Make sure the press is under no load.
- ii. Connect the tonnage sensors to channels 1, 2, 3, and 4 only. Do not connect channels 6, 7, 8, and 9.
- iii. Navigate to the *Configuration* → *CAL (Calibration)* menu.
- iv. Open the PWi / N800 enclosure and locate the Balance and Gain pots for channels 1-4 on the Analog Board (refer to the User's Manual).



- v. Adjust the balance pot for CH1 until the balance value for channel 1 reads zero. Turn the pot clockwise to increase the balance value and counter-clockwise to decrease the balance value.



- vi. Repeat step v for channels 2, 3, and 4.

**B. Find the Shut Height of the Press**

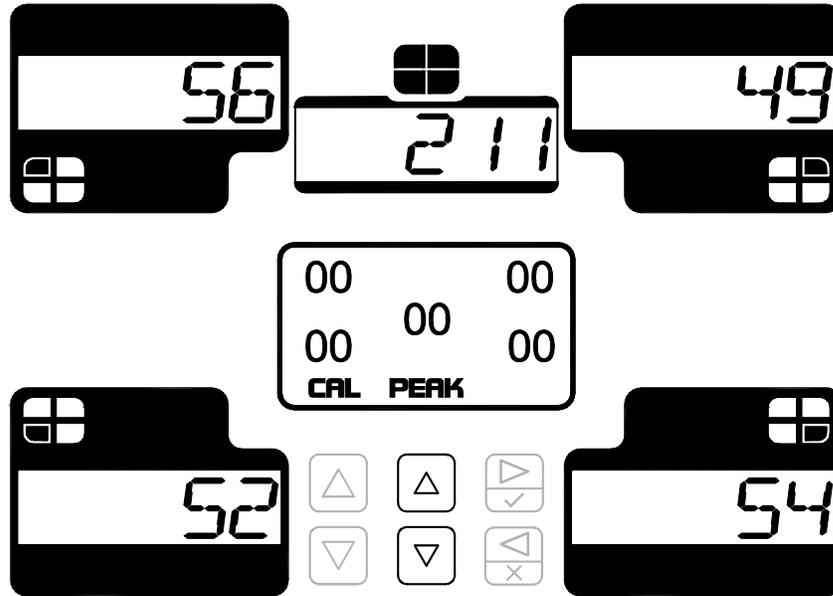
- i. Jog the press until the ram is at bottom dead center (BDC) or 180° without any load cells or the die in the press.
- ii. Determine the amount of spacers needed with your load cells. Cycle the press without load cells to insure correct height.

**C. Place the Load Cells in the Correct Position in the Press**

- i. Place a load cell under each corner of the **outer slide only**.
- ii. All load cells should be equal distance from the sides and front and rear. For example, 12” from side, 10” from front and rear. Load cells are typically placed at each corner of the press’s bed.
- iii. Cycle the press without hitting the load cells first.
- iv. Place cardboard on the top and bottom of the load cells.

**D. Cycle the Press**

- i. While still in the *Calibration* menu, push  or  to display the PEAK load.



- ii. Cycle the press once. Make sure the ram impacts the load cells. Add the four load cell values to determine the total load on the press.
- iii. Adjust the shut height and cycle the press until the press impacts the load cells (total load) at 100% of the outer slide press capacity. See warning below.

**WARNING:**

Depending on the press capacity and the size of the load cells being used, loading the press at capacity with load cells could indent the ram or bolster. To prevent this from happening, consider one of the following:

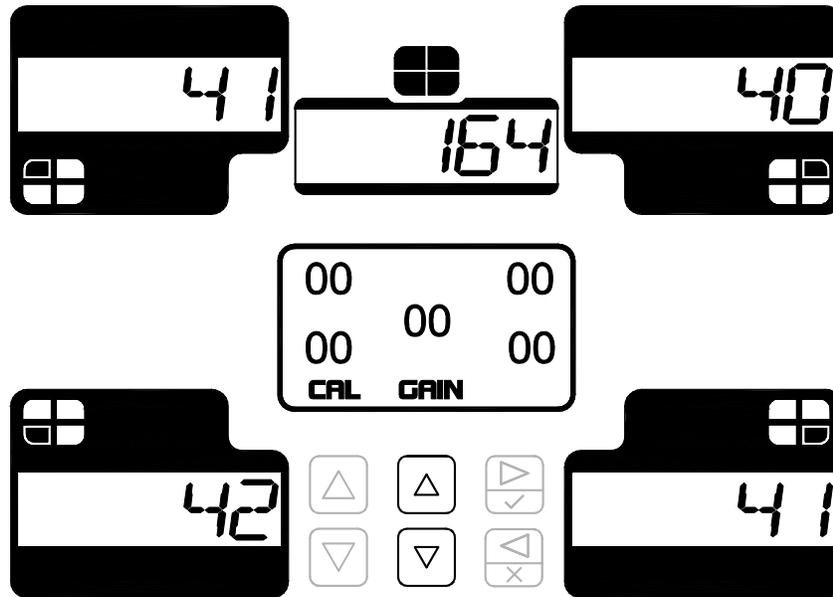
- Calibrate the press only up to 80% of capacity, or
- Use larger load cells to increase the loading surface. For instance, to calibrate a 400-ton press, use (4) 250-ton load cells instead of (4) 100-ton load cells.

- iv. Check the four load cells. Ideally, their load should match. If not, use shims on the load cells as needed until you get an evenly distributed load.

**E. Gather, Record, and Enter Data**

- i. Record the load cell numbers for each of the outer channels. These are the load values of the press corners.
- ii. Record the outer slide peak tonnage values.

- iii. Push  or  to display the Gain numbers. This enables the shunt. Record the Gain numbers for channels 1-4.



- iv. Use the following formula to determine the new gain number:

$\text{New Gain Number} = (\text{Load Cell reading} \div \text{Peak Tonnage reading}) \times \text{Current Gain Number}$
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- v. Repeat the calculation for each of the outer slide channels.
- vi. Adjust the gain pot for CH1 until the gain number for channel 1 equals the new calculated gain number. Turn the pot clockwise to increase the gain number and counter-clockwise to decrease the gain number. Repeat for each of the remaining outer slide channels.
- vii. Push  or  to display the Balance values. Use the balance pots to re-balance the channels if needed.
- viii. Push  or  to display the Gain numbers. If they are not equal to the calculated gain numbers, re-adjust them.
- ix. Repeat steps vi-viii as needed.

**F. Verify Results and Repeat**

- i. While still in the *Calibration* menu, push  or  to display the PEAK load.
- ii. Cycle the press and verify that the load cell values and the tonnage monitor's outer slide peak tonnage values are the same. If not, repeat step E until the values are the same.
- iii. This completes the outer slide calibration.

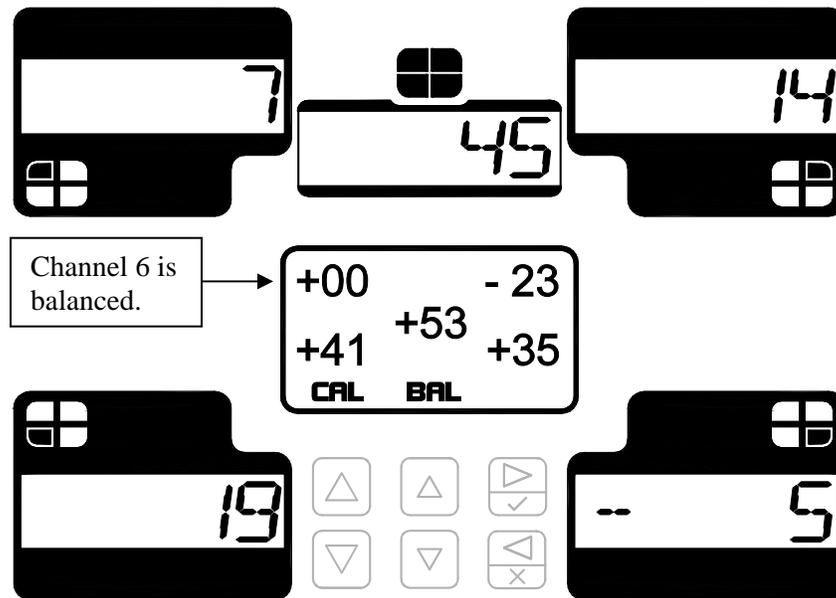
**G. Document CAL#s**

- i. Record the CAL#s (Gain) on the Calibration Sheet (Form #1224) provided with the User's Manual.
- ii. Record the CAL#s (Gain) on the Calibration Label located on the door inside the unit.

## 5) Calibrate the Inner Slide (Channels 5-9)

### A. Balance the Tonnage Sensors

- i. Make sure the press is under no load.
- ii. Connect the tonnage sensors to channels 6, 7, 8, and 9 only. Do not connect channels 1, 2, 3, and 4.
- iii. Navigate to the *Configuration* → *CAL (Calibration)* menu.
- iv. Open the PWi / N800 enclosure and locate the Balance and Gain pots for channels 6-9 on the Analog Board (refer to the User's Manual).
- v. Adjust the balance pot for CH6 until the balance value for channel 6 reads zero. Turn the pot clockwise to increase the balance value and counter-clockwise to decrease the balance value.



- vi. Repeat step v for channels 7, 8, and 9.

### B. Find the Shut Height of the Press

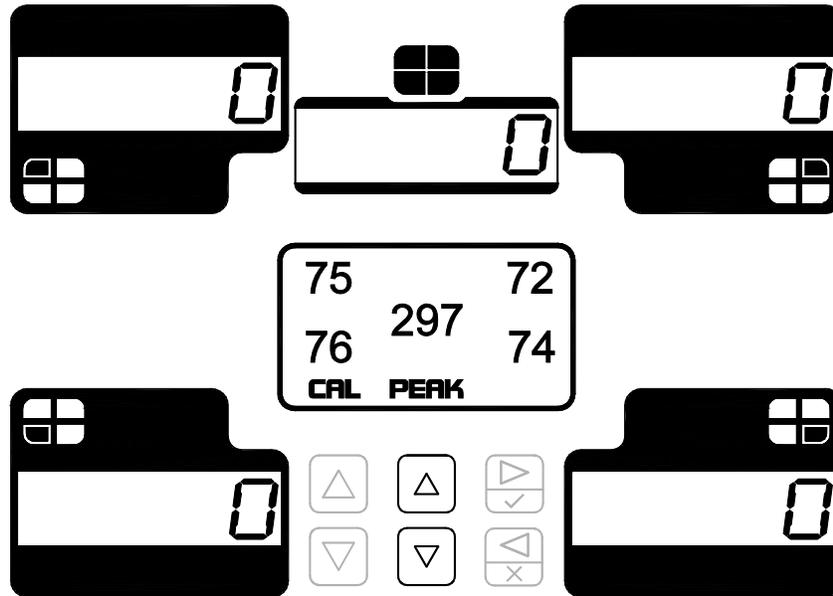
- i. Jog the press until the ram is at bottom dead center (BDC) or 180° without any load cells or the die in the press.
- ii. Determine the amount of spacers needed with your load cells. Cycle the press without load cells to insure correct height.

### C. Place the Load Cells in the Correct Position in the Press

- i. Place a load cell under each corner of the **inner slide only**.
- ii. All load cells should be equal distance from the sides and front and rear. For example, 12" from side, 10" from front and rear. Load cells are typically placed at each corner of the press's bed.
- iii. Cycle the press without hitting the load cells first.
- iv. Place cardboard on the top and bottom of the load cells.

### D. Cycle the Press

- i. While still in the *Calibration* menu, push  or  to display the PEAK load.



- ii. Cycle the press once. Make sure the ram impacts the load cells. Add the four load cell values to determine the total load on the press.
- iii. Adjust the shut height and cycle the press until the press impacts the load cells (total load) at 100% of the inner slide press capacity. See warning below.

**WARNING:**

Depending on the press capacity and the size of the load cells being used, loading the press at capacity with load cells could indent the ram or bolster. To prevent this from happening, consider one of the following:

- Calibrate the press only up to 80% of capacity, or
- Use larger load cells to increase the loading surface. For instance, to calibrate a 400-ton press, use (4) 250-ton load cells instead of (4) 100-ton load cells.

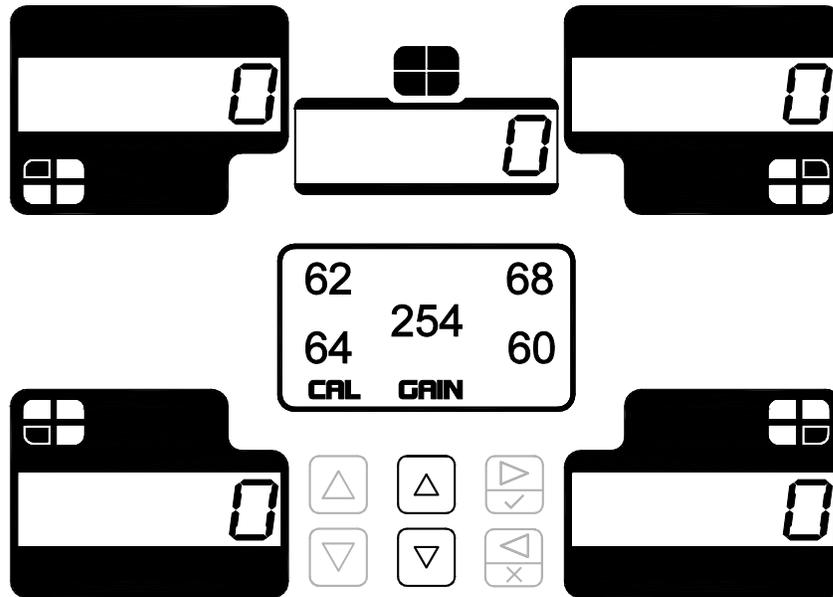
- iv. Check the four load cells. Ideally, their load should match. If not, use shims on the load cells as needed until you get an evenly distributed load.

**E. Gather, Record, and Enter Data**

- i. Record the load cell numbers for each of the inner channels. These are the load values of the press corners.
- ii. Record the inner slide peak tonnage values.



- iii. Push  or  to display the Gain numbers. This enables the shunt. Record the Gain numbers for channels 6-9.



- iv. Use the following formula to determine the new gain number:

$$\text{New Gain Number} = (\text{Load Cell reading} \div \text{Peak Tonnage reading}) \times \text{Current Gain Number}$$

- v. Repeat the calculation for each of the inner slide channels.  
vi. Adjust the gain pot for CH6 until the gain number for channel 6 equals the new calculated gain number. Turn the pot clockwise to increase the gain number and counter-clockwise to decrease the gain number. Repeat for each of the remaining inner slide channels.  
vii. Push  or  to display the Balance values. Use the balance pots to re-balance the channels if needed.  
viii. Push  or  to display the Gain numbers. If they are not equal to the calculated gain numbers, re-adjust them.  
ix. Repeat steps vi-viii as needed.

#### F. Verify Results and Repeat

- i. While still in the *Calibration* menu, push  or  to display the PEAK load.  
ii. Cycle the press and verify that the load cell values and the tonnage monitor's inner slide peak tonnage values are the same. If not, repeat step E until the values are the same.  
iii. This completes the inner slide calibration.

#### G. Document CAL#s

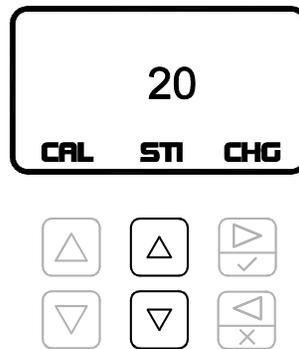
- i. Record the CAL#s (Gain) on the Calibration Sheet (Form #1224) provided with the User's Manual.  
ii. Record the CAL#s (Gain) on the Calibration Label located on the door inside the unit.

## 6) Calibrate Both Slides Simultaneously

- A. Connect the tonnage sensors to all channels, as shown in **Figure 3.1**.
- B. Navigate to the *Configuration* → *MODE* menu and change the mode to **STI** to enable the STI tonnage mode.
- C. Navigate to the *Configuration* → *DELAY* menu and enter a value for the capture position or time. Refer to the **Setting the capture (delay) position/time** section earlier in this manual.
- D. Place all 8 load cells on the bolster. 4 under the outer slide and 4 under the inner slide.
- E. Cycle the press once. Make sure the ram impacts all eight load cells. Because the outer gives or dips during impact the inner tonnage may no longer be accurate. Next, you will set the STI reference number to compensate for this inaccuracy.

**About the STI Reference Number:** The STI reference number is an adjustment number ranging from 0 to 255, with 0 being no adjustment and 255 being the maximum adjustment. It provides a correction factor to compensate for the outer slide dip.

- F. Navigate to the *Configuration* → *CAL (Calibration)* menu.
- G. Push  or  to display the STI number.



- H. Start by setting the STI number to 20.
- I. While still in the *Calibration* menu, push  or  to display the PEAK load, cycle the press and observe the peak tonnage. At first, the total inner slide tonnage should be greater than the total load on the inner load cells.
- J. Increase the STI number, cycle the press, and observe the total inner slide tonnage. Repeat this step until the total inner slide tonnage is equal to the inner load cell total.
- K. This completes the calibration of both slides.

**7) Make Linearity Check**

- A. Raise the shut-height in .020 to .030 inch increments to decrease tonnage.
  
- B. Cycle the press and impact the load cells.
  
- C. Compare the tonnage applied to the load cells to the peak tonnage displayed on the PWi / N800. These values should be documented.

**8) Document calibration details on the Calibration Sheet (Form #1224) provided with the User's Manual and file it for future reference. Include the STI reference numbers.**

**9) Record STI reference numbers on the calibration label located on the door inside the unit.**

**10) Calibration Complete**

The calibration procedure is now complete. Contact Toledo Integrated Systems' Service Department for assistance if needed. Our Service Department can be reached at 419-867-4170, Monday through Friday, 8:00 AM to 5:00 PM.

**NOTE:** Due to the nature of the sensor wiring for the STI application, you must be aware of the following when checking the calibration numbers.

- In order to check the CAL#s for the outer slide channels (CH1-4), you must first disconnect the sensors from the inner slide channels (CH6-9).
- In order to check the CAL#s for inner slide channels (CH6-9), you must first disconnect all sensors inputs. Once all sensors are unplugged, plug the CH1-4 sensor connectors into the CH6-9 sensor inputs.

