PressWatch
Load Signature ZT Series
Load Monitor
User's Manual

Revision: B

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Limited Warranty

This unit is warranted by the manufacturer, Toledo Integrated Systems, to be free of defects in workmanship and materials for one year from date of manufacturer's shipment. This warranty is limited to repairing or replacing products which manufacturer's investigation shows were defective at the time of shipment by the manufacturer.

All products subject to this warranty must be returned for examination, repair, or replacement

        F.O.B. to: Toledo Integrated Systems
                              1345 Ford St.
                              Maumee, Ohio 43537

The express warranty set forth herein is in lieu of all other warranties, expressed or implied, including without limitation any warranties of merchantability or fitness for a particular purpose. All such warranties are hereby disclaimed and excluded by the manufacturer.

Repair or replacement of defective products as provided above is the sole and exclusive remedy provided thereunder. The manufacturer shall not be liable for any further loss, damages, or expenses, including incidental or consequential damages, directly or indirectly arising from the sale or use of this product.

Any unauthorized repair voids this warranty.

There are no warranties that extend beyond those expressly set forth herein.

Features Overview

The PressWatch LS-ZT Series is a press tonnage monitor with signatures. It integrates tonnage monitoring and signatures with enveloping into ONE system. It features a large 10.1" touch screen interface, making the tonnage and signatures easy to read and access.
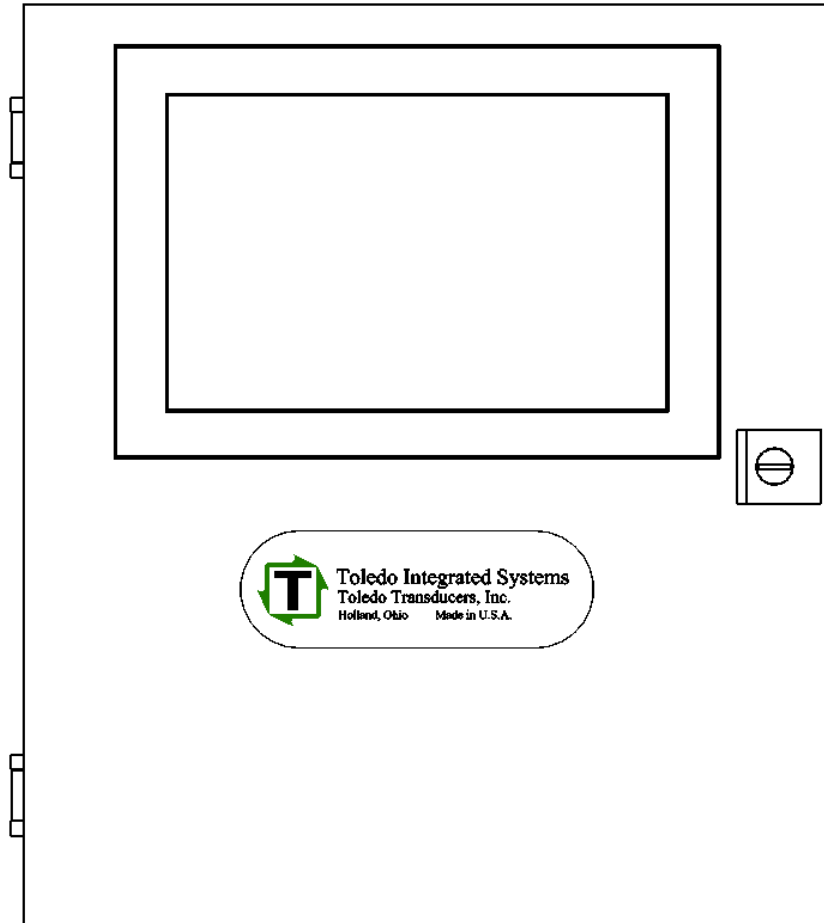
FEATURES

- 2 or 4 channel tonnage monitoring
- Reverse tonnage
- Signatures - each press corner and total
- 5 signature zones for enveloping
- Critical Curve Monitoring - CCM

- Hard Hit signature storage
- Job storage
- 3 password levels
- PressNet 5 compatibility

OPTIONS

- Additional 2 or 4 channels for tonnage monitoring or analog input

- TR-1 Resolver
- RS422 Serial Port

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Specifications

Tonnage	No. of Channels	Two or Four (Six or Eight optional)
	Sensor Inputs	Full bridge strain gage sensors
		120 to 1,000 ohms
		Up to (8) 350 ohm sensors
	Sensor Excitation	Built-in 10VDC @ 250mA max
	Sensor Input Connections	Terminal blocks
	Balance Range	+/- 1mV/V of sensor imbalance
	Gain Ranges	Low range = x50 to x550 adjustable
		High range = x500 to x5,500 adjustable
	Inaccuracy	+/- 1% of full scale max
	Non-linearity	+/- .02% of full scale max
	Frequency Response	DC to 5 KHz
	Resolution	Each channel provides a 4-digit load value in
		1024 count resolution
	Calibration Shunts	Built-in 1 mega ohm (.1%). Accepts custom shunt.
Job Storage	Yes	Limited only by available PC storage capacity
Password	Master level	For supervisor
	Setup level	For die setter
	Operator level	For general operation
Speed Limit	Up to 1200 SPM	
Human Machine Interface (HMI) Unit	Display	10.1" diagonal TFT LCD display
		Full color SVGA graphics
	Input	Touch screen standard
		(4) USB 3.0 ports available
	Operating System	Windows 10
	Storage	64GB SSD for operating system and data storage
	Network	Integrated Ethernet NIC (x2)

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Shutdown Relays   (2) solid state relays (N.O.) – Top and Immediate Stop
0.5 AMP @ 250V AC/DC

General   Resolver   Built-in excitation supports standard 5000Hz
rotor excited positional resolver

Computer Interface   Giga LAN Ethernet (x2)

Power requirements   95 Watts max.
85-132VAC @ 50-60Hz or
170-264VAC @ 50-60Hz

Operating temperature   0-50 degrees Celsius

Enclosure Dimensions   13.8" W x 15.75" H x 6.3" D, or
350mm W x 400mm H x 161mm D

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➤ Installation

1. Mounting the LS-ZT

The LS-ZT is an electronic instrument and must therefore be protected from physical stresses such as shock and vibration. Shock mounts are provided with every LS-ZT for this purpose. Failure to use these shock mounts may result in premature failure of the instrument and possibly void your warranty.

The LS-ZT may be mounted directly to the press or to an adjacent structure. It should be positioned so that the display is easily read, and the instrument is readily accessible. Figure 1-1 below provides the mounting dimensions and demonstrates the proper attachment of the provided shock mounts. A ground wire is also provided for proper instrument grounding and should be installed across one of the shock mounts.
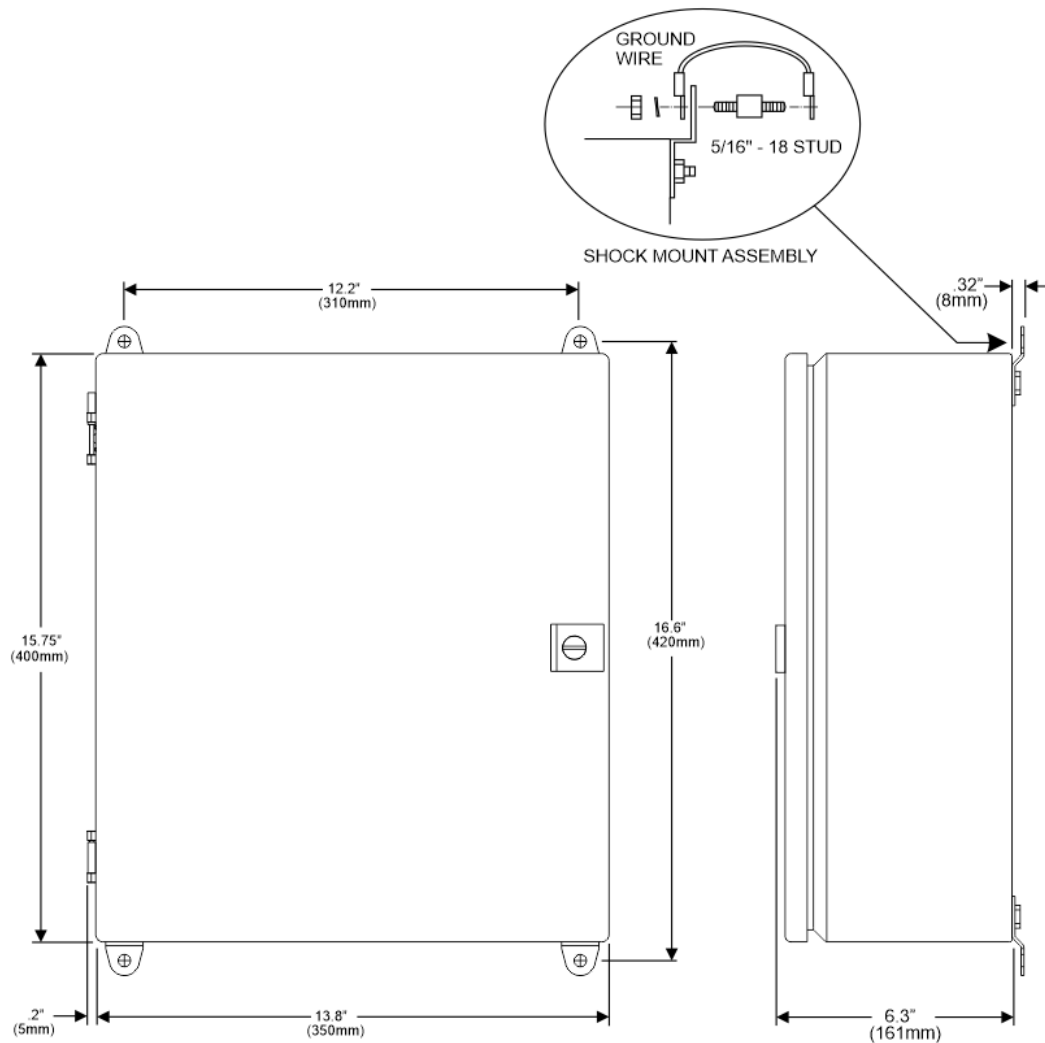
Figure 1-1:   Mounting Dimensions

2. LS-ZT Components
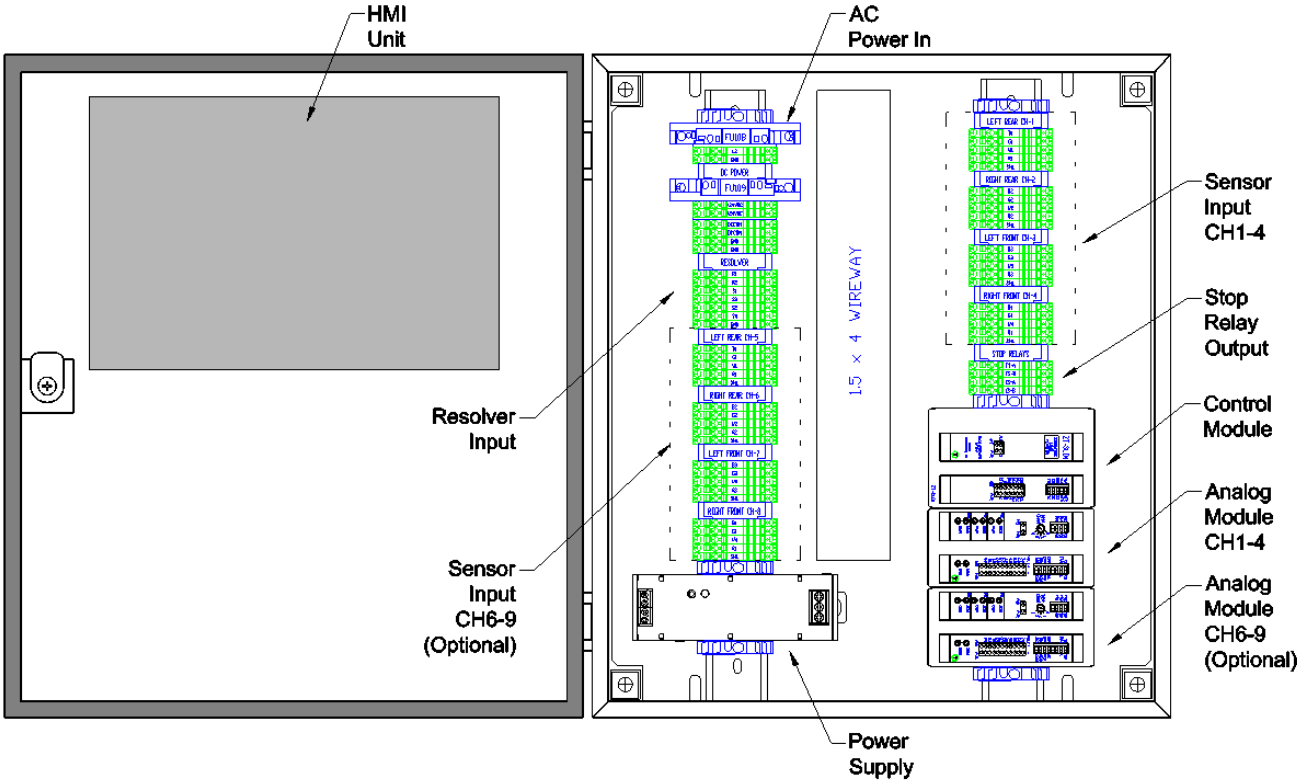
Figure 1-2:   LS-ZT Components

Note: The above figure details the layout of a standard 8-Channel LS-ZT. The layout of a
4-Channel LS-ZT will vary slightly.

3. Conduit Hole Selection

Follow Figure 1-3 to select the proper conduit hole for cabling. The holes are for ¾" conduit, but they can be enlarged in the field if a larger fitting is required.

BOTTOM VIEW
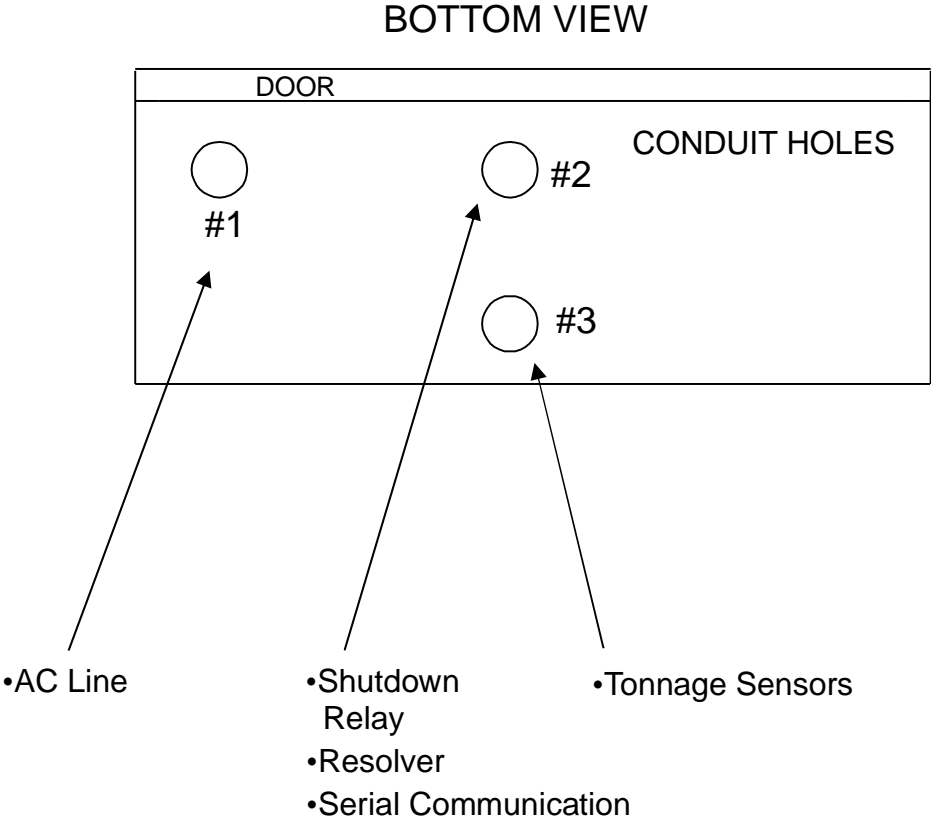
Figure 1-3:   Conduit Hole Selection

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4. AC Power Requirement and Connection

AC power is connected to the LS-ZT as shown in Figure 1-4. Use Conduit Hole #1 (see Figure 1-3) for the AC Power Wiring. Use the proper fuse as indicated.
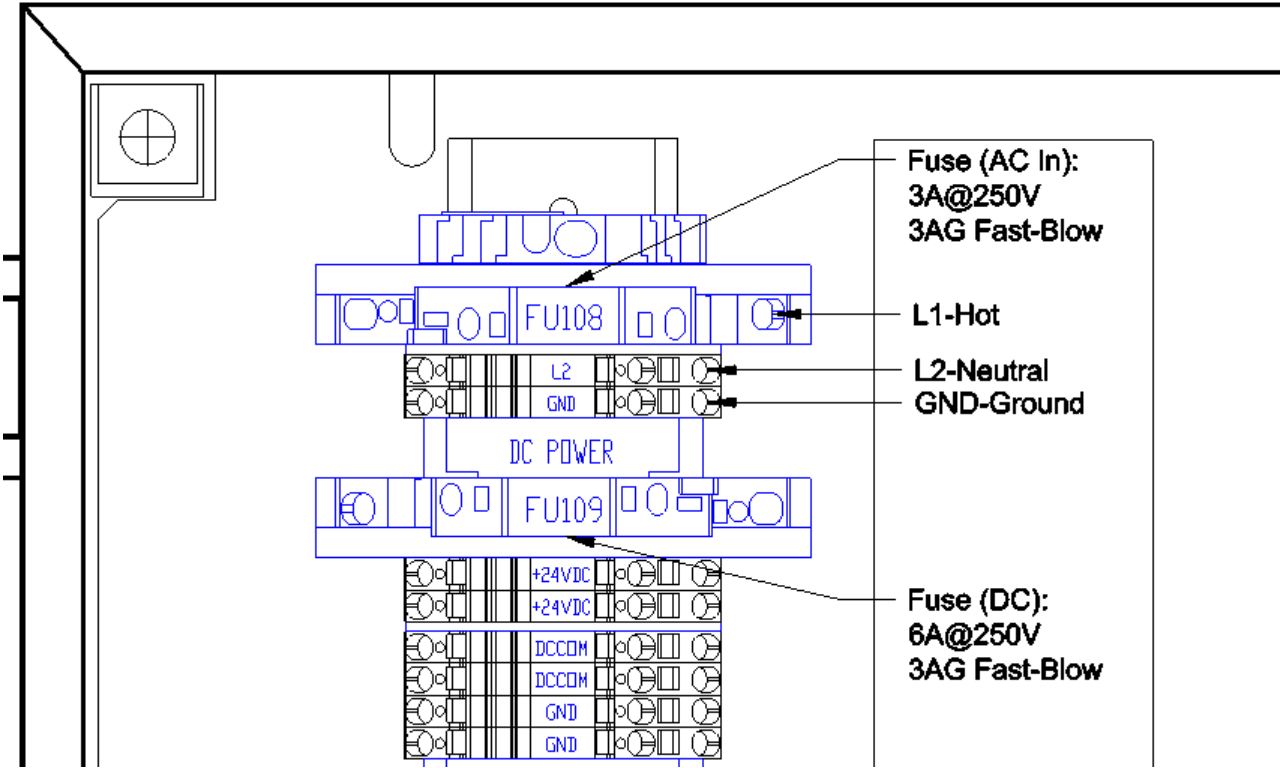
Figure 1-4:   AC Power Wiring

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5. Tonnage Sensor Connection

Refer to Figure 1-5 for the procedures below to connect tonnage sensors properly:

1) Power down the unit. Open the door of the LS-ZT enclosure.

2) Run Tonnage Sensor Cables through the Conduit Hole #3 (see Figure 1-3), and upward through the central wireway. For channels 1-4, route them to the right toward the CH1-4 terminal blocks. For channels 6-9, route them to the left toward the CH6-9 terminal blocks.

3) Prepare the sensor cable for termination as described in Illustration A on page 15.

4) Wire each sensor cable as described in Illustration B on page 16.

5) The tonnage sensor cable connections are now complete.

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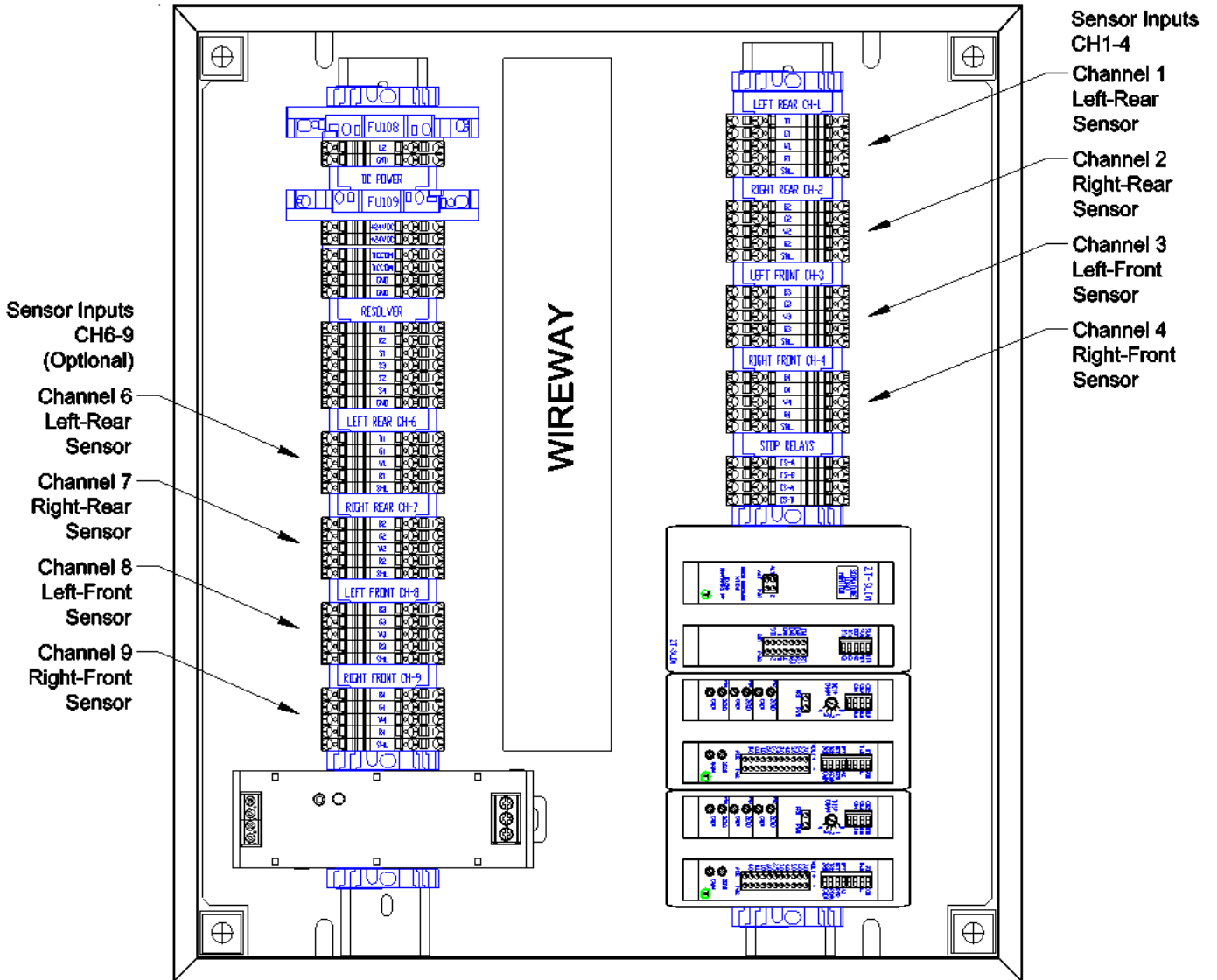
Figure 1-5:   Tonnage Sensor Input

Illustration A - Sensor Cable Termination

1) Strip the sensor cable as shown in Figure 1-6 below. Be sure not to nick any of the signal conductors or cut the braid shield.

approx 2 inches

CABLE JACKET

BRAID SHIELD

SIGNAL WIRES
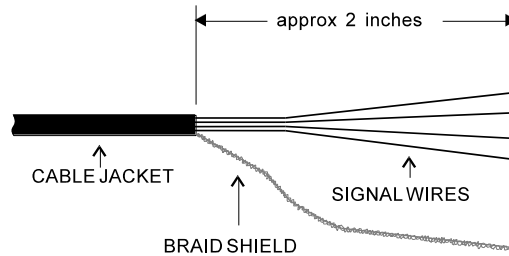
Figure 1-6:   Tonnage Sensor Cable Stripping

2) Strip approximately ¼" of insulation from each of the four signal conductors.

Note: If your sensor cable is not double shielded with both foil and a braid, electrical noise may affect your output readings.

Illustration B - Sensors Connection

The LS-ZT accepts the signals from Toledo Transducers T-400 sensors as well as other strain gage sensors. Figure 1-7 illustrates the sensor connections.

T400 Sensor   T400 Sensor

Tension Force   Compression

Tension connection
shown. For compression
connections, switch the
red and white wires

BLACK   Bx
GREEN   Gx
WHITE   Wx
RED   Rx
SHIELD   SHL

BLACK = EXCITATION -
GREEN = EXCITATION +
WHITE = SIGNAL +
RED = SIGNAL -
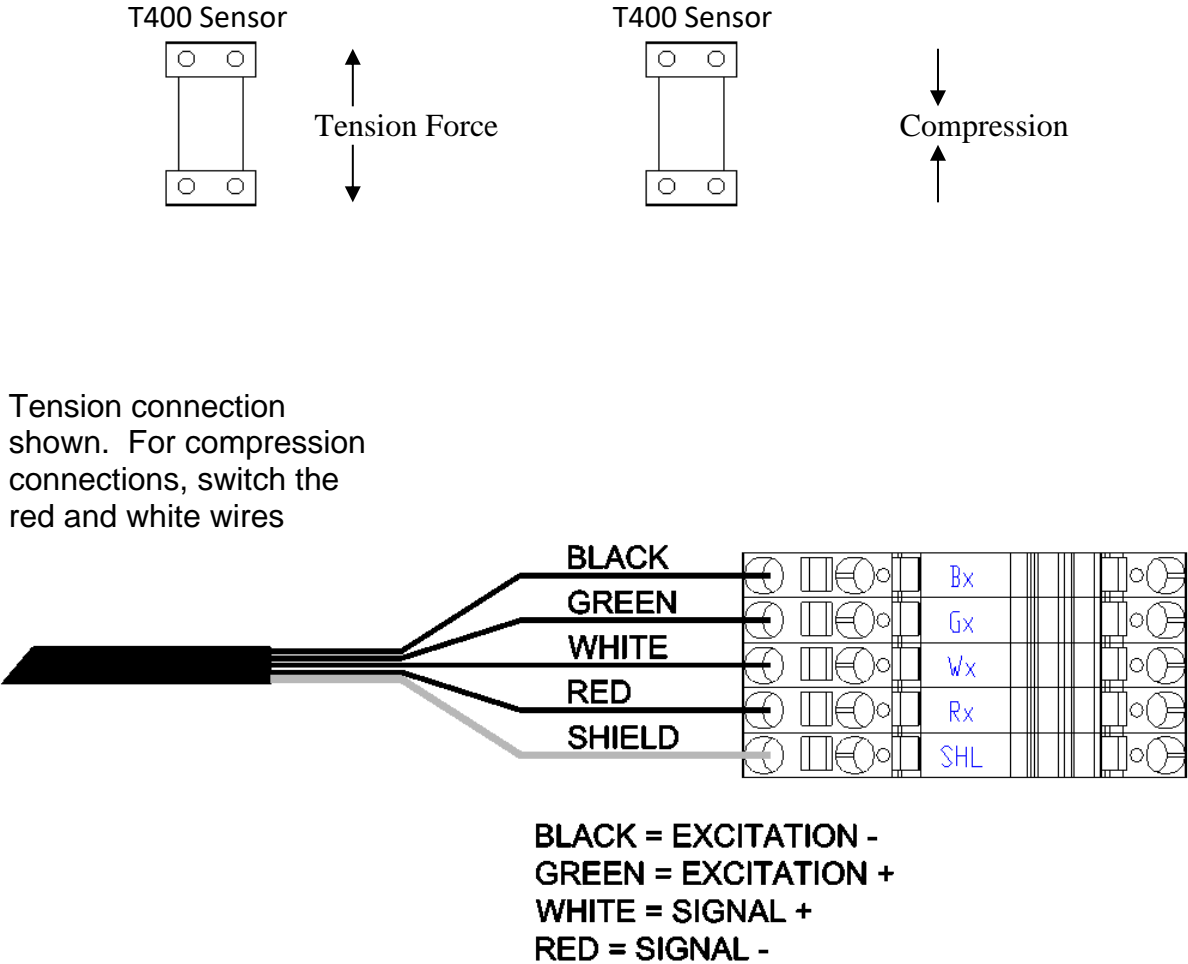
Figure 1-7:   Tonnage Sensor Wiring

6. Resolver Connection

The LS-ZT resolver input has a built-in excitation which supports standard 5,000 Hz rotor-excited positional resolvers. The input can be configured in Master Mode or Slave Mode. In Master Mode, the LS-ZT supplies excitation voltage to the resolver and is wired directly to the resolver. In Slave Mode, the LS-ZT does not supply excitation voltage to the resolver and is wired to the resolver input terminal of a Master device, where the resolver signal is shared.

Use Conduit Hole #2 (see Figure 1-3) for the Resolver Cable. The resolver input consists of the following components:
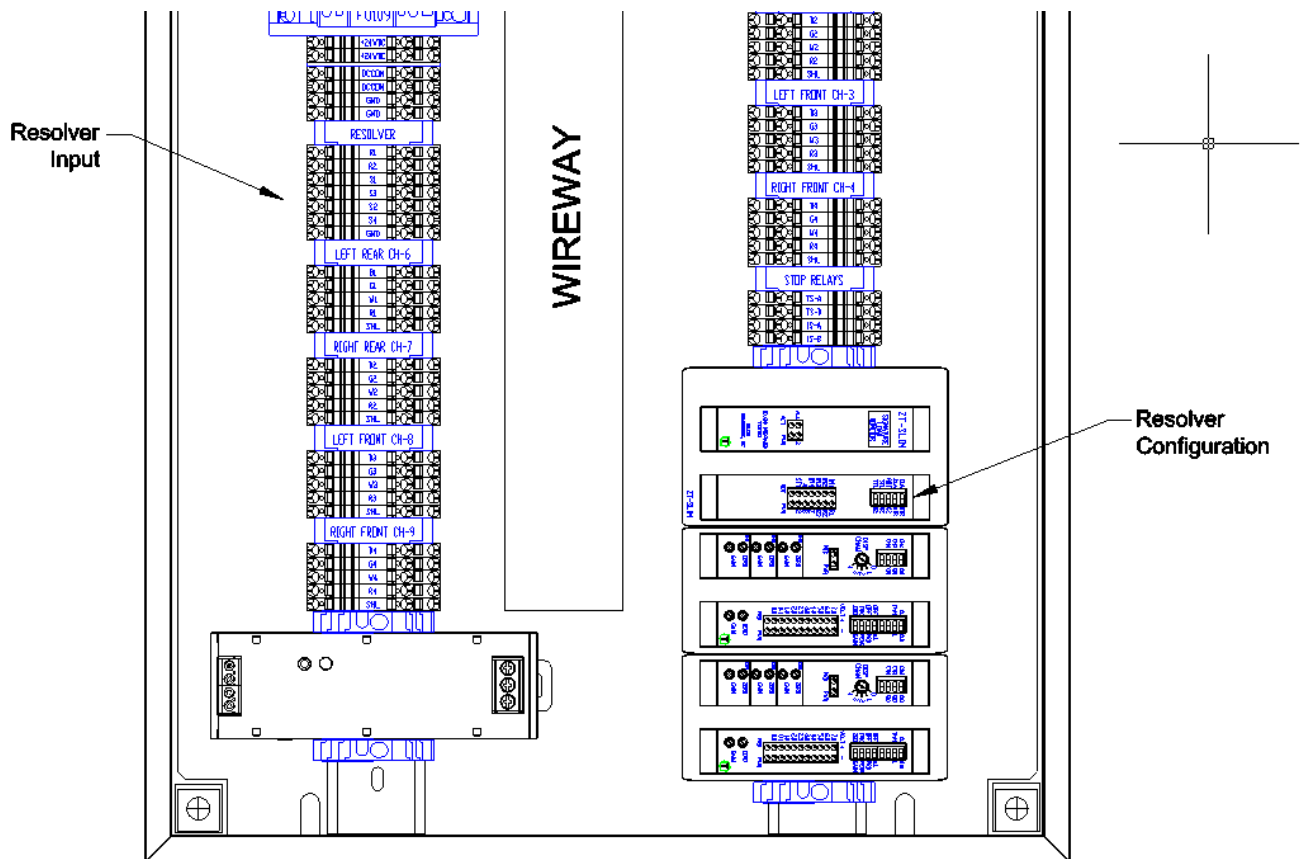
Figure 1-8:   Resolver Input Descriptions

Resolver Wiring:
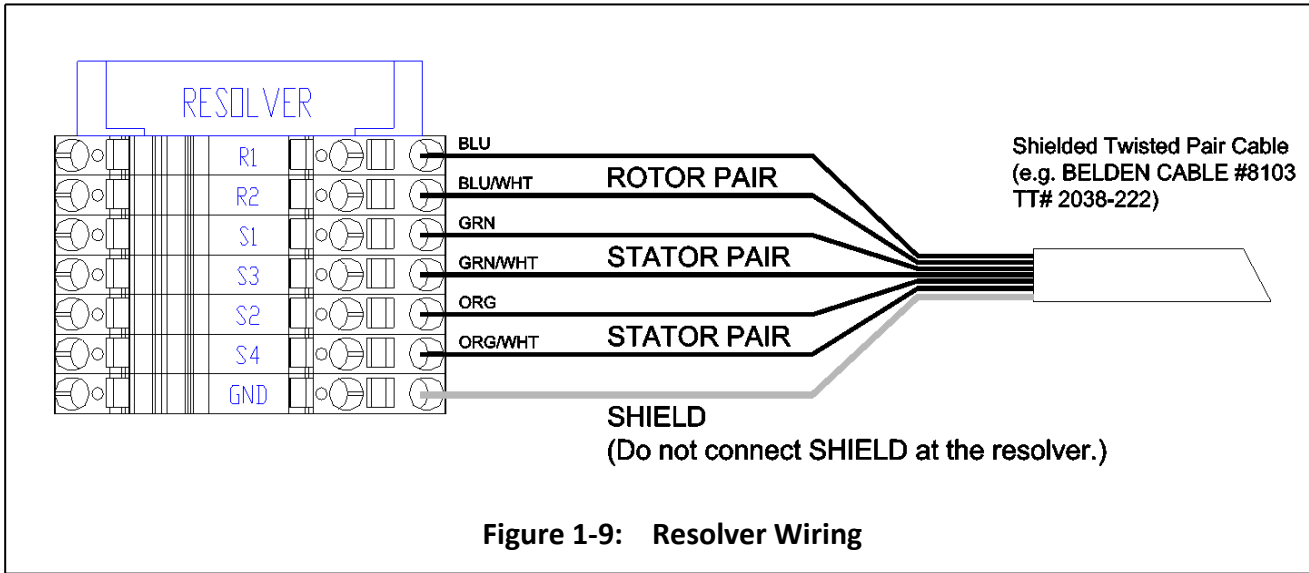
Figure 1-9:   Resolver Wiring

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7. Resolver Input Setup

1) The resolver input is set up by configuring the resolver dip switches on the control module.
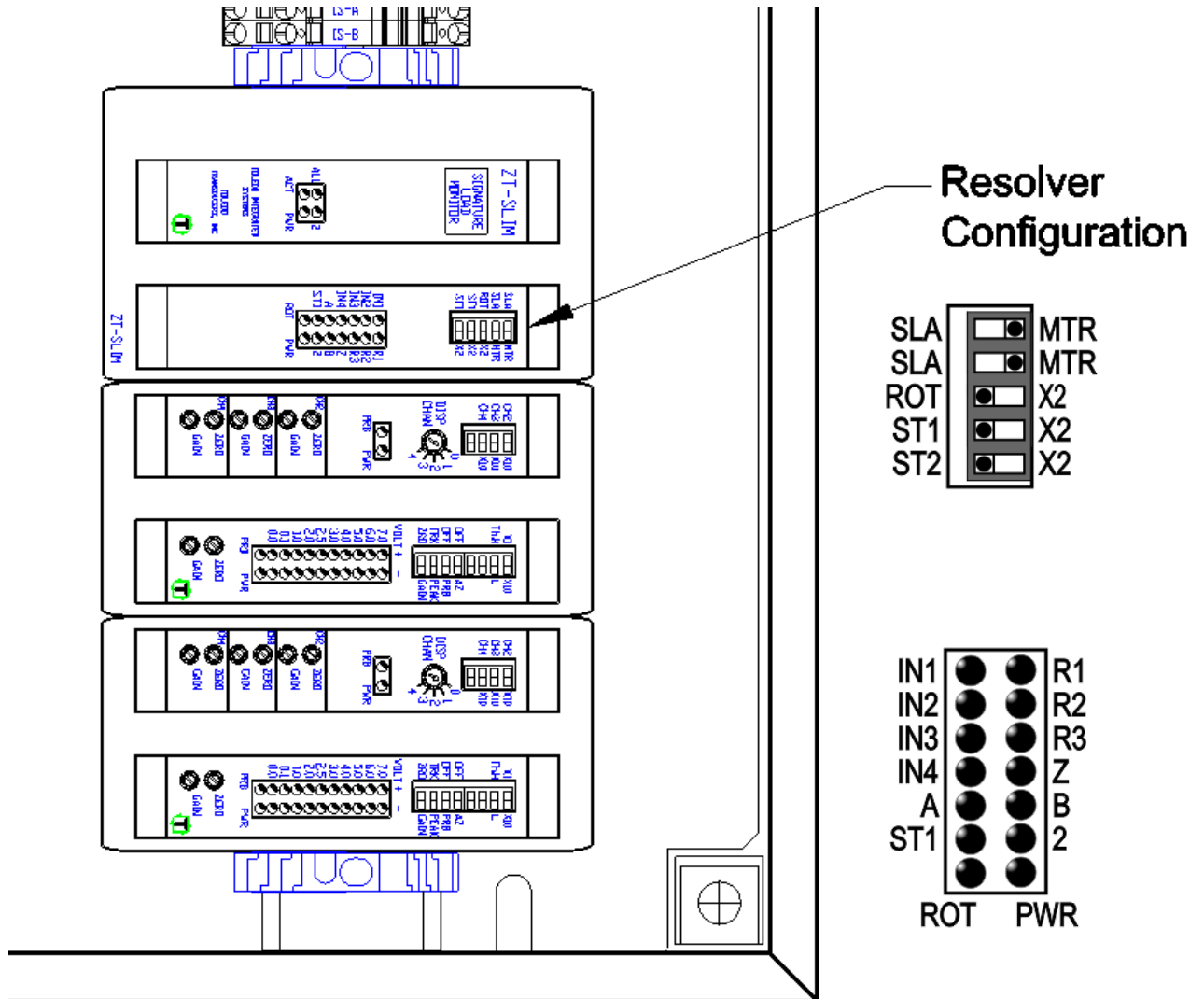
Figure 1-10: Resolver Setup

2) If the LS-ZT is the only equipment to interface with the resolver, the control module's DIP switches should be set to MASTER mode. If the resolver also connects to an AMCI resolver card, or other similar equipment, the control module should be set to SLAVE mode.

   Note: The top two DIP switches must **both** be set to MTR (Master) or SLA (Slave).
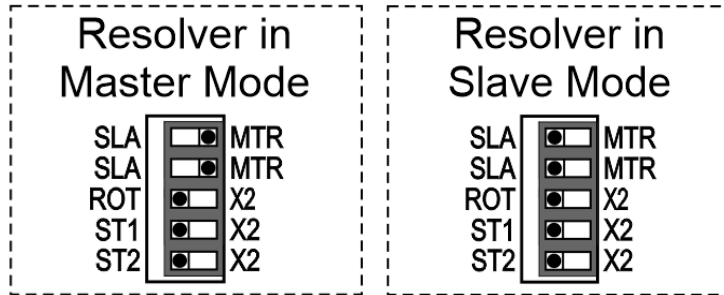
3) Make resolver connection.

4) With the system on (press can be either running or not running), check the brightness of the ROT LED on the control module.

GOOD	DIM
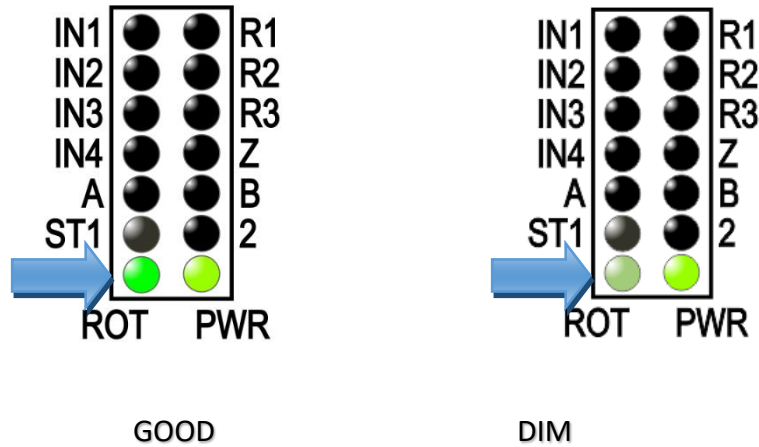
5) If the ROT LED appears to be dim, toggle the ROT, ST1, and ST2 DIP switches to X2.

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6) With the press running, check to see if the ST1 and ST2 LEDs turn on. They should fade on and off, opposite to each other. When fully on, they should have a similar brightness to the ROT LED.
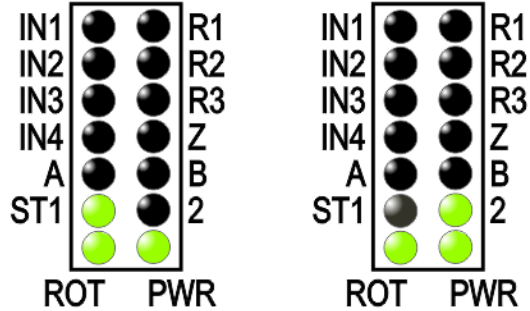
7) Record all DIP switch settings on the control module's calibration card.

8) Setup is basically completed. Refer to the Operation section of this manual for resolver offset adjustment.

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8. Shutdown (Stop) Relays

Two internal relays are provided for press shutdown, one for top-stop operation and one for immediate-stop operation. Relay rating is 0.5 Amp, 240V AC/DC. Relay contacts open for fault condition.
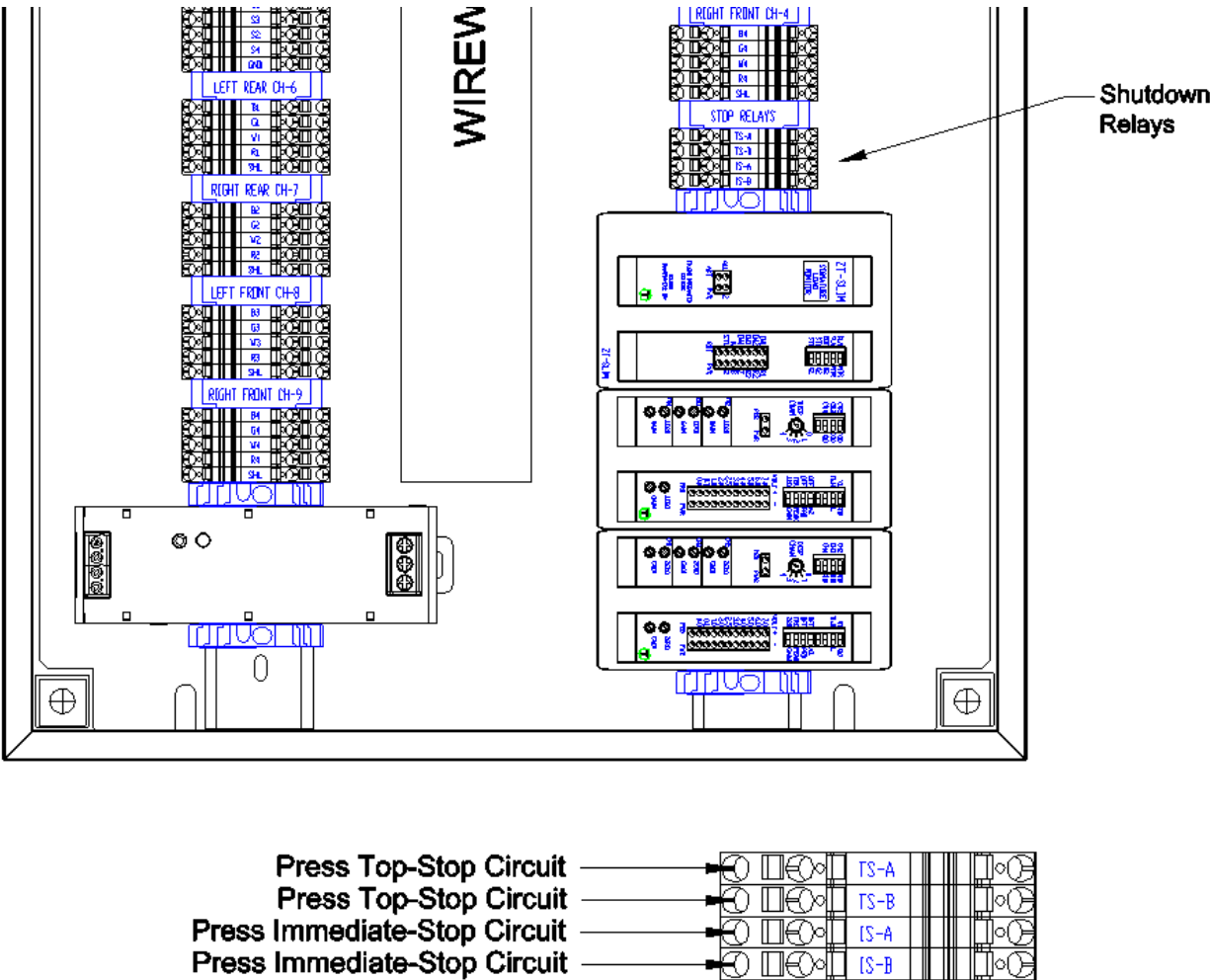
Figure 1-11: Shutdown Relay Wiring

The function of these relays will vary, depending on the type of alarm that occurs and how it is configured in SlimWare.

Top Stop Fault	>>	TS-A/B opens at 290°	IS-A/B remains closed
Immed. Stop Fault	>>	TS-A/B opens immediately	IS-A/B opens immediately

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9. Serial Port Connection

An optional RS422/485 serial port can be used for interfacing with a wide variety of instruments like Programmable Logic Controllers, Industrial PCs, and laptop computers. RS422/485 allows the implementation of a daisy chain (multi-drop) serial network, such as the PressNet Networking Suite. Remove the terminal block adapter from the serial port to complete serial wiring (see the wiring diagram on the next page).
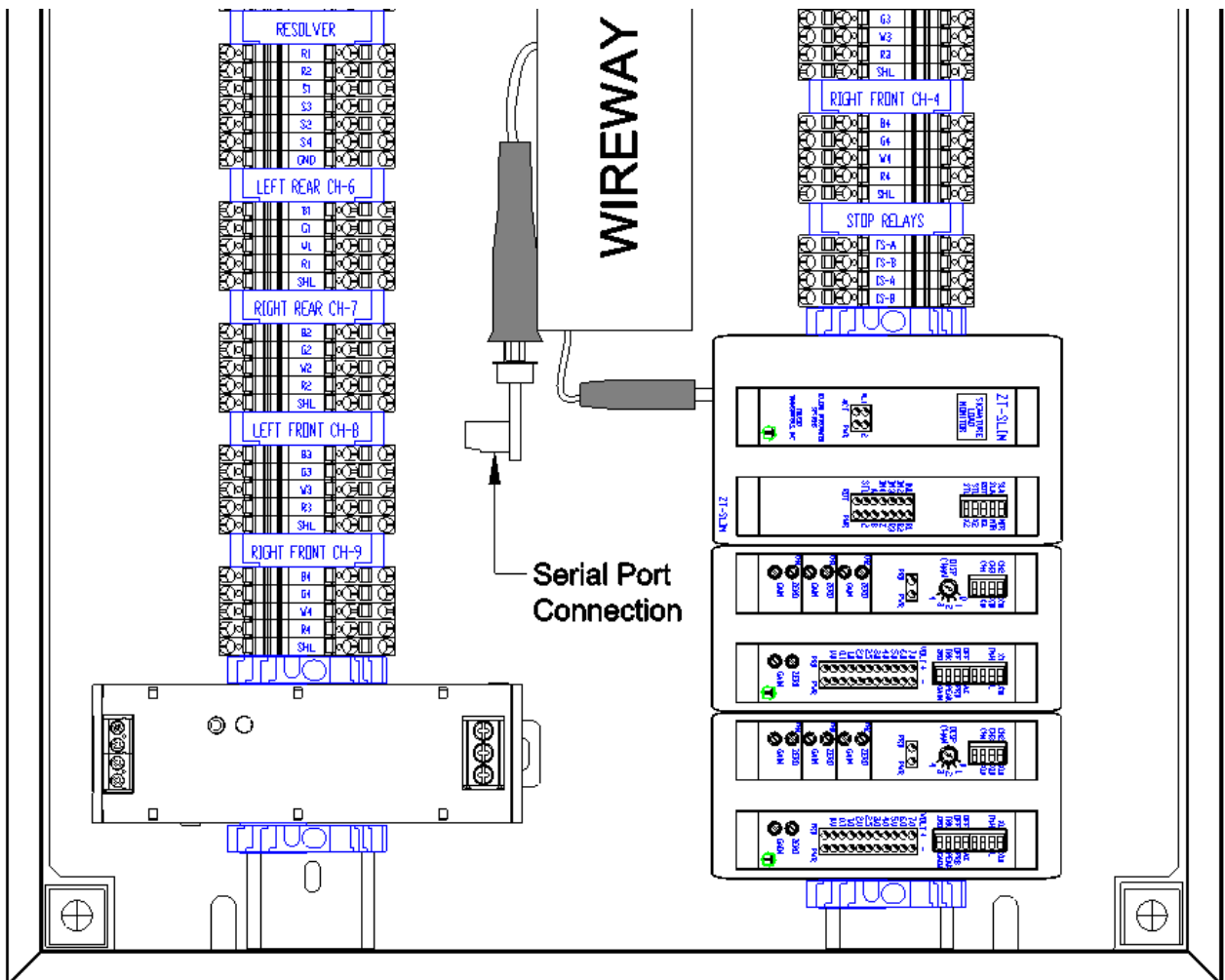
Figure 1-12: Serial Port Connection

The wiring diagram below illustrates the connection to a RS422/485 serial daisy chain PressNet network.
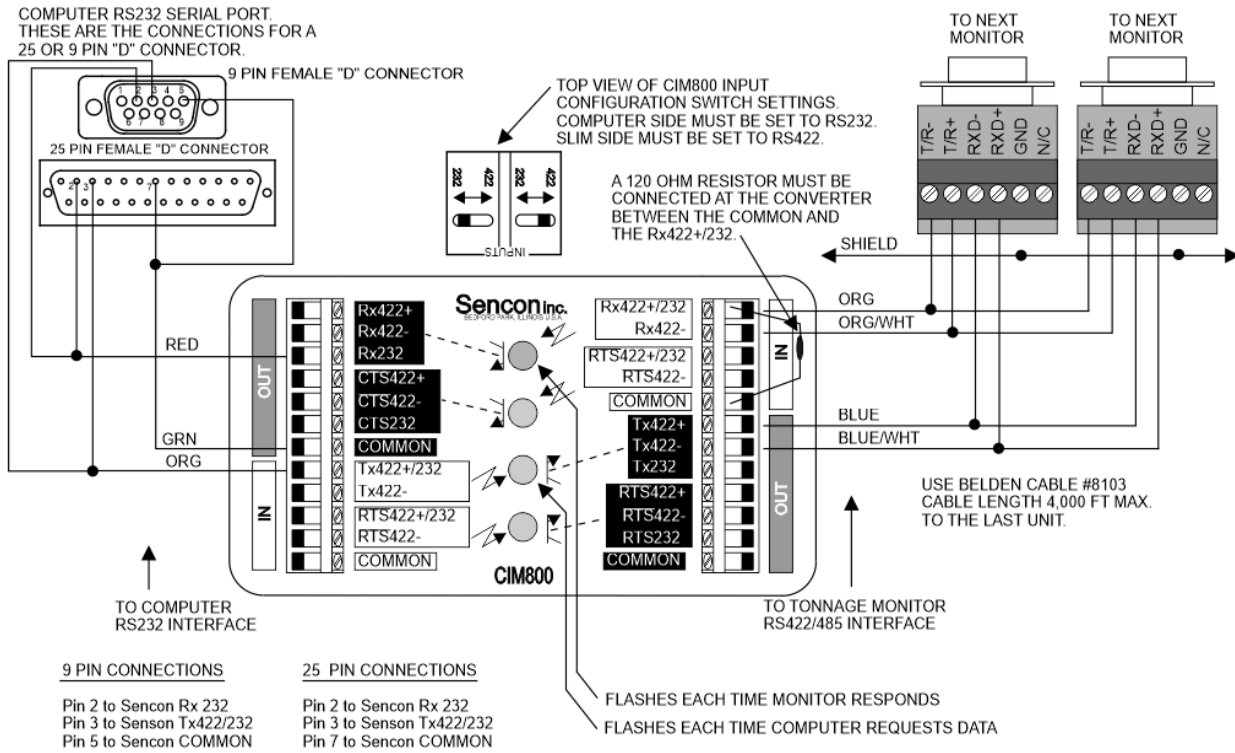
Figure 1-13: Serial PressNet Connection

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➢ **Operation**
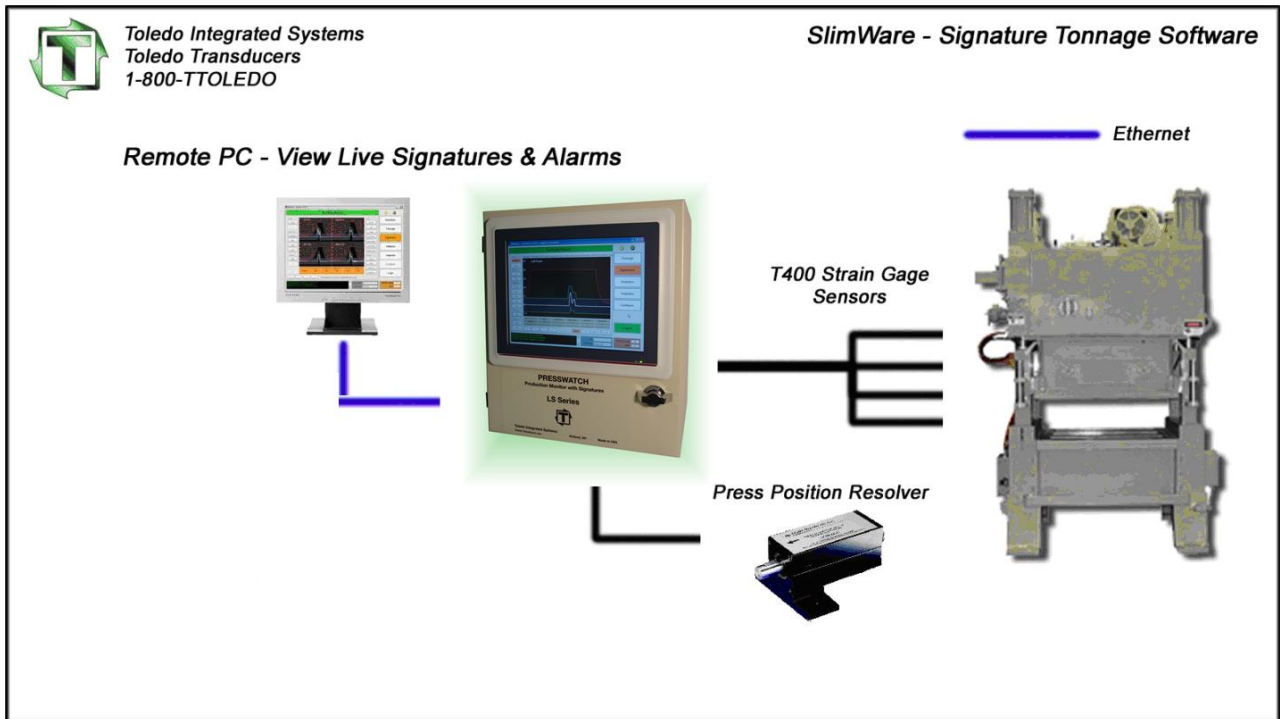
1. Overview

Figure 2-1:   System Overview

The LS-ZT uses our exclusive SlimWare HMI (Human-Machine Interface) software. SlimWare can provide and monitor all information stored in the LS-ZT including tonnage, setpoints, alarm history and signatures (tonnage curves).

The LS-ZT is a powerful tonnage monitor that does more than protect your press and dies from hard-hits. The LS-ZT allows for 5 levels of alarms (Capacity, CCM, High & Low Setpoint, High & Low Envelope and Reverse Setpoint). Each alarm type can be enabled/bypassed and configured for top or immediate stop.

Another feature of the LS-ZT is to provide users with signature-based tonnage analysis. These signatures are extremely helpful in determining problems in the forming process. Problems can include excessive tonnage through the stroke, loose tie-rods, low nitrogen cylinders or reverse (strike-through) tonnage. SlimWare is able to monitor and control all features included with the LS-ZT unit.

2. Initial Startup

The initial communications settings are as follows:
- Communication Mode: Ethernet
- IP Address: 192.168.16.180
- Subnet Mask: 255.255.255.0
- TCP Port: 31000
- Address: 0

SlimWare will start automatically upon boot-up. It can also be manually started by either double-clicking the shortcut on the desktop or by the following:
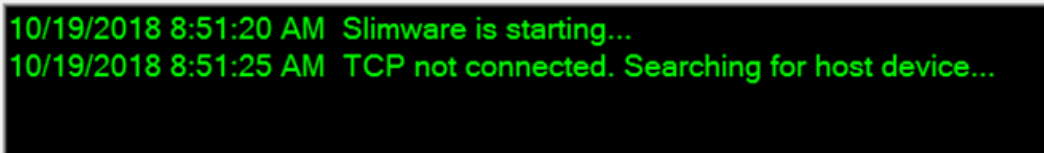
Start >> All Programs >> Toledo Integrated Systems >> SlimWare 7

To determine if communications have been established between SlimWare and the control module, start SlimWare. If there is no communications, the yellow LED's in the upper right hand corner of the SlimWare window will not be flashing and a communications error will appear near the top of the screen as well as in the historical data box. See Figure 2-2 and Figure 2-3 for examples of a communications error.

Communication Error

Figure 2-2:   Communication Error Alert

10/19/2018 8:51:20 AM Slimware is starting...
10/19/2018 8:51:25 AM TCP not connected. Searching for host device...

Figure 2-3:   Communication Error (Historical Data Box)
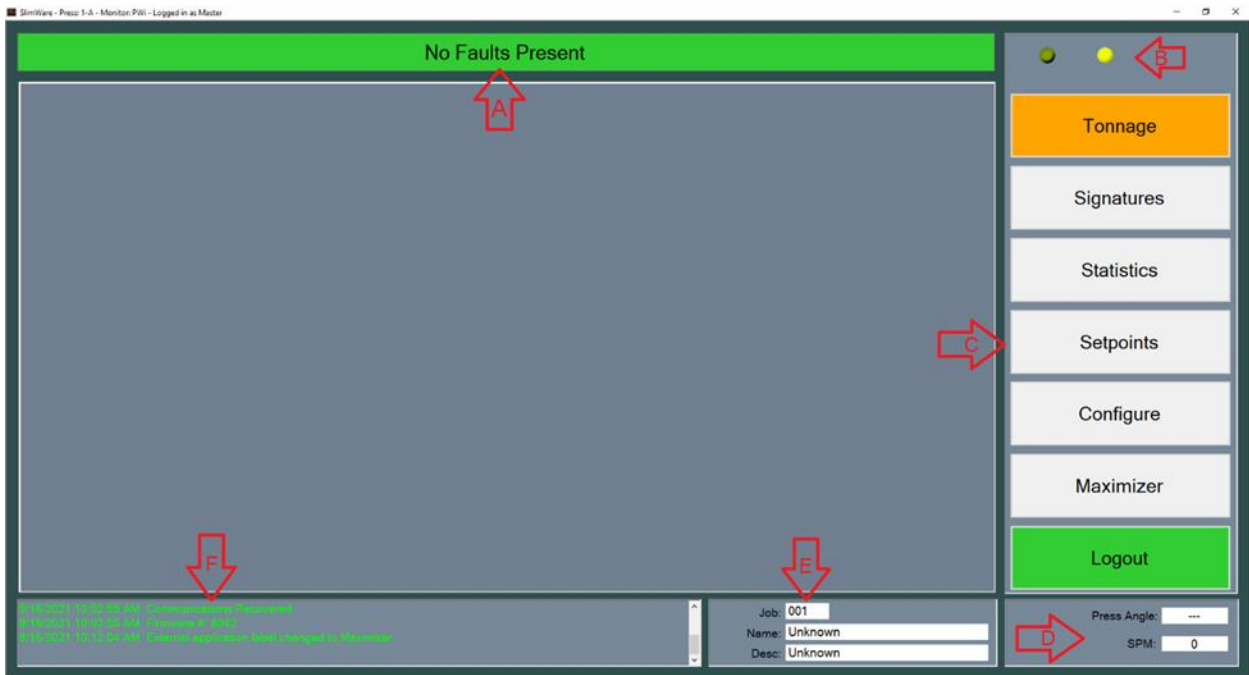
3. Main Window

Figure 2-4: SlimWare Main Window

The main window is always displayed regardless of what page a user is on. The main window includes all of the navigation buttons, press angle, strokes per minute, job number, name and description, status bar and the historical data log. Also displayed in the top left-hand corner of the main window is the Press Name (configurable), communication address, and user permission level if logged in.

- **Status Bar (A)** – Displays the current status of the LS-ZT unit. If an alarm is detected, the status bar will flash red and white and display the highest-level alarm. To reset an alarm, a user can simply click on this bar while alarmed.
- **Indicator Lights (B)** – In the top right-hand of the SlimWare windows are two (2) yellow LED's. If these LEDs are idle, this is due to a communication error.
- **Navigation (C)** – These buttons allow the user to navigate to the various pages throughout SlimWare.
  - **Tonnage** – Pressing this button will load the tonnage page. From the tonnage page, the current peak or reverse tonnage can be viewed easily. Personnel with a setup or master password can also enable setup or learn modes from this page.
  - **Signatures** – This button will load the signature page. From the signature page, users can recall current signatures from the LS-ZT monitor or recall previously saved signatures.
  - **Statistics** – Pressing this button will load the statistics page. This page displays information such as the highest load, number of high alarms and last alarm. Personnel logged in with a setup or master password can clear the alarm history from this page.

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- o **Setpoints** – Clicking the setpoints button will load the setpoints page. If the user is not logged in with a setup or master password, this page is read only and no setpoints can be changed. If a user is logged in with a setup or master password, setpoints such as high and low alarms and reverse tonnage setpoints can be modified.
- o **Configure** – Only a master password can access the configure page. From this configure page, all personnel and hardware settings can be modified, alarms can be disabled and a tonnage calibration can be performed.
- o **External Application**– This button will call an external program (such as a SCADA program). This program is declared on the configuration page. In Figure 2-4, the configured external program is the "Maximizer", Toledo Integrated Systems' proprietary automation program.
- o **Login/Logout** – Pressing this button will load the login keypad if no user is currently logged in. Enter the correct password and the button will change to a green background indicating that a user is logged in. While logged in, if the user selects this button again, the current user will be logged out. The Login/Logout pushbutton will be hidden if SlimWare is configured to use external data management.
  The LS-ZT comes shipped with the default passwords set to:
  - ▪ Master: "m"
  - ▪ Setup: "s"
  - ▪ Operator: "o"

  The passwords can be changed from the Configure → Hardware/Trigger screen.
- **Press Angle (D)** – Displays the current angle of the press if a resolver, encoder, or gray code input is used.
- **SPM – Strokes Per Minute (D)** – Displays the speed at which the press is running.
- **Job Number (E)** – Displays the current job number loaded. If enabled, a user can click on the job number box and load or create a new job.
- **Job Name (E)** – Displays the current job name loaded. If enabled, a user can click on the job name box and load or create a new job.
- **Job Description (E)** – Displays the current job description loaded. If enabled, a user can click on the job name box and load or create a new job.
- **Historical Data Log (F)** – This displays all pertinent information regarding the LS-ZT unit and any changes or alarms that occur. This log can be saved to a log file located in the user's storage folder if "Data and Alarm Logging" is enabled from the configure page.

4. Tonnage
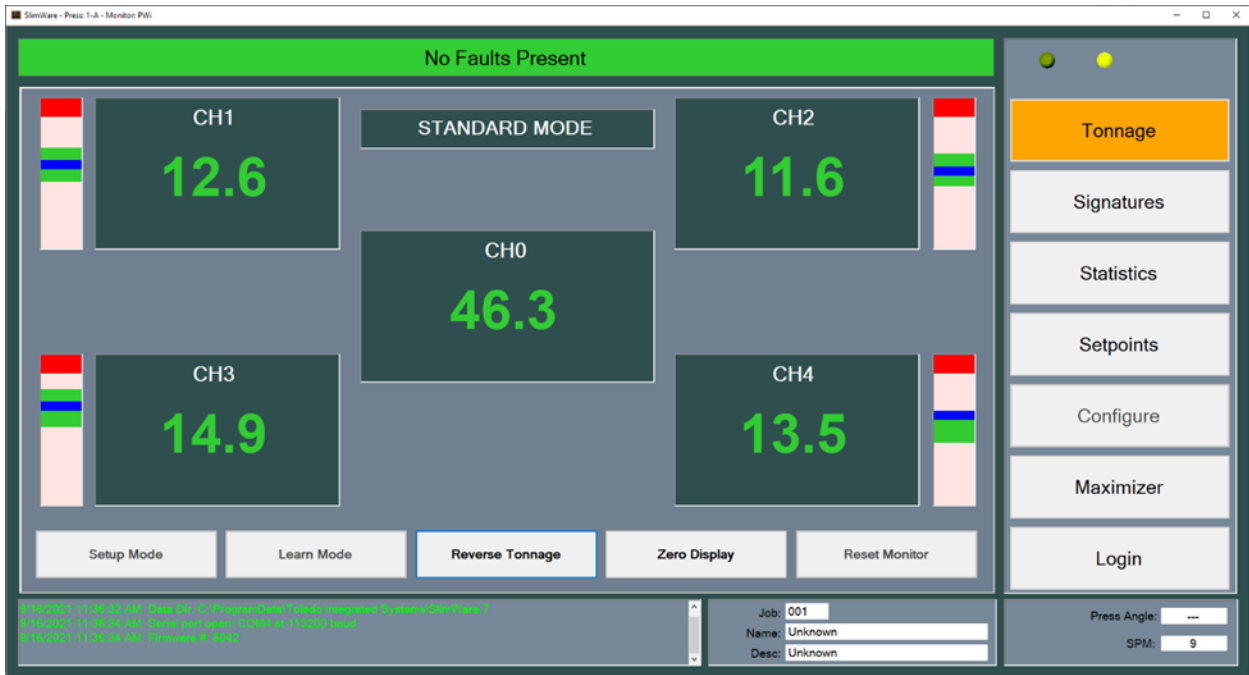
Figure 2-5:   Tonnage Screen (4-Channel)

The tonnage page displays all relevant tonnage information. This information includes current tonnage, alarm status of each channel, the monitor mode (setup, learn or normal) and a graphical representation of each corner's high/low setpoint windows with regards to current tonnage.

Figure 2-5 shows a typical four (4) channel LS-ZT monitor. Each corner displays the current tonnage and will turn red if an alarm is flagged for that channel.

I.   Setup Mode

- *[Requires Operator, Setup, or Master password]*
- Press the "Setup Mode" button in the bottom left-hand corner to place the LS-ZT unit into setup mode. While in setup mode, the press will be able to run and the following alarms will be bypassed.
    - High and Low Envelope Alarms
    - High and Low Setpoint Alarms
    - Reverse Alarms

The setup mode button is only available when a user is logged in (depending on configured permissions). The monitor should only be placed in setup for the beginning or end of runs. Setup mode is not recommended for normal production use, as several alarm modes are bypassed.

II.   **Learn Mode**

- *[Requires Operator, Setup, or Master password]*
- Press the "Learn Mode" button in the bottom left-hand corner to place the LS-ZT unit into learn mode. Learn mode will run for eight (8) strokes. During these eight strokes, the LS-ZT unit will calculate new high and low setpoints, as well as a new benchmark for each channel.
- When the learn mode button is pressed, a dialogue box will appear prompting the user to confirm that learn mode is desired. This is to prevent users from accidently entering learn mode and learning new benchmarks.
- The LS-ZT unit will come out of learn mode automatically after eight (8) strokes.
- The learn mode button is only available when a user is logged in, and when autoset mode is enabled (depending on configured permissions).

III.   **Reverse Tonnage**

- Press the "Reverse Tonnage" button to display the reverse tonnage for each channel.
- Even with reverse tonnage displayed, the monitor will function as in normal mode; all alarms will be monitored. This button is available for all users.
- To return to normal mode, simply press the "Reverse Tonnage" button and the normal tonnage will be displayed.

IV.   **Zero Display**

- Press the "Zero Display" button to clear the displayed tonnage.
- This is mostly used in the initial setup of the LS-ZT and SlimWare to make sure communications are correct and the tonnage values are updating properly.

V.   **Reset Monitor**

- *[Requires Operator, Setup, or Master password]*
- Press the "Reset Monitor" to reset any alarms.
- By default, the "Reset Monitor" button is only available when a user is logged in (depending on configured permissions). If you wish alarms to be reset without logging in (**not recommended**), see the "Reset Alarms Without Password" feature, which is described in Section 8.
- Alarms can also be reset by pressing the channel which is alarmed or pressing the flashing status bar at the top of the screen (subject to password authorization).

VI.   **Bar Graphs**

- The bar graphs next to each channel display the relationship between the current tonnage and the high and low setpoint window.

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- This graph can be changed to display either the current tonnage with regards to the high and low setpoint window, or the benchmark with regards to the percentage variation of each hit. The display is determined by which autoset mode (Capacity or Benchmark) is selected in the configuration page.

VII. Mode Display

- Just above the total tonnage is the mode display box. This displays what type of mode the monitor is in. These modes can be any of the following:
    - o Standard (Shown in Figure 2-5)
    - o First Level
    - o STI
    - o TFP
    - o Pendulum
    - o Multi-Strike
- The tonnage modes can only be changed from the configuration page. (To learn more about each type of mode, refer to the configuration section.)

VIII. Alarms

- If the LS-ZT detects an alarm, the status bar will begin flashing red and white and the alarmed channel will turn red. To reset any of these alarms, first find the cause for the alarm. Once the cause has been corrected, press either the alarmed corner, the status box or the "reset monitor" pushbutton in the bottom right-hand corner of the tonnage page (subject to password authorization).

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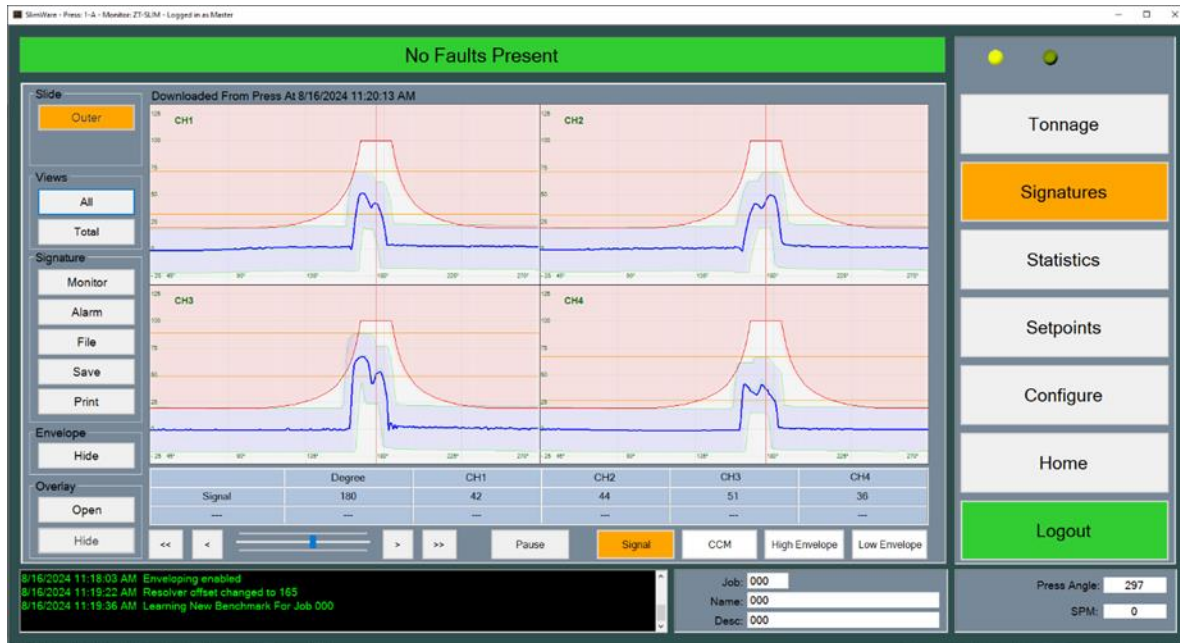
5. Signatures

Figure 2-6:   Signature Screen (4-Channel)

The signature page is used to display historical or live signatures from the LS-ZT monitor. To navigate to the signature page, simply press the "Signatures" button on the right side of the main screen.

Figure 2-6 shows a typical four (4) channel signature with enveloping. Operators can analyze the signatures from each stroke and determine if there are problems such as excessive tonnage early or late in the stroke.

I.   **Slide**

- The slide buttons determine whether to display signatures for the inner or outside slide, or both. If the number of channels is set to 2 or 4, the inner slide option is not shown.
    - Outer – Displays the outer slide signature (Channels 0-4)
    - Inner – Displays the inner slide signature (Channels 5-9)

II.   **Views**

- The default view of the signatures page is all 4 corners shown in normal viewing mode. Clicking on one of the corner signature windows will display an enlarged view of the corner. Click the enlarged view to return to the 4-corner view. In addition, the following buttons may be used to provide other viewing options.
    - All – This view will overlay all four corners into one window. This is best used to view differences between channels. Click the "All" button or the signature window to return to the multi-corner view.

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- ▪ Total – This view shows the total for the selected slide(s). Click the "Total" button or the signature window to return to the multi-corner view.

III.   **Signature**

- • The signature group box contains the controls for polling, retrieving from file or saving to file, a signature.
  - ▪ Monitor – Select this button to poll the LS-ZT for the most recent 25 signatures.
  - ▪ Alarm – Select this button to poll the last alarmed signature.
  - ▪ File – Selecting this button will load a file dialogue box. From here, select a .SIG, .SWS, or .SWSX file to open and view in the signature viewing window. When a signature is loaded, the file path will be shown above the viewing window.
  - ▪ Save – Select this control to save the loaded signature to a file.
  - ▪ Print - Use the print function to print out any signatures or overlays shown in the viewing window. The default print setting is landscape mode. When printing a signature, the current signature view will be printed.
    Note: Before you can print, one of the following must be true:
    →   The LS-ZT Panel PC must be connected to and configured for the network and a network printer must be properly setup.
    →   The LS-ZT Panel PC must be connected to a local USB printer and the printer's drivers must be properly installed.

IV.   **Envelope**

- • This option enables an operator to hide or display envelope and benchmark signatures. This option is only available if enveloping is enabled.

V.   **Overlay**

- • Once a signature is loaded, the overlay controls will become enabled. Use overlays to compared previous "good" signatures to current signatures.
  - ▪ Open – Selecting this control will load a file dialogue box. From here, select a .SIG, .SWS, or .SWSX file to load as an overlay. The overlay will be a light gray color in each channel.
  - ▪ Hide – Once an overlay is loaded, select the "Hide" control to hide the overlay.

VI.   **Detail and Scan**

- • While viewing live signatures the signature will continually update. To examine a signature more closely press the Pause button to stop the screen from updating. SlimWare will continue to update all critical data in the background.

Pause
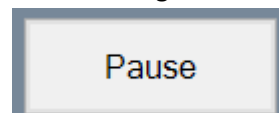
- To view the details of each signature (load, CCM, and envelope at each degree), use the four (4) left/right buttons and slider in the bottom left-hand corner of the signature window.

  A vertical red line will appear through the signature viewing area. To change the degree, use the four (4) navigation buttons mentioned above.
- The details display is updated if the view or angle is changed. When all four corners are displayed, the displayed details include:
    - Degree
    - Channel 1 Signal Value
    - Channel 2 Signal Value
    - Channel 3 Signal Value
    - Channel 4 Signal Value

  If the total or any corner is displayed, the values include:
    - Degree
    - Load Value
    - CCM Value
    - High Envelope Value
    - Low Envelope Value
- The current loaded signature filename or timestamp is shown above the signature window. If the signature has been downloaded from the press, this path will include the timestamp of when the signature was downloaded. If the signature has been recalled from a file, the file path will be shown.
- All signatures and overlays are saved as .SIG files.

6. Statistics

The statistics page is used to detail the number and types of alarms that have been recorded. From this page, any user can view the various alarms for each channel.

Figure 2-7: Statistics Screen

Figure 2-7 shows a typical four (4) channel LS-ZT unit's historical statistics. If the logged in user has "Change Setpoints" permission, these values can be cleared by pressing the "C" button for the corresponding alarm row. If not, these statistics are "read only."

- **Highest Load** – Displays the highest recorded tonnage per channel
- **Lowest Load** – Displays the lowest recorded tonnage per channel
- **Last Alarm** – The last recorded alarm (any type) per channel
- **Last High Alarm** – The last recorded high alarm per channel
- **Last Low Alarm** – the last recorded low alarm per channel
- **# Capacity Alarms** – The number of capacity alarms recorded per channel
- **# CCM Alarms** – The number of CCM alarms recorded per channel
- **# High Alarms** – The number of high alarms recorded per channel
- **# Low Alarms** – The number of low alarms recorded per channel
- **# Reverse Alarms** – The number of reverse alarms recorded per channel

7. Setpoints

Figure 2-8:   Standard Setpoints Screen (4-Channel)

The setpoints page displays and configures the LS-ZT unit's alarm setpoint values. From this page, setpoints such as high and low setpoints, high and low benchmark percentages and reverse setpoints can be altered. Capacity settings are "read only" on this page and can only be changed from the configure screen.
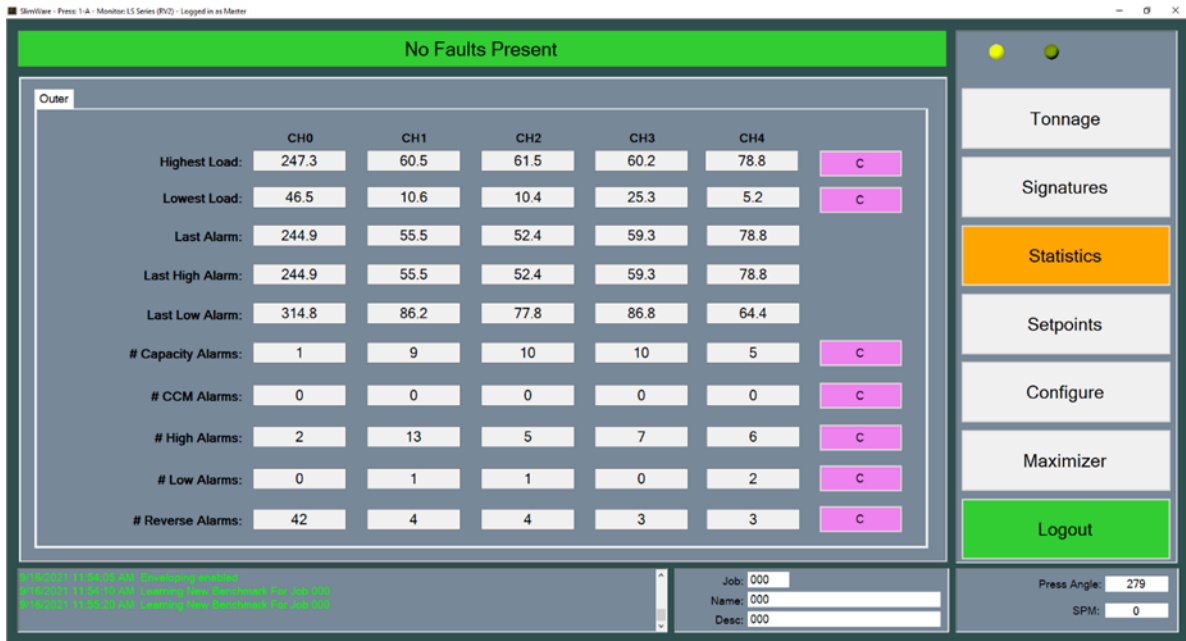
Figure 2-8 shows a typical four (4) channel LS-ZT unit's setpoint screen. If the logged in user has "Change Setpoints" permission, these setpoint values can be changed. If not, these setpoints are "read only."

   I.   Standard Setpoints

   A. High Setpoint

- The high setpoint value will stop the press when peak tonnage is above this value.
- The high setpoint value is stored with each job, so each job can have a different high setpoint value.
- A high setpoint alarm can be configured for an immediate stop or top stop (See page 52).

   B. Peak Tonnage

- Peak tonnage is the current tonnage that the LS-ZT has recorded. This value is specific to the monitor mode (Standard, First Level, Etc…).
- Peak tonnage is read only and cannot be changed.

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C. Benchmark

- The benchmark value is the desired peak tonnage per corner. The benchmark value is created by putting the monitor into learn mode.
- The benchmark tonnage is read only and can only be changed by putting the LS-ZT into learn mode.
- The benchmark tonnage is stored with each job, so each job can have a different benchmark tonnage.

D. Low Setpoint

- The low setpoint value will stop the press when peak tonnage is below this value.
- The low setpoint value is stored with each job, so each job can have a different low setpoint value.
- A low setpoint alarm is always top stop.

E. High Percentage

- The high percentage value is used in conjunction with learn mode. This value is used to determine the new high setpoint value.
- While in learn mode, the LS-ZT will multiply either the capacity or new benchmark value (configurable) by the high percentage value. The difference is then added to the benchmark value and the high setpoint value is established.
- The high percentage value is stored with each job, so each job can have a different high percentage value.

F. Low Percentage

- The low percentage value is used in conjunction with learn mode. This value is used to determine the new low setpoint value.
- While in learn mode, the LS-ZT will multiply either the capacity or new benchmark value (configurable) by the low percentage value. The difference is then deducted from the benchmark value and low setpoint value is established.
- The low percentage value is stored with each job, so each job can have a different low percentage value.

G. Reverse Tonnage

- Reverse tonnage is current reverse tonnage that the LS-ZT has recorded.
- Also called "Snap Thru" tonnage, this is tonnage that is applied to the press once the punch stamps through the part.

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- Reverse tonnage is read only and cannot be changed.

H. Reverse Setpoint

- The reverse setpoint value will stop the press when reverse tonnage is beyond this value.
- The reverse setpoint value is stored with each job, so each job can have a different reverse setpoint value.
- A reverse setpoint alarm can be configured for an immediate or top stop (see page 52).

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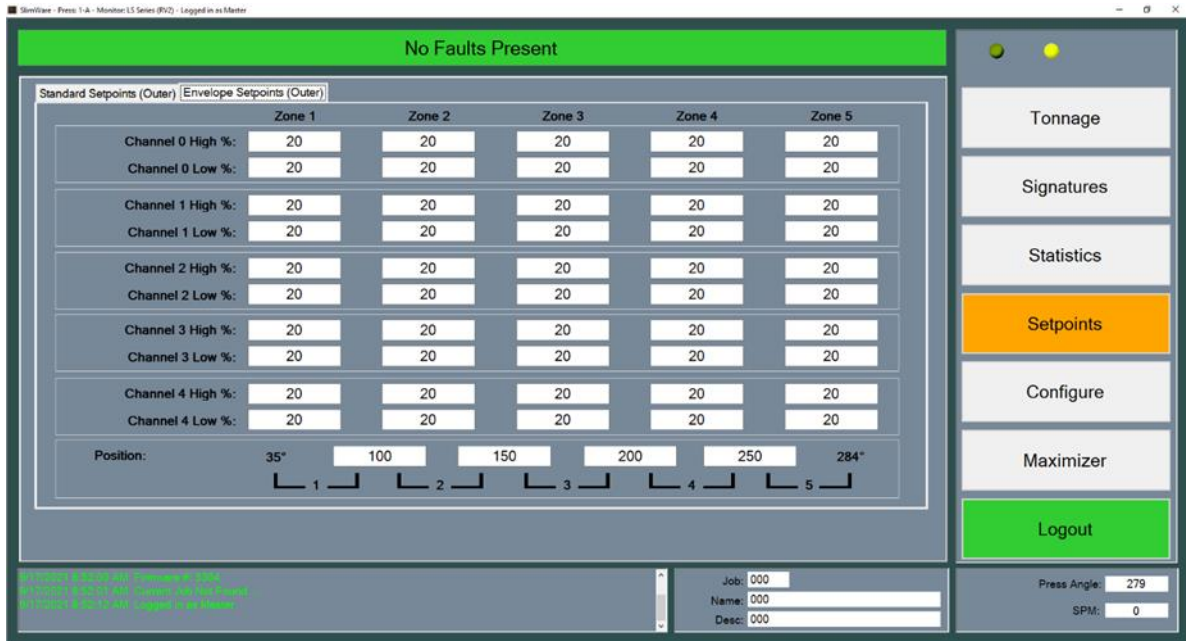
II. Envelope Setpoints

Figure 2-9: Envelope Setpoints Screen (4-Channel)

Enveloping allows for a form-fitting curve through the entire press stroke. Enveloping goes above and beyond a simple high and low setpoint by calculating different high and low limits throughout each degree of the press stroke.

With the LS-ZT, five (5) envelope zones can be calculated allowing for different high and low tolerances throughout certain windows. As seen in Figure 2-9, the enveloping setpoints for each zone are set by a degree-based value. Each window can be configured by entering the desired degrees. To bypass a zone, simply enter the same value as the previous zone.

A. Channel High and Low %

- These are the percentage values above and below the benchmark used to calculate the high and low enveloping limits in each specified zone. These values are used during learn mode.

B. Position

- The LS-ZT allow for up to five (5) zones to be calculated throughout the press stroke. Enter the desired windows in these textboxes.

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8. Configure

I. Settings

There are 5 total configuration screens. From these screens, a user logged in with a master password can access such features as tonnage calibration, user settings, communication settings, capacity values and alarm bypass settings. From the Settings screen, users can also change the login passwords and view the SlimWare software version.
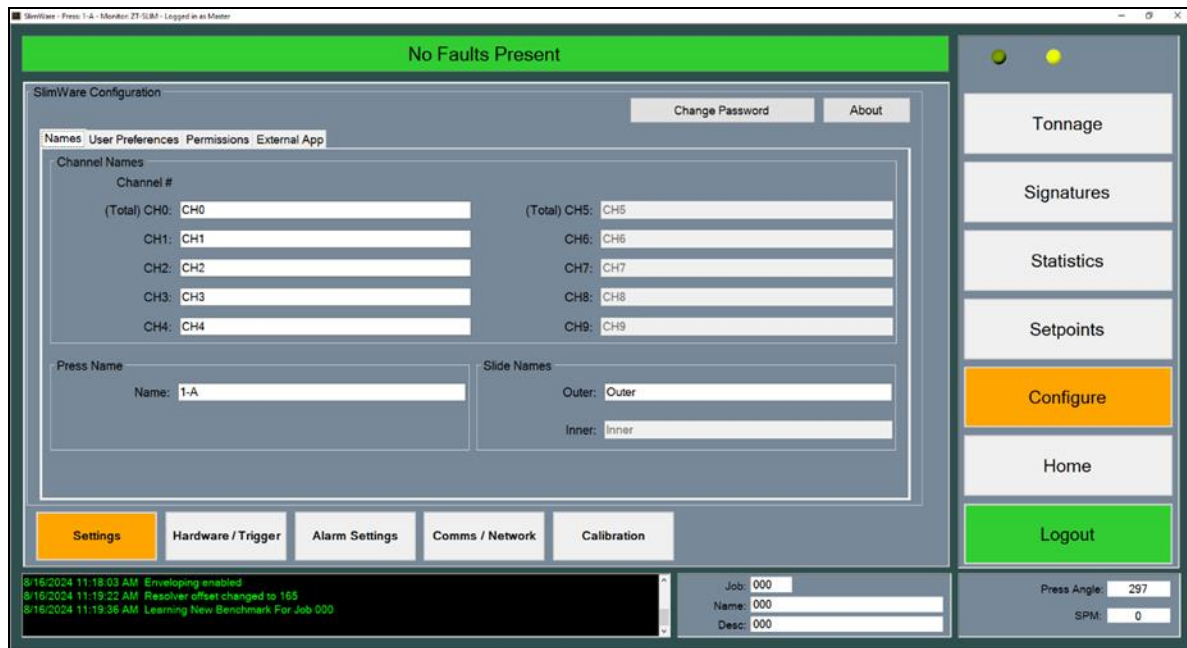

Figure 2-10: Configure Settings - Names Screen

Figure 2-10 shows the initial configure page (Settings). The Settings screen is split up into four different tabs (Names, User Preferences, Permissions, and External App). Use the buttons near the bottom of the configuration window to navigate to the different configuration menus.

- **Names**
  - **Channel Names** – Each channel can be configured for a specific name. Type in the desired name and press "Enter" to save the name to the desired corner. The default names are shown in Figure 2-10.
  - **Press Name** – Enter the name of the press on which the LS-ZT unit is installed. This name will be displayed in the SlimWare title bar. You may need to restart SlimWare after the press name is changed.
  - **Slide Names** – Each slide can be configured for a specific name. Type in the desired name and press "Enter" to save the name to the desired corner.
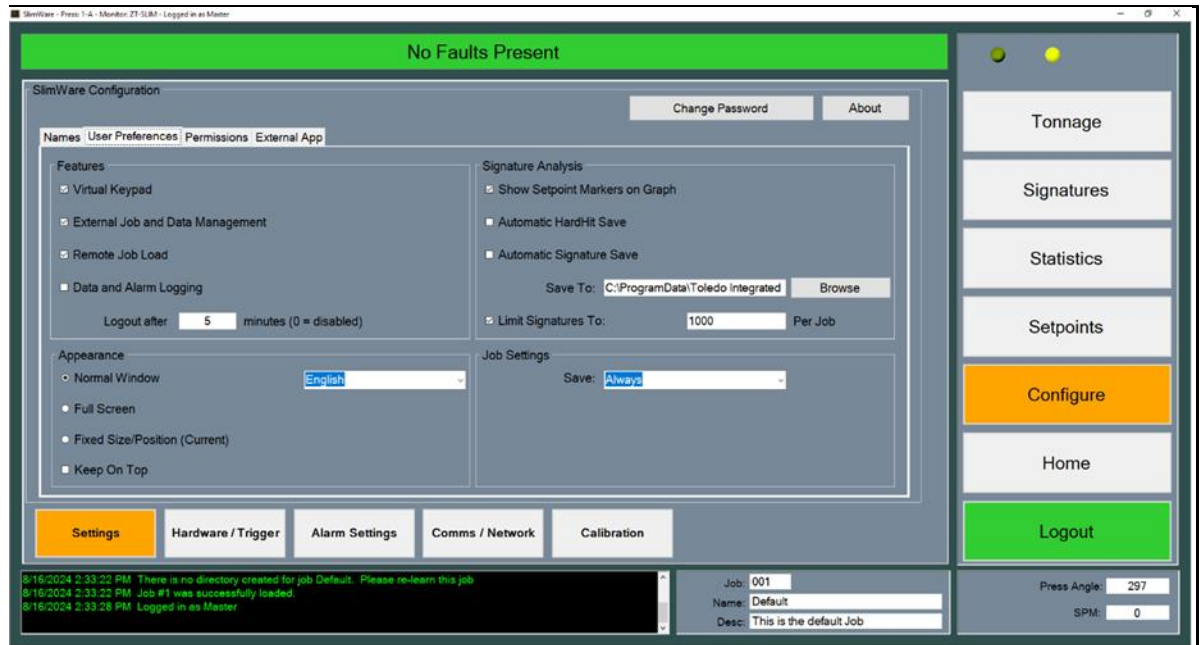
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Figure 2-11: Configure Settings - User Preferences Screen

- **User Preferences**

    - **Features**
        - **Virtual Keypad** – Enabled by default, this calls a keypad to the foreground when an alpha or numeric entry is required. This is to be used when a mouse and keyboard is not available (touch-screen applications). If a keypad is not desired, uncheck this option.
        - **External Job Data and Management** – This allows for third-party program to be used with SlimWare for functions such as automated job loading. For example, if using a SCADA program, this option would be checked. Checking this option will also enable the Live Data Output feature. See sections 11, 12, and 13 for more information.
        - **Remote Job Load** – Checking this option allows a job to be loaded by another device such as a PLC, via serial or tags.
        - **Data And Alarm Logging** – Checking this option will log all events from the event viewer window to a text file. This file is stored in the program installation folder (default location: C:\ProgramData\Toledo Integrated Systems\SlimWare 7\). If this log file becomes larger than 2GB, the oldest record will be deleted and the most current records will be added.
        - **Logout Time** – The number of minutes of inactivity that SlimWare will wait before automatically logging out the current user. Setting this to 0 will disable the auto-logout feature.

- o **Appearance**
  - ▪ **Normal Window** – Selecting this option will allow the user to change the size and position of SlimWare like any other window (click-and-drag, etc.). It is recommended to restart SlimWare after this option is changed.
  - ▪ **Full Screen** – Selecting this option will cause SlimWare to take up the entire screen, including the taskbar. It is recommended to restart SlimWare after this option is changed.
  - ▪ **Fixed Size/Position (Current)** – Selecting this option will cause SlimWare to open at the current size and position every time it starts. Before selecting this option, set the appearance to Normal Window, adjust SlimWare to the desired location and size, then select Fixed Size/Position. It is recommended to restart SlimWare after this option is changed.
  - ▪ **Keep On Top** – When enabled, SlimWare will always be the top-most window. Disable this if you would like SlimWare to be able to go to the background.
  - ▪ **Language** – SlimWare has the capability of running in three different languages (English, Spanish and Simplified Chinese). Note that SlimWare will need to be restarted after this option is changed.

- o **Signature Analysis**
  - ▪ **Show Setpoint Markers on Graph** – Checking this option will display the high and low setpoint markers on the signature(s). These markers are designated by yellow horizontal lines on the graph.
  - ▪ **Automatic HardHit Save** – When checked, SlimWare will automatically save the incoming alarm signatures to the HardHit directory.
  - ▪ **Automatic Signature Save** – This option allows for SlimWare to automatically request and save a signature every 1 second. See section 10 for more details.
  - ▪ **Limit Signatures To** – Limits the number of signatures that will be stored while using the Automatic Signature Save feature. See section 10 for more details.

- o **Job Settings**
  - ▪ **Save Changed Setpoints to Job** – When changing setpoints (standard or enveloping) to a loaded job, the changes can be:
    - • Always saved
    - • Prompted before saving
    - • Never saved (dismissed)
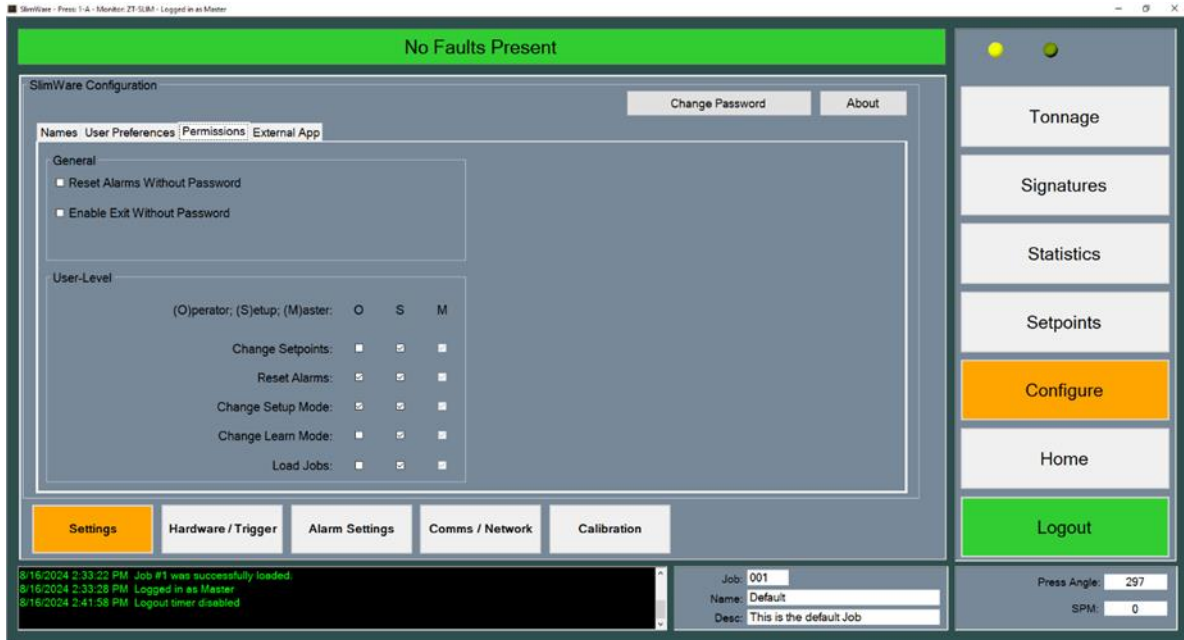
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Figure 2-12: Configure Settings - Permissions Screen

- **Permissions**
  Here, various functions can be allowed or restricted for Operator and Setup users.

  - **General**
    - **Reset Alarms Without Password** – Checking this option will allow alarms to be reset regardless of the level of user logged in or when no one is logged in.   Setting this option will override the user-level Reset Alarms permission.
    - **Enable Exit Without Password** – Checking this option allows SlimWare to be closed, regardless of the login status. When unchecked, the user must be logged in with the master password before SlimWare can be closed.

  - **User-Level**
    The Operator (O) and Setup (S) users can be granted permission to perform the following tasks. Note that the Master (M) level login always has permission to perform all tasks.
    - **Change Setpoints** – The selected user(s) can modify settings on the Setpoints screen, as well as on the Jobs Edit tab.
    - **Reset Alarms** – The selected user(s) can reset all alarms.
    - **Change Setup Mode** – The selected user(s) can enter and exit Setup Mode from the Tonnage screen.

- **Change Learn Mode** – The selected user(s) can enter and exit Learn Mode from the Tonnage screen.
- **Load Jobs** – The selected user(s) can access the Jobs screen to change jobs. Note that the ability to edit job setpoints will still be restricted unless the user(s) are also granted the "Change Setpoints" permission.
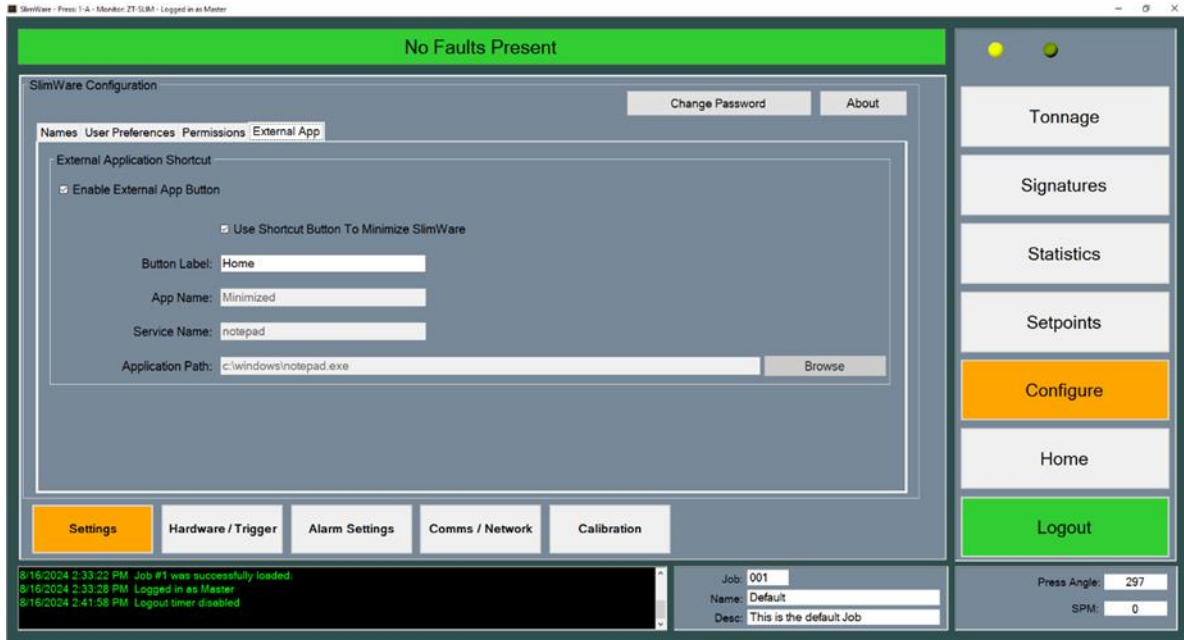
Figure 2-13: Configure Settings - External App Screen

- **External Application Hotkey**
  - ○ **External App** – Checking this option will enable the external application button above the Login/Logout button. This button is used to call a third-party program to the front.
  - ○ **Use Shortcut Button to Minimize SlimWare** – Checking this option will configure the shortcut button so it will minimize SlimWare when clicked. This is often used in combination with press control software to send SlimWare to the background.
  - ○ **Button Label** – Input the name to be shown on the external application button.
  - ○ **App Name** – The name of the external application. This name can be seen in the taskbar when the program is running.
  - ○ **Service** – This is the external applications service name. *The service name can be seen by right clicking on the taskbar and selecting "Task Manager". On the services tab of the task manager, find the external applications service name.*
  - ○ **Application Path** – This is the path to the .exe of the external application. Use the browse button to open a dialogue box to browse to the external program executable.

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- **Change Password** – Press this button at the top of the Settings screen to change the passwords for master, setup, or operator users. Select the desired type of user from the top radio buttons and select "Enter" once a new password has been entered.
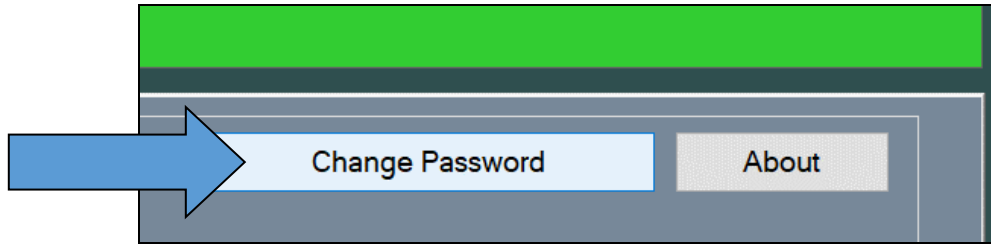
- **About** – Press this button at the top of the Settings screen to view the SlimWare software version.
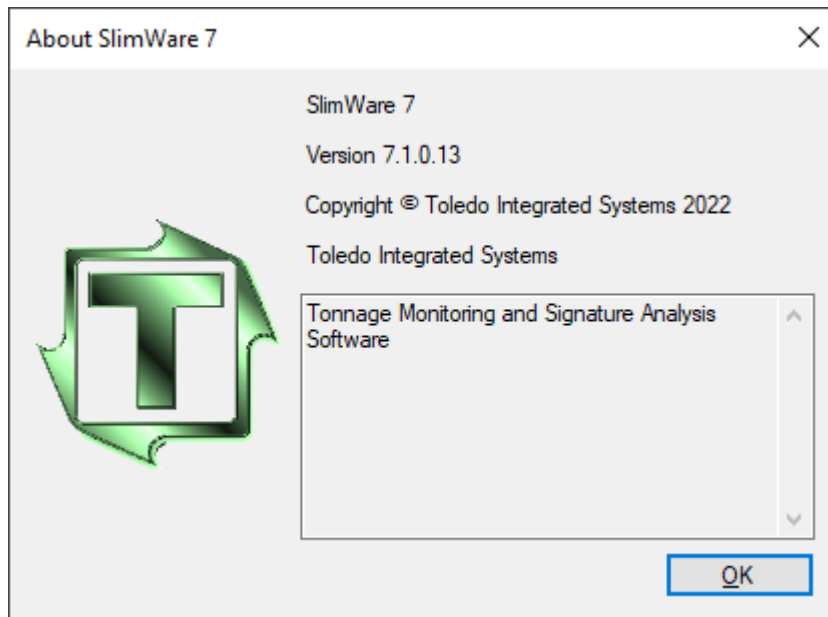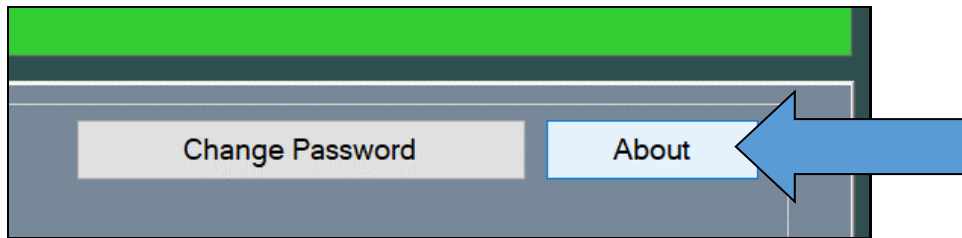
II.   Hardware / Trigger

The hardware/trigger page contains the basic tonnage monitor features such as the monitor type, number of channels, corner capacity, type of position instrument, decimal place precision and enveloping mode. The hardware/trigger page is split up into three different tabs (Hardware Configuration, Capacity, and Trigger).
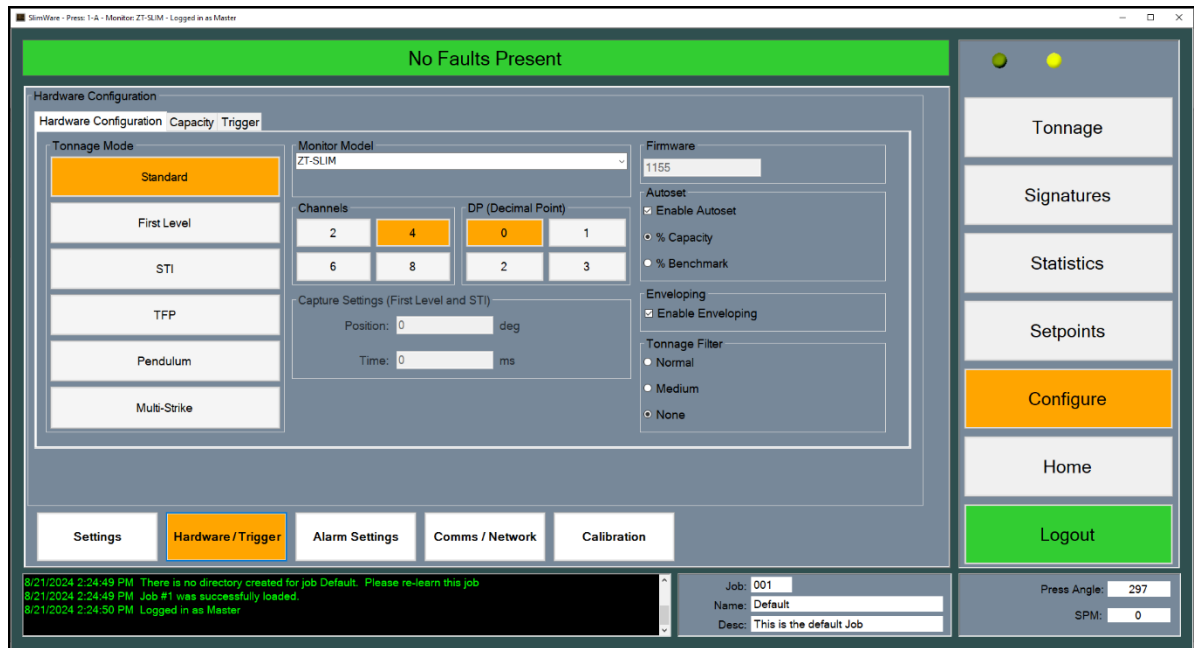

Figure 2-14: Configure Hardware/Trigger - Hardware Configuration Screen

- **Hardware Configuration**
  - **Tonnage mode**
    - **Standard** – The normal mode of operation. For most applications, this is the desired mode. Unless otherwise noted, use this tonnage mode.
    - **First Level** – In first level mode, the load is the peak loading which occurs during the portion of the stroke from the initial threshold crossing until the time point is reached.
    - **STI** – Designed for double-action stamping presses. This mode allows for the inner and outer slide tonnage to be monitored with only mounting four (4) sensors.
    - **TFP** – Designed for a specific type of transfer press system with six (6) columns, where center columns are shared by the two slides.
    - **Pendulum** – Used by servo presses. This mode allows tonnage gathering for the non-cyclical, forward-backward, short stroke motion of servo presses. Each short stroke produces a part.

- **Multi-Strike** – Used by servo presses. Similar to Pendulum mode, but several strikes are used to produce a single part.

- **Monitor Model**
  - The model of the connected tonnage monitor with which SlimWare will communicate. This should always remain set to "LS-ZT".

- **Channels**
  - The number of physical sensor inputs on the LS-ZT. Typically 4 or 8.

- **DP (Decimal Point)**
  - Sets the digits to the right of the decimal point to be displayed.

- **Firmware**
  - The firmware version installed on the tonnage monitor. Read only.

- **Autoset**
  - **Enable Autoset (Capacity)** – When enabled, the monitor will calculate all percentages based on press capacity. (The percentages can be configured from the setpoints page).
  - **Enable Autoset (Benchmark)** – When enabled, the monitor will calculate all percentages based on the obtained benchmark value calculated during learn mode. (The percentages can be configured from the setpoints page).

- **Capture Settings**
  - **Position** – Used with first level and STI tonnage modes, this is the position (resolver, encoder, or gray code triggering) that the load will be captured.
  - **Time** – Used with first level and STI tonnage modes, this is the amount of time the peak hold circuit is monitored once the threshold tonnage has been crossed (threshold triggering) or the probe input signal is read (probe triggering).

- **Enveloping**
  - **Enable Enveloping** – Check this to enable enveloping mode. Enveloping provides a window throughout the press stroke that monitors tonnage from 35 to 284 degrees. Applies to resolver, encoder, or gray code triggering only.

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- o **Tonnage Filter**
  - **Normal** – Analyzes incoming signal from the tonnage sensors and filters out noise from electrical interference.
  - **Medium** – More aggressive noise filtering. Should only be used in situations where high electrical noise is suspected.
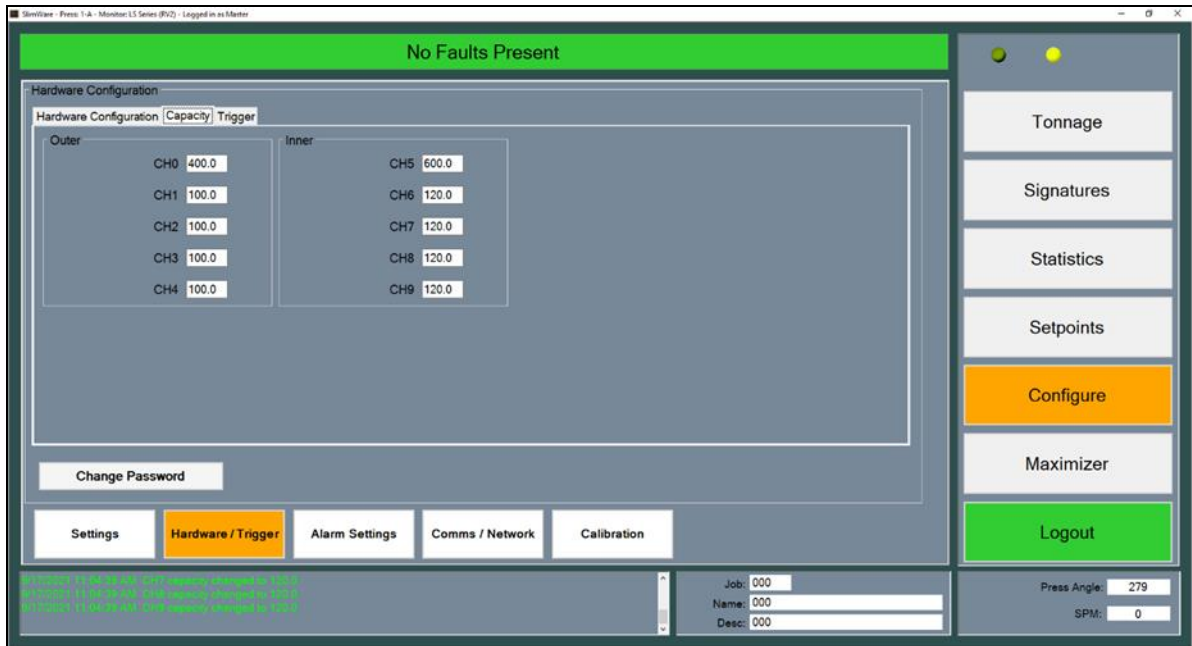 - **None** – The incoming tonnage sensor signal is not filtered.

Figure 2-15: Configure Hardware/Trigger - Capacity Screen

The capacity settings for the unit should be set during initial startup and should not be changed thereafter. Changing the capacity will affect all other setpoints.

- **Capacity**
  - o **Outer** – The rated maximum tonnage for the outer slide's total and each corner.
    - For standard single-action presses, this is where the press's rated capacity is entered.
    - For double-action presses, this is where press's rated capacity for the outer slide is entered.
    - Each corner's capacity is typically the slide's total divided by the number of channels for that slide. When the total capacity is entered, SlimWare will automatically calculate the capacities for the individual corners.
    - Each corner can have a different capacity assigned if required (not typical).

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- o **Inner** – The rated maximum tonnage for the inner slide's total and each corner.
  - For double-action presses, this is where the press's rated capacity for the inner slide is entered. Not used for single-action presses.
  - Each corner's capacity is typically the slide's total divided by the number of channels for that slide. When the total capacity is entered, SlimWare will automatically calculate the capacities for the individual corners.
  - Each corner can have a different capacity assigned if required (not typical).
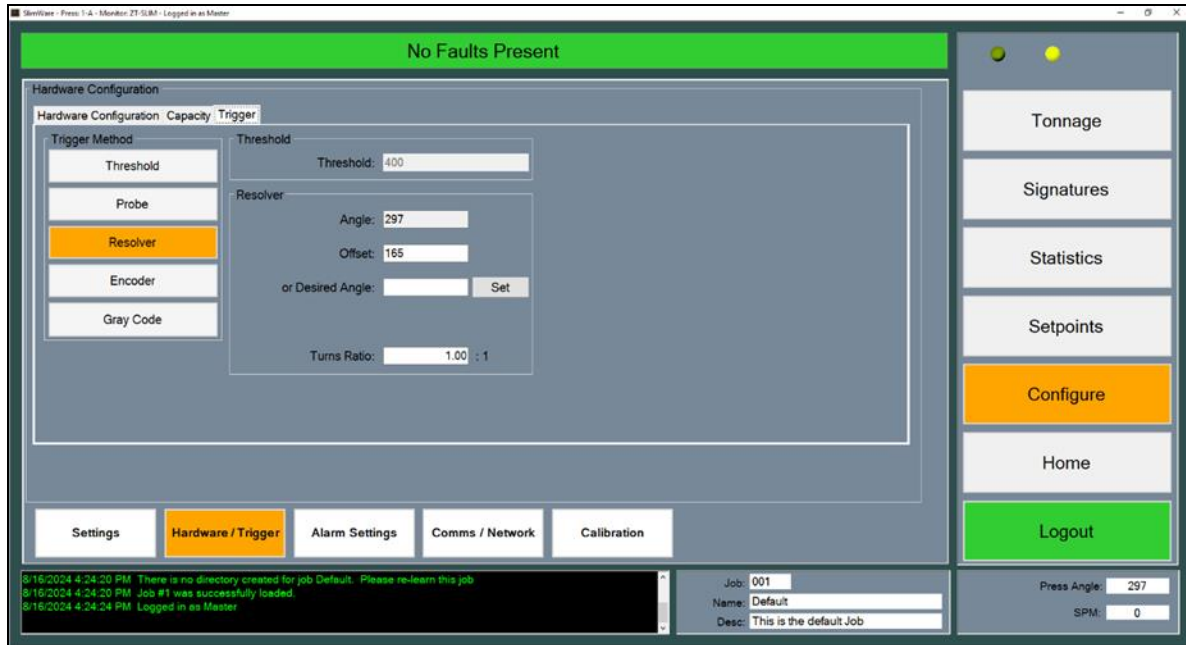

Figure 2-16: Configure Hardware/Trigger - Trigger Screen

- **Trigger**
  - o **Trigger Method**
    - **Threshold** – Setting the trigger to threshold will allow a user to enter a desired total tonnage value at which the monitor should start monitoring. For example, if 100 tons is entered, the monitor will not begin its peak hold circuit until 100 total tons has been obtained.
      - The maximum press speed is 400 spm with a threshold trigger.
      - Signatures are not available when using a threshold trigger.
      - The **Threshold** entry field is the total tonnage value (CH0) at which the LS-ZT will start to monitor. If the threshold method is not selected, this field is not changeable.
    - **Probe** – The probe method can be wired so that an input signal can trigger the monitor to start and stop monitoring.

- The maximum press speed with a probe trigger is 2000 spm.
- Signatures are not available when using a probe trigger.

▪ **Resolver** – The standard method. Use this method when a resolver is wired into the resolver input on the LS-ZT.

- **Angle** - This field is read-only and displays the current resolver/encoder/gray code position.
- The maximum press speed with a resolver trigger is 900 spm.
- **Offset** - This entry field allows users to enter the desired offset value to obtain the correct angle. Valid offset values range from 0-359.
- **Desired Angle** – An alternative to calculating the offset, simply enter the current press angle here and click the "Set" button to automatically calculate and set the offset.
- **Turns Ratio** – This entry field allows users to enter a custom turns ratio for situations where the resolver is mounted to a shaft that turns more or less than one revolution per press stroke. For example, if the resolver turns two full revolutions for each 360° of press movement, enter a turns ratio of 2.00.
  Note: For improved accuracy, a "Resolver Angle Reset Signal" should be wired to the LS-ZT control module's IN2 terminal. See the ZT-SLIM User's Manual for further detail.

▪ **Encoder** – Similar to resolver method. Use this method when an incremental encoder is wired into the encoder input on the LS-ZT control module.

- **Angle** - This field is read-only and displays the current resolver/encoder/gray code position.
- The maximum press speed with an encoder trigger is 900 spm.
- **Offset** – This entry field allows users to enter the desired offset value to obtain the correct angle. Valid offset values range from 0-359.
- **Desired Angle** – An alternative to calculating the offset, simply enter the current press angle here and click the "Set" button to automatically calculate and set the offset.

▪ **Gray Code** – Accepts a gray code logic signal. Use this method when a gray code signal is wired into the IN(x) inputs on the LS-ZT control module.

- The angle field is read-only and displays the current resolver/encoder/gray code position.
- The maximum press speed with a gray code trigger is 900 spm.
- Gray code is the absolute position of the press. Therefore, no offset value is needed.

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III. Alarm Settings

Alarm settings can be configured from the Alarm Settings screen (see example below). Each type of alarm can be configured for a specific type of stop including top or immediate stop. Alarms can also be bypassed on a channel-by-channel basis.

Figure 2-17: Configure Alarm Settings Screen (4-Channel)

For example, in the above screen shot, the high setpoint and reverse alarms are bypassed, while Capacity, CCM, Low setpoint, High and Low enveloping alarms are active. Immediate stops are declared for Capacity and CCM alarms, while top stops are declared for the remaining alarms.

To bypass and/or change the alarm type, click on the button to scroll through the available options. When any type of alarm or stop is changed, an Apply and Cancel button will appear in the bottom right-hand corner of the configuration screen. To save the alarm setting changes, press the "Apply" button.

For an eight (8) channel unit, toggle between the slides by using the two tabs near the top of the screen. As with the four (4) channel unit, each slide and channel number can be configured independently.

The alarm configuration will affect the function of the LS-ZT's two (2) shutdown relays when the corresponding fault occurs.

Top Stop Fault   >>   TS-A/B opens at 290°   IS-A/B remains closed
Immed. Stop Fault   >>   TS-A/B opens immediately   IS-A/B opens immediately

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IV.   Comms /Network

The Comms (communication) / Network screen contains all the settings pertaining to the communication between SlimWare and the LS-ZT control module, hard-hit software connections and OPC server and client tag definitions. Once configured during setup, the communication and network settings should not be adjusted unless communications have been terminated. The Communication/Network screen is split up into four different tabs (Common, Ethernet, Serial, PLC, and Bluetooth).
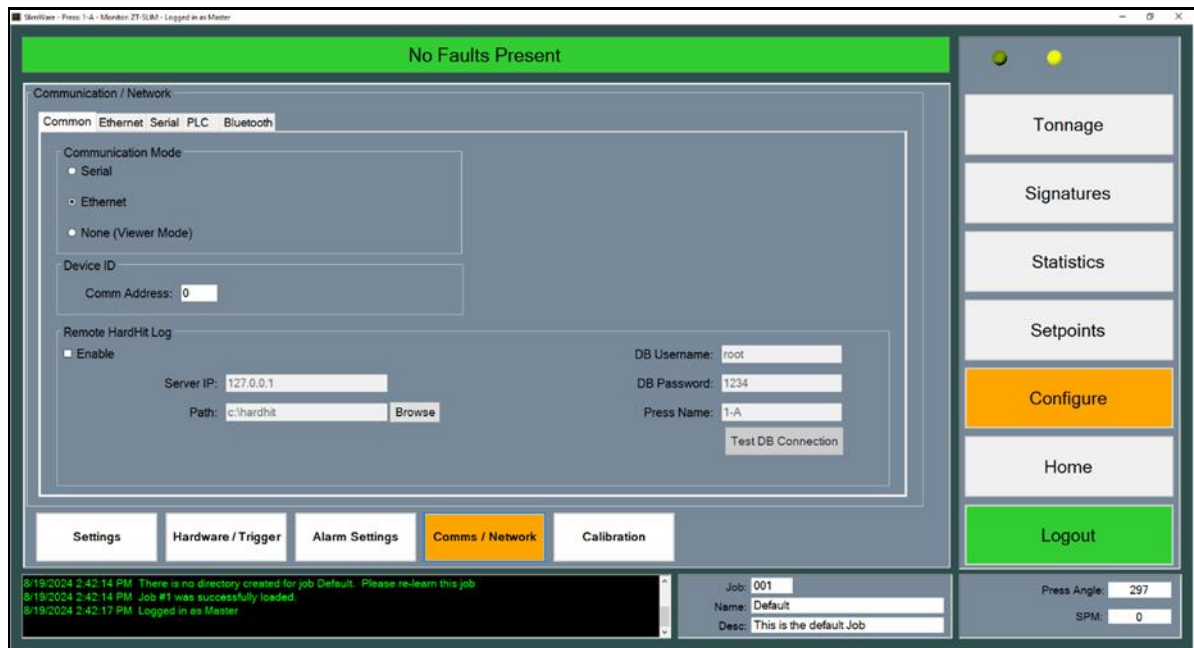

Figure 2-18: Configure Comms/Network - Common Screen

- **Common**
    - o   This tab contains settings that are common to Ethernet, Serial, and PLC communication.
    - o   **SlimWare Communication Mode –** Specifies how SlimWare will communicate with the LS-ZT control module. Choose between Serial or Ethernet, depending on the connection. By default, the LS-ZT uses the Ethernet configuration. Typically, this should not be changed.
    - o   **Device ID**
        - ▪   **Comm Address –** The SLIM Address is a unique number (0-31) assigned to each individual tonnage monitor when multiple units are installed on a PressNet plant-wide network. If not part of a PressNet network, leave this at 0.
    - o   **Remote HardHit Log –** This group contains the network settings for saving hard hits (over-tonnage) to a location on the network.
        - ▪   **Enable** – If checked, SlimWare will attempt to write any alarm values to the remote MySQL database and save hard-hit signatures (alarms) to the

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remote PC. If the remote PC is unavailable, SlimWare will attempt to store the alarm information in a local database. Once the remote PC becomes available, the alarm data stored in the local PC will be transferred to the remote PC database.

- **Server IP** – The IP address of the remote PC.
- **Path** – The location on the remote PC where signatures will be stored.
- **DB Username** – The MySQL database username (Default: "root").
- **DB Password** – The MySQL database password (Default; "1234").
- **Press Name** – The name of the press. This is stored in the remote database and used for reporting purposes.
- **Test DB Connection** – This button can be used to verify the connection between SlimWare and the remote database. By clicking this button, SlimWare will attempt to connect to the remote database. A message box will appear indicating the connection status.

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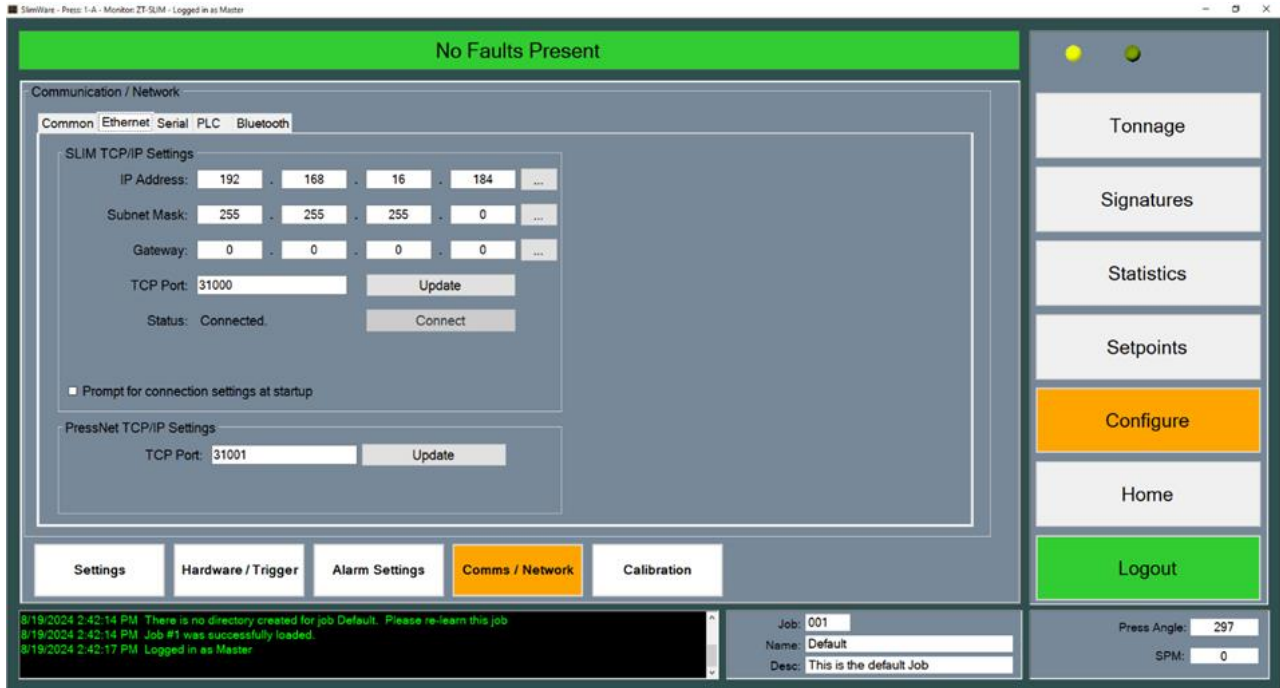
Figure 2-19: Configure Comms/Network - Ethernet Screen

- **Ethernet**
  - This tab contains Ethernet-related communication settings. These settings are only changeable when the SlimWare Communication Mode is set to Ethernet.
  - **TCP/IP Settings**
    - **IP Address –** The IP Address of the LS-ZT control module. Default is 192.168.16.180
    - **Subnet Mask** – The subnet mask of the local network on which the SlimWare PC and the LS-ZT are connected. Default is 255.255.255.0
    - **Gateway** – The gateway is the IP address of the router or managed switch if one is installed. If none is installed, set this to the default of 0.0.0.0
    - **TCP Port** – The unique port number of the TCP connection that the LS-ZT and SlimWare will share. Default is 31000.
    - **Status** – The current state of the TCP connection between SlimWare and the LS-ZT control module. Will be either "Connected" or "Disconnected".
    - **Update –** Pressing this button will send the IP Address, Subnet Mask, Gateway, and TCP Port settings to the LS-ZT control module. Press the Update button after changing any of the above settings. After the settings are sent, the control module will reboot and SlimWare will display a message that it will need to restart to apply the settings. Wait for the control module to finish rebooting, then reopen SlimWare.

- o **PressNet TCP/IP Settings**
  - ▪ **TCP Port** – The unique port number of the TCP connection that the monitor and PressNet will share. This must be different than the TCP port number for the SlimWare connection. Default is 31001.

If the SlimWare communication method is set to Ethernet, and communication has been lost, follow these steps to establish communication with the LS-ZT control module.

- • **Ethernet Communication Setup**
  - o Verify that the Ethernet cable is connected between the Panel PC and the LS-ZT control module.
  - o Go to the Configure → Comms/Network screen.
  - o On the Common tab, make sure the Communication Mode is set to Ethernet.
  - o On the Ethernet tab, enter the default IP address (192.168.16.180), subnet mask (255.255.255.0), and TCP port (31000).
  - o Click the Update button.
  - o If communications do not start, close SlimWare then restart it from the desktop shortcut.

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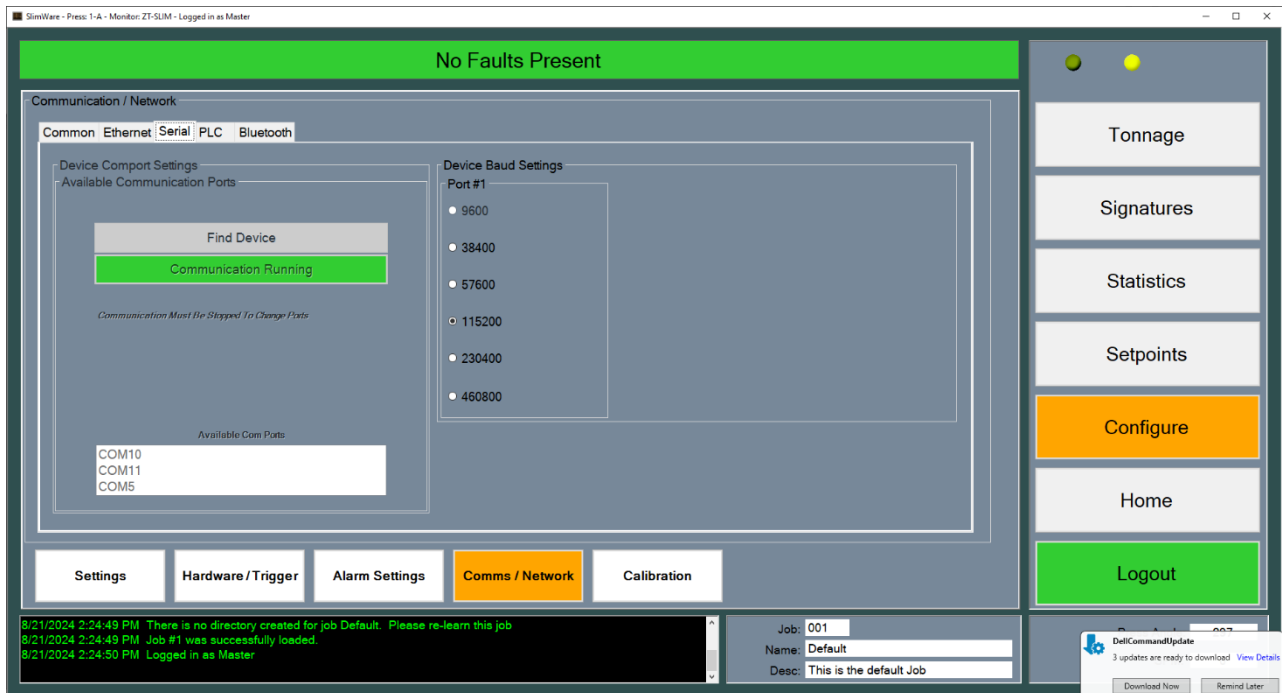
Figure 2-20: Configure Comms/Network - Serial Screen

- **Serial**
  - This tab contains Serial-related communication settings. Some settings are only changeable when the SlimWare Communication Mode is set to Serial.
  - **SLIM Comport Settings**
    - This section is only available when the Communication Mode is set to Serial.
    - **Find Device –** Select this button if the com port, baud rate or address have been changed. *See more about this is the initial communication setup later in this section.*
    - **Available Com Ports** – Lists the available com ports on the PC.
    - **Communication Running / Idle** – Indicates whether communications have been established and whether communications are running. If the com port is open, this button will be green. If no com port is open, this button is yellow.
  - **SLIM Baud Settings/Port #1** – If the Communication Mode is set to Serial, this is the baud rate of the main communication port between the PC (SlimWare) and the control module. Select the correct baud rate for the control module.
    If the Communication Mode is set to Ethernet, this is the baud rate of the serial port between the LS-ZT control module and the remote device/communication software (i.e. the PressNet network). Select the correct baud rate for the remote device.

If the SlimWare communication method is set to Serial, and the serial communication has been lost, follow these steps to establish communication with the LS-ZT control module.

- **Serial Communication Setup**
    - o If communications are currently running, press the green "Communications Running" button. The button should turn yellow and the text will change to "Communication Not Running".
    - o From the Available Com Ports list box, select the desired PC com port, then press the yellow "Communication Not Running" button. SlimWare will try to connect to the desired com port.
    - o If needed, change the baud rate and SLIM address to the desired values.
    - o If the baud rate and/or SLIM address is not known, press the Find Slim and wait while SlimWare searches for the proper settings.
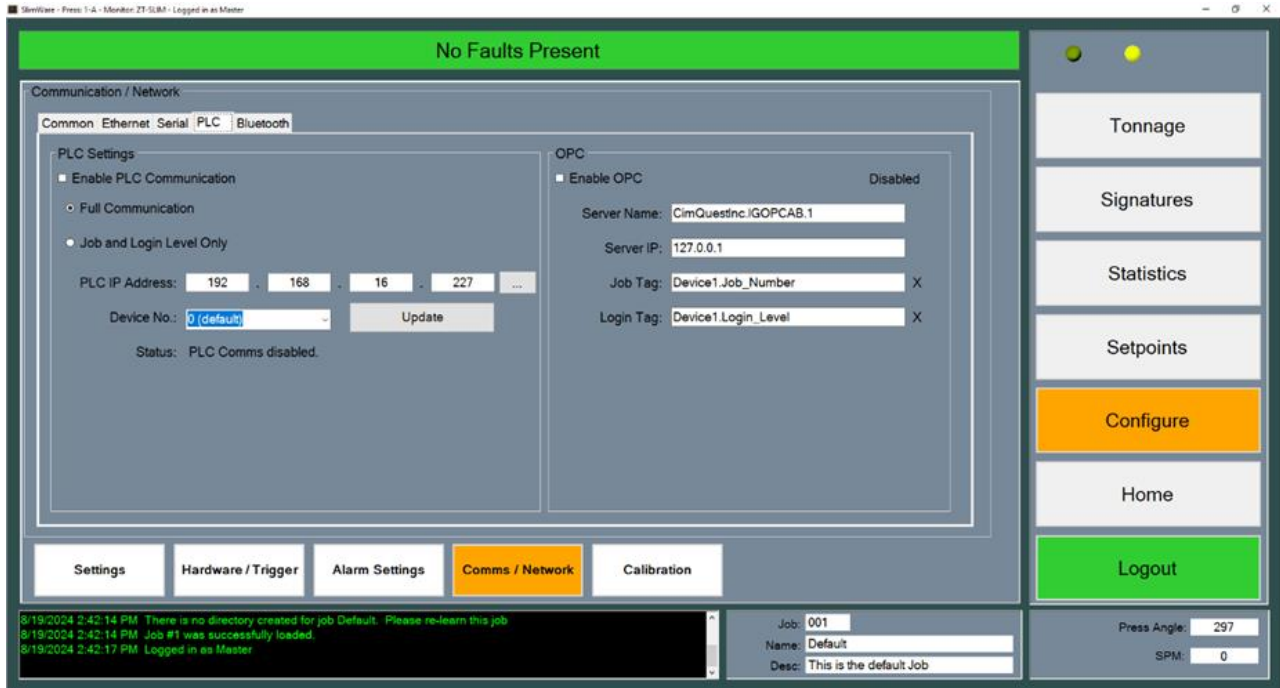
Figure 2-21: Configure Comms/Network - PLC Screen

- **PLC**
    - This tab contains PLC-related communication settings. Configure these settings when the LS-ZT will communicate directly to a PLC.
    - **PLC Settings**
        - **Enable PLC Communication** – Check this box to enable communications between the LS-ZT and the PLC located at the IP Address listed in the PLC IP Address field.
        - **Communication**
            - **Full Communication** – Choose this if the tonnage monitor will communicate all settings, configuration, tonnage, and signatures to the PLC.
            - **Job and Login Level Only** – Choose this if the PLC will only change jobs and/or SlimWare login level. This option requires less PLC resources. If this option is selected, the following tags must be created in the PLC. All tags must be controller tags, INT data type (2 bytes).
            JobNumber_To_ZT – Write the job number to this tag.
            JobNumber_From_ZT – Read this tag to get the current job number loaded to the tonnage monitor. This tag is optional.
            Login_To_ZT – Write the login level to this tag to log in or out in SlimWare. This tag is optional.

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Below are the login levels and equivalent values:
- o Master: "3"
- o Setup: "2"
- o Operator: "1"
- o Log Out: "0"

- **PLC IP Address** – The IP address of the PLC with which the LS-ZT will communicate. The Enable PLC Communication checkbox must be unchecked before you can edit this.
- **Device No. –** Configure the device number of the LS-ZT if the PLC is communicating to multiple units. If the PLC communicates with only this LS-ZT, this setting should remain at 0 (default).
- **Update** – Press this button to send the PLC IP Address to the LS-ZT. The Enable PLC Communication checkbox must be unchecked before you can send the PLC IP Address to the LS-ZT.
- **Status** – The current state of the PLC connection.

- o **OPC**
  - This group box contains the OPC server address and OPC client tag names used for job changes, bolster ID, etc.
  - **Enable OPC** – If checked, SlimWare will attempt to read the OPC tags defined from the tag names and server address.
  - **Server Name** – This is the OPC server name. By default, this is *CimQuestInc.IGOPCAB.1*
  - **Server IP** – The IP address of the PC where the OPC server is located.
  - **Job Tag** – The OPC client tag name. This value is defined by the job name/number tag in the PLC.
  - **Login Tag** – The OPC client tag name. This value is defined by the login level tag in the PLC.

Ⓣ
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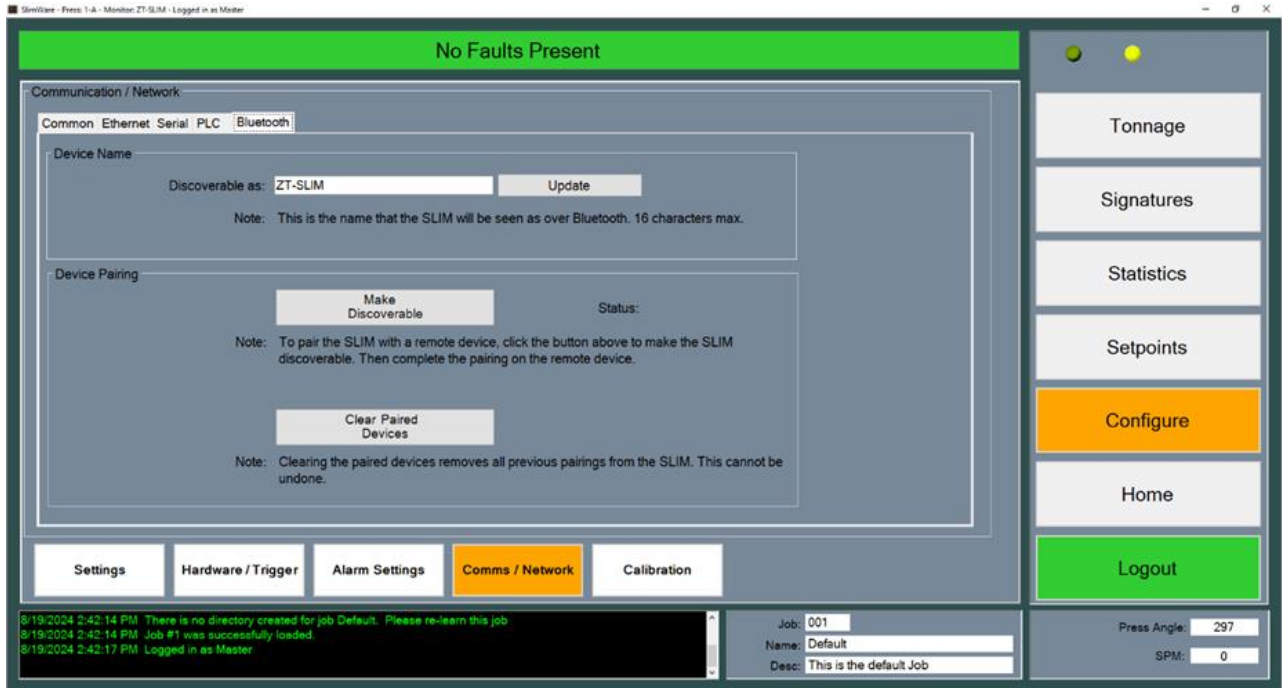
Figure 2-22: Configure Comms/Network - Bluetooth Screen

- **Bluetooth**
    - This tab contains Bluetooth-related settings that allow the LS-ZT tonnage monitor to communicate with the ForceView app for Android smart phones (available on the ttoledo.com web site).
    - **Device Name**
        - **Discoverable As** – This is the name that the LS-ZT will be seen as over Bluetooth. The name can be up to 16 characters long. After changing the name, click the Update button.
    - **Device Pairing**
        - **Make Discoverable** – Click this button to make the LS-ZT discoverable to a remote device, such as a smart phone. After making the monitor discoverable, complete the pairing on the remote device.
        - **Clear Paired Devices** – Multiple remote devices can be paired with the LS-ZT. Clicking this button will clear the list of paired devices from the LS-ZT's memory.

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V.   Calibration

This details the tonnage calibration for the LS-ZT unit. This should only be done by a trained Toledo Integrated Systems technician or someone else with tonnage monitor calibration knowledge.

Refer to the Calibration Procedure of this manual for further details.

**Warning: Improper calibration of the LS-ZT unit can result in physical damage to the press. Please contact Toledo Integrated Systems if you have any questions about the tonnage calibration procedure.

Figure 2-23: Configure Calibration Screen

- **Channel Tonnage** – Displays the current peak tonnage from the LS-ZT unit
- **Load Cells** – User input of the displayed tonnage from the calibration load cells (AutoCells). Available when displaying Gain values. Entering a Load Cell value will cause SlimWare to calculate a new Desired Gain value based on the current channel tonnage.
- **Balance/Gain** – Depending on the mode and stage of calibration, the monitor's balance (zero) or gain (shunt).
- **Desired Gain** – User input of the new desired gain values. Available when displaying Gain values. These are automatically calculated by entering load cell values.
- **Capture/Capturing Tonnage** – When the LS-ZT is ready to capture peak load tonnage values, this button will turn yellow and display the "Capturing Tonnage" message. When the balance or gain values are being displayed, pressing this button will exit calibration mode and the LS-ZT will be ready to capture peak load tonnage again.

- **Display/Displaying Balance** – Press this button to display the current sensor balance for each channel. After pressing this button, the values in the "Balance/Gain" fields show the sensor balance. This mode is used for calibration purposes. The monitor will not update its peak tonnage while it is displaying the balance.

- **Display/Displaying Gain** – Press this button to display the current gain for each channel. After pressing this button, the values in the "Balance/Gain" fields show the sensor gain. This mode is used for calibration purposes. The monitor will not update its peak tonnage while it is displaying the gain.

- **Zero the Balance** – When displaying the balance, this button zeroes the balance of the LS-ZT monitor's channels. The balance should only be zeroed when the press is in the top position without any load on the sensors. ***This button does not balance the actual signal output voltage by the LS-ZT analog module.*** You should always adjust the balance pot of each channel on the analog module to read close to zero volts output. After this is done, you can use the Zero the Balance button to correct minor differences between the actual balance voltage and the balance readings as shown in SlimWare.

- **STI**
  - ○ **STI Value** – User input for the desired STI value so that the LS-ZT can calculate the Inner Slide tonnage. Only available when in STI mode.
  - ○ **Apply STI** – When entering the STI Value this button will send the desired value to the LS-ZT unit.
  - ○ **Cancel STI** – When entering the STI Value this button will cancel the value the user has entered and return to the original value.

9. Job Settings

The job settings can be controlled through SlimWare itself or externally through INI (configuration) files. From SlimWare, users can add, edit, or delete job setpoints. To access the job settings page, click anywhere in the job group box near the bottom of the screen (see Figure 2-4, point E). If the logged-in user has "Change Job" permission, the screen in Figure 2-24 will load.
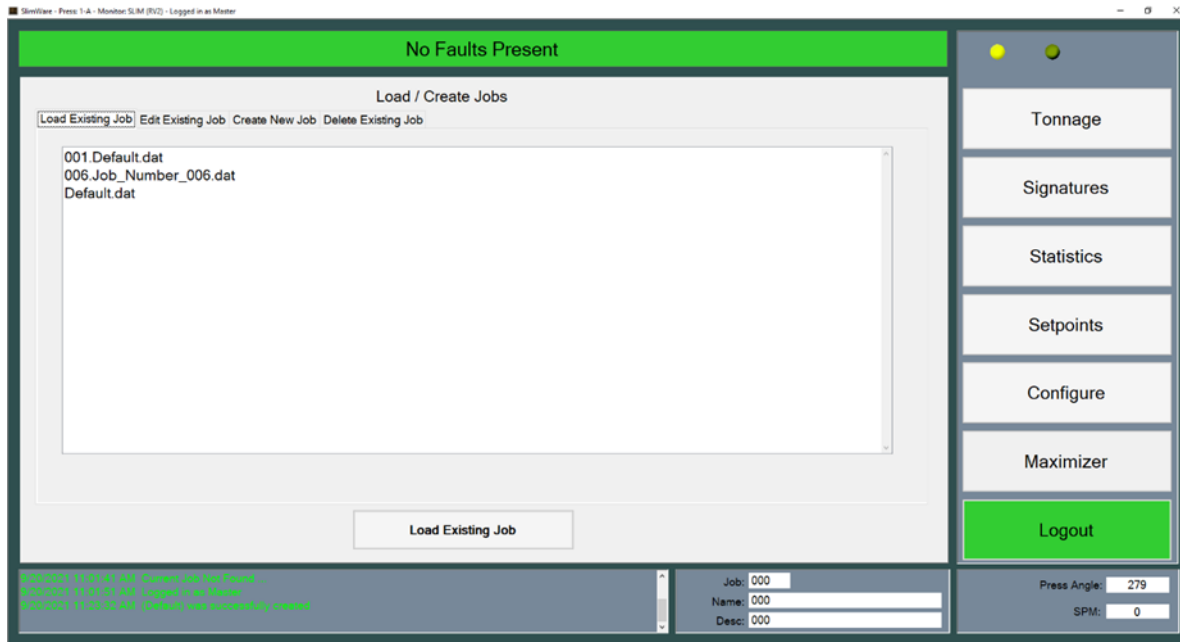
Figure 2-24: Load Existing Job Screen

I.   Load Existing Job

- As mentioned above, SlimWare is able to manually or externally load a new job. If "External Job Data and Management" is checked on the configuration page, third party programs need to create an INI file in SlimWare's external file directory and a new job will load.

- To load a new job manually, click on the desired job (the new job will become highlighted in the list), and select "Load Existing Job". Notice the job number, name and description will update along with the historical text box.

- If the loaded job is new or has not yet been "learned", a message will appear notifying the user that no available signature is available. Once the job has been successfully "learned", a saved signature and folder will be created for the job. (To learn a job, simply select "Learn" from the tonnage page once the new job is loaded. This will automatically calculate setpoints based on 8 strokes.)

- The external job folder is located in the SlimWare data directory. Normally, this path is: C:\ProgramData\Toledo Integrated Systems\SlimWare 7\ExtData.

- To view the INI file structure type, view section 11 for all external file type structures.

II. Edit Existing Job
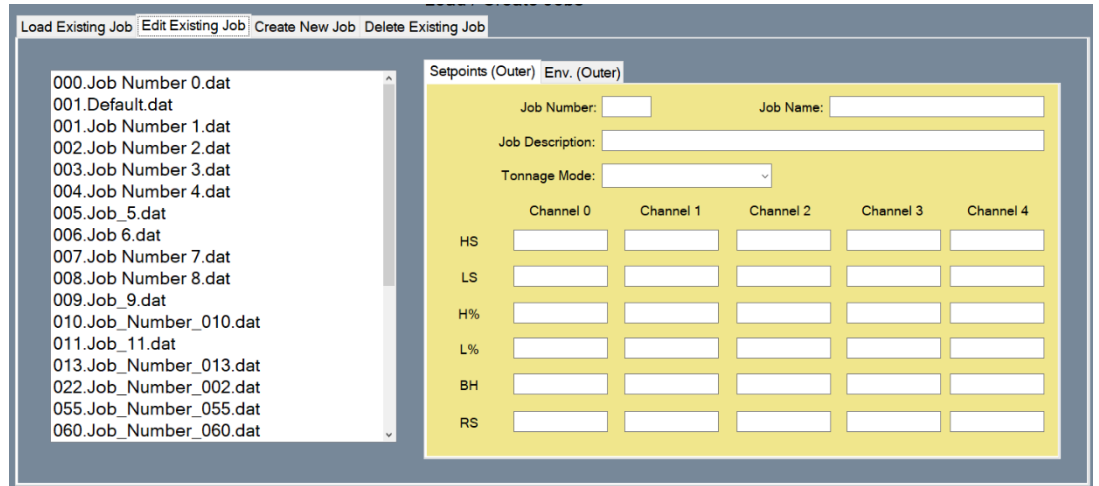
Figure 2-25: Edit Existing Job Screen

- SlimWare allows for users to edit job parameters while the job is not loaded. By selected the "Edit Existing Job" tab, a list of all previously saved jobs (excluding the currently loaded job) will appear. Click on the desired job and the setpoints (standard and enveloping) will load.

- Edit any of the job parameters and select "Save Job Settings". This will save the setpoints to the desired job. The changes will be reflected next time the job loads.

III. Create New Job

- To create a new job, select the "Create New Job" tab. The window below will load.

Figure 2-26: Create New Job Screen

- Enter the desired job number, job name and description for the new job and select "Create New Job".

- The newly created job is not loaded, just created. It is created with the current setpoints that are stored in the LS-ZT control module (the current job loaded). To load the new job, select the "Load Existing Job" tab. The recently created job will be listed. Click on the new job and select "Load Existing Job". The new job will be loaded.

- If the setpoints of the currently loaded job are not suitable, once created, follow the steps in the section above for editing an existing job.

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IV.   Delete Existing Job
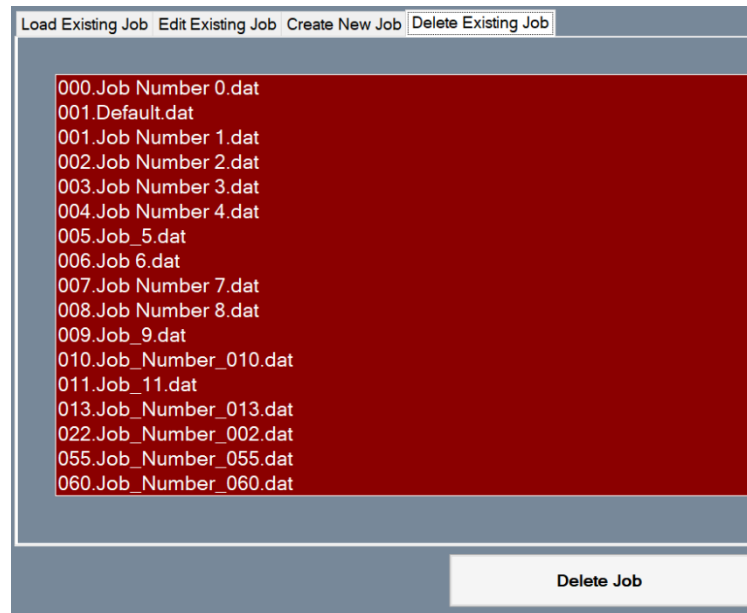
Figure 2-27: Delete Existing Job Screen

- To remove an existing job, select the "Delete Existing Job" tab and highlight the job that is to be removed. Once highlighted, select "Delete Job". A message box will appear asking for confirmation; select "Yes" to permanently remove the job from SlimWare.

10.   Automatic Signature Save Feature

SlimWare can automatically download and save signatures for later analysis. This section will discuss this feature and its options.

The Automatic Signature Save feature can be found on the **User Preferences** tab of the **Configure→Settings** screen.
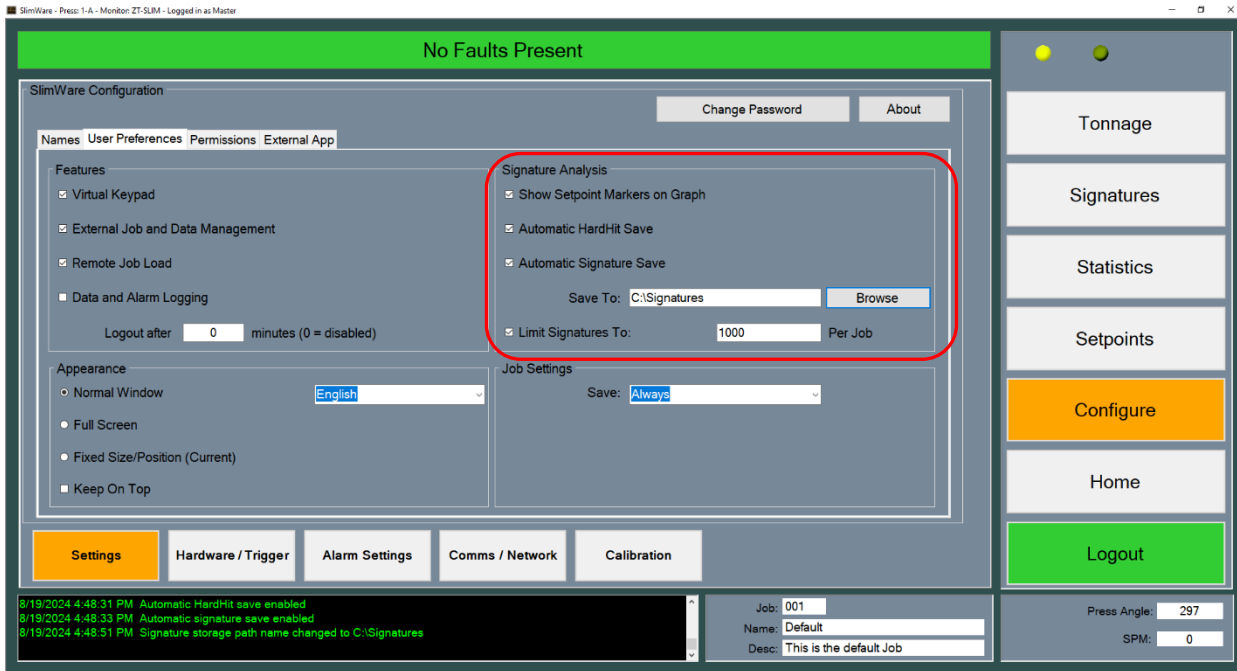
Figure 2-28: Automatic Signature Save Configuration
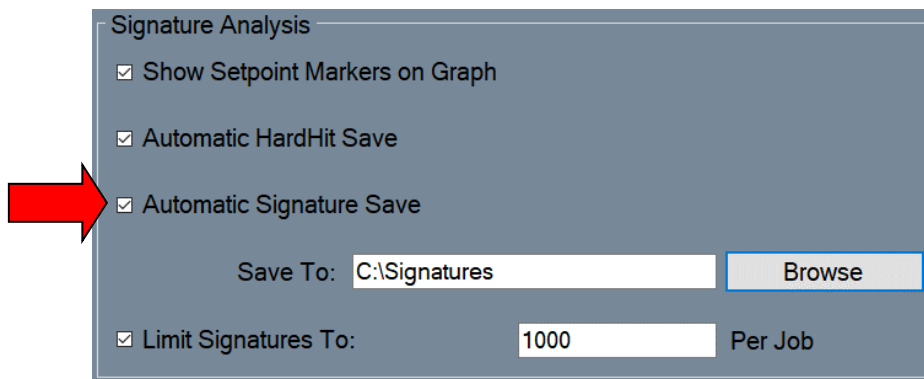
Check the **Automatic Signature Save** box to begin gathering signatures during runtime.

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- Please note the following:

  - Signatures are saved in both .sig and .csv file formats. SlimWare can only open and analyze the .sig file format. See section 14 for details of the comma-separated-value (.csv) files.

  - Automatic saving does not occur while the tonnage monitor is in Learn Mode. If learn mode is active, automatic saving will resume once the new benchmark is learned.

  - Signature saving occurs no more often than every 1 second. Therefore, presses cycling faster than 60 SPM will not be able to capture and save every stroke.

  - Signatures are named in the following format:

YYYY_MM_DD_hh_mm_ss.swsx where
YYYY is the year in 4-digit format
MM is the month (01-12)
DD is the day of the month (01-31)
hh is the hour in 24-hour format (00-23)
mm is the minute (00-59)
ss is the second (00-59)

I.   Automatic Signature Storage

By default, SlimWare saves its signatures to the **C:\ProgramData\Toledo Integrated Systems\SlimWare\DataLog\Signature** directory. This location can be changed to suit your requirements. For example, you can choose a different directory on the local hard drive, a network drive, or a USB flash drive.

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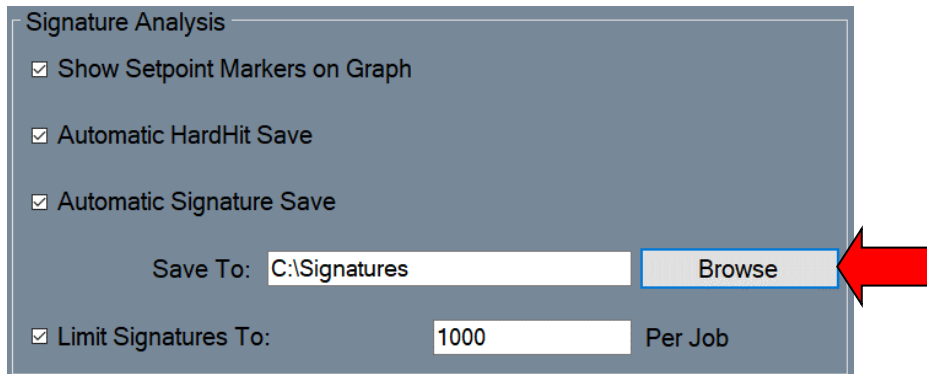
- To select a customized storage location, click the **Browse** button next to the **Save To** path. In the resulting dialog box, browse to the directory that you would like to use for storage and click **OK**.

- Once a **Save To** directory is selected, SlimWare will create a directory structure in which to store the signatures. In this example, the **Save To** directory is **C:\Signatures**.
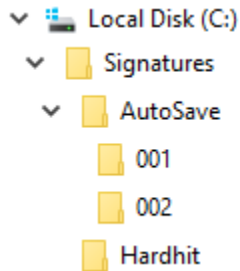
Inside the Save To directory, SlimWare creates a directory named **AutoSave** where all automatically saved signatures are stored. The signatures are further sorted into numeric subdirectories that correspond to the currently loaded job. For example, while Job #2 is loaded all saved signatures will be stored in the **C:\Signatures\AutoSave\002** directory.

Also, inside of the **Save To** directory, if the **Automatic Hardhit Save** feature is enabled, SlimWare creates a Hardhit subdirectory where all alarm signatures are stored.

II.   Signature Storage Maintenance

To manage the number of signatures that are automatically saved, you can apply a limit. Once the limit is exceeded, SlimWare will delete the oldest signatures in a first-in-first-out (FIFO) manner to make room for new ones.
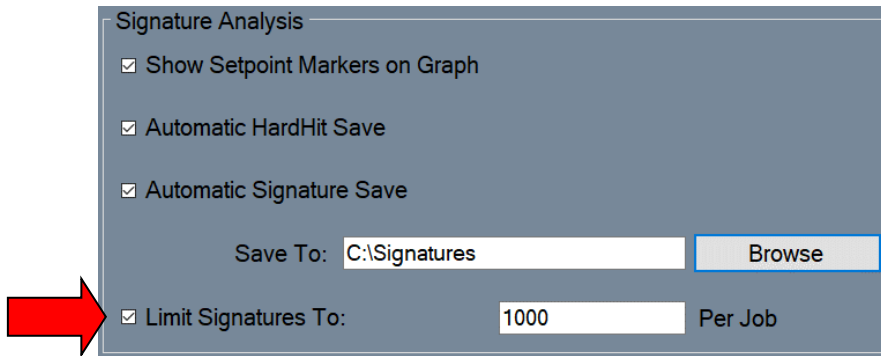
- To enable signature limits, check the **Limit Signatures To** box, then enter a value for the maximum number of signatures that should be stored. You may set the limit from 1 to 25,000 signatures per job.

- Signature limits apply only to the **AutoSave** directory and its subdirectories. The limit does not apply to the Hardhit directory.

- The signature limit is enforced for each type of signature file. Therefore, setting a limit of 25,000 will allow SlimWare to save up to 25,000 .csv signature files **AND** 25,000 .sig signature files.

- When choosing a limit, keep in mind the size of the signature files. An 8-channel .sig file takes approximately 11KB of storage, but each .csv file can vary in size, potentially taking 30KB or more.

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If you have 120 jobs with 25,000 signatures each, there could be 3,000,000 signatures in total. Therefore, saving 3,000,000 signatures can require up to 123GB of storage.

- If you choose not to impose a signature limit, SlimWare will still protect the storage drive from overfilling. In this case, the number of saved signatures is limited only by the storage space available. SlimWare continuously checks the amount of storage space remaining and warns the user when the amount of storage is low. When the amount of available storage falls below 1GB remaining, SlimWare will present the following warning.

This is simply a warning. All signature storage will continue, but the user should make more storage space available soon to avoid losing signatures. Click **Later** to close the warning or click **View** to open the storage directory.

When the amount of available storage falls below 500MB remaining, SlimWare will present the following warning.
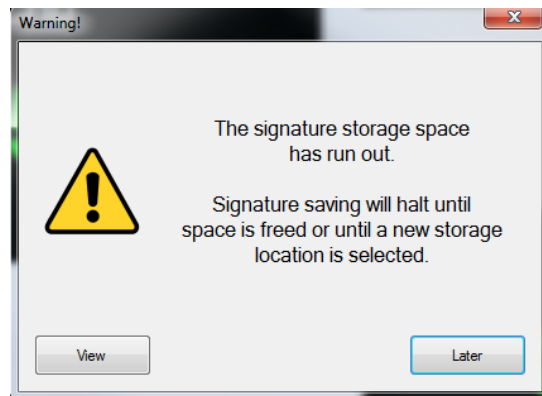
When this happens, no further signatures will be stored until more space is made available. Click **Later** to close the warning or click **View** to open the storage directory.

REMEMBER: It is the responsibility of the user to maintain the signature storage to avoid loss of data.

11.   External Configuration Files

There are two (2) configuration files that control job, login and setpoint features. These two configuration files are named **Ext_Job.ini** and **Slimware_Stat.ini**. These files are to be written to the following location:

C:\ProgramData\Toledo Integrated Systems\SlimWare 7\ExtData

The above path reflects the default installation path. If this path was changed during SlimWare installation, the path will reflect these changes.

I.   Ext_Job.ini

- Ext_Job.ini controls all features related to job changes. A sample Ext _Job.ini is shown below in Figure 2-29.
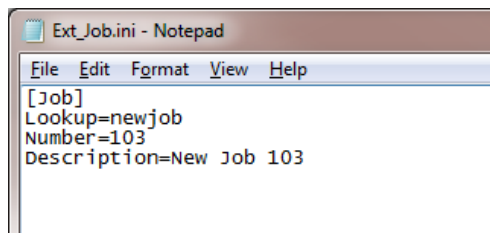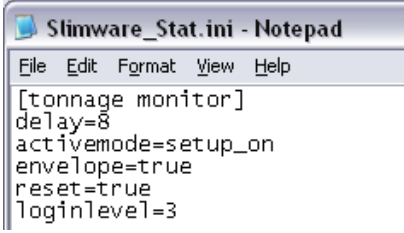
Figure 2-29: Ext_Job.ini File

- **[Job]** – This is a static value and cannot be changed. When writing the Ext_Job.ini, this value must be included.
- **Lookup** – This is the value that SlimWare will use to lookup or create the job. The Lookup value is the Job Name and must start with a non-numeric value.
- **Number** – SlimWare will also use this value to lookup or create the job. The Number value is the Job Number. This must be a numeric value and a max of three digits.
- **Description** – This value is only used to give a better description of the job and is not used to lookup or create a job.
- In Figure 2-29, SlimWare is searching for the job with the name of "newjob" and a number of "103". If this job can be found, the job and corresponding setpoints will be loaded. If "103.newjob" is not found, the job will be created with the current setpoints, and the user will be alerted that the job could not be found (in the historical data window).

II. Slimware_Stat.ini

- Slimware_Stat.ini controls all features related to setpoints, login and other functions with the LS-ZT.

Figure 2-30: Slimware_Stat.ini File

For all items defined below, only one variable is required when writing the Slimware_Stat.ini. For example, to reset the monitor, only the reset command needs to be sent. The delay, activemode, envelope and loginlevel are not required to be written along with the reset command.

- **[tonnage monitor]** - This is a static value and cannot be changed. When writing the Slimware_Stat.ini, this value must be included.
- **Delay** – This value is used in conjunction with the activemode feature (described below). When the delay value is set, the monitor will remain in setup mode for the declared number of cycles before switching to learn mode. In Figure 2-30, the monitor will remain in setup mode of eight (8) cycles before automatically moving to learn mode.
- **Activemode** – There are four possible declarations for this variable:
    - setup_on: This will place the monitor in setup mode.
    - setup_off: This will take the monitor out of the setup mode.
    - learn_on: This will place the monitor into learn mode.
    - learn_off: This will take the monitor out of the learn mode.
  Activemode is optional and is only required when the delay value is declared.
- **Envelope** – By setting this value to "true", the monitor will enable enveloping mode. Enveloping is disabled by writing a "false" to this variable.
- **Reset** – The only value that can be written to this variable is "true". By writing "true", the monitor will issue the reset command to reset any alarms.

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- **Loginlevel** – By writing a "3", "2", "1" or "0", users can be logged in or out. Below are the login levels and equivalent values:
    - Master: "3"
    - Setup: "2"
    - Operator: "1"
    - Log Out: "0"

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12.   Live Data Output Feature

The Live Data Output feature provides a means for SlimWare to communicate the current peak load values and alarm status to external applications. This is accomplished via a Comma-Separated-Value (CSV) file, named "livedata.csv" that can be opened and read at any time. The file is written to the following location:

C:\ProgramData\Toledo Integrated Systems\SlimWare 7\ExtData

To enable this feature, check the External Job and Data Management option on the Configure>>Settings>>User Preferences screen.

I.   File format of the "livedata.csv" file

- The "livedata.csv" file contains the most current peak load values for each channel as well as their corresponding alarm status. A sample file is shown below in Figure 2-31.
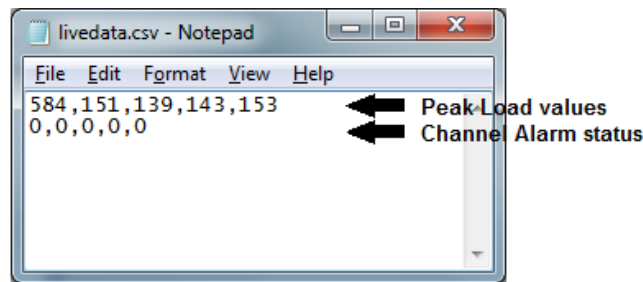
Figure 2-31: livedata.csv File

- The file format for a 4-channel LS-ZT is as follows:

	CH0 Load	CH1 Load	CH2 Load	CH3 Load	CH4 Load
Line 1	CH0 Load	CH1 Load	CH2 Load	CH3 Load	CH4 Load
Line 2	CH0 Status	CH1 Status	CH2 Status	CH3 Status	CH4 Status

Where CH0 corresponds to the total, CH1 corresponds to channel 1, etc.
- Each peak load value is separated by a comma.
Each channel alarm status is separated by a comma.
The new-line characters (ASCII <CR> <LF>) separate the peak load values and the channel alarm statuses.
- The peak load values are stored in standard ASCII format, including decimal points (when applicable).
- The channel alarm status values are stored in standard ASCII format. The status is represented by a decimal number (0-7), which equates to the following alarm types:

- o   0 = No alarm
- o   1 = Capacity alarm
- o   2 = CCM alarm
- o   3 = High Setpoint alarm
- o   4 = Low Setpoint alarm
- o   5 = Reverse alarm
- o   6 = High Enveloping alarm
- o   7 = Low Enveloping alarm

- Note that only enabled channels are written to the file.
  2-channel units will only include CH0, CH1, and CH2 load values and statuses.
  8-channel units will include CH0, CH1, CH2, CH3, CH4, CH5, CH6, CH7, CH8, and CH9 load values and statuses.

II.   Reading the "livedata.csv" file

- Any application that accesses the "livedata.csv" file must follow this sequence:
  - o   Open the file.
  - o   Read the contents.
  - o   Close the file.
- SlimWare will not be able to update the file if it remains opened.
- SlimWare updates the "livedata.csv" every 1 second. Any application that reads this file should not attempt to read it more frequently than this interval.
- The "livedata.csv" was designed to be read a line at a time.
  The first line read will return the load values, starting at CH0 (the total) and ending with the highest configured channel, with a comma separating each value.
  The second line read will return the channel alarm statuses, starting at CH0 (the total) and ending with the highest configured channel, with a comma separating each value.

13.   Job Data Output Feature

The Job Data Output feature provides a means for SlimWare to communicate the settings (setpoints, benchmark tonnages, etc.) of the currently loaded job to external applications. This is accomplished via a Comma-Separated-Value (CSV) file, named "jobdata.csv" that can be opened and read at any time. The file is written to the following location:

C:\ProgramData\Toledo Integrated Systems\SlimWare\ExtData

To enable this feature, check the External Job and Data Management option on the Configure>>Settings>>User Preferences screen.

I.   File format of the "jobdata.csv" file

- The "jobdata.csv" file contains the settings for the currently loaded job, as well as other data such as the job number and name, and the press capacity. A sample file is shown below in Figure 2-32.
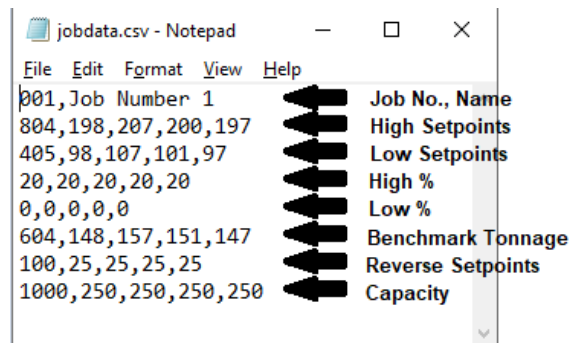
Figure 2-32: jobdata.csv File

- The file format for a 4-channel unit is as follows:

Line 1	Job Number	Job Name			
Line 2	CH0 Hi Setpoint	CH1 Hi Setpoint	CH2 Hi Setpoint	CH3 Hi Setpoint	CH4 Hi Setpoint
Line 3	CH0 Lo Setpoint	CH1 Lo Setpoint	CH2 Lo Setpoint	CH3 Lo Setpoint	CH4 Lo Setpoint
Line 4	CH0 Hi %	CH1 Hi %	CH2 Hi %	CH3 Hi %	CH4 Hi %
Line 5	CH0 Lo %	CH1 Lo %	CH2 Lo %	CH3 Lo %	CH4 Lo %
Line 6	CH0 Benchmark	CH1 Benchmark	CH2 Benchmark	CH3 Benchmark	CH4 Benchmark
Line 7	CH0 Rev Setpoint	CH1 Rev Setpoint	CH2 Rev Setpoint	CH3 Rev Setpoint	CH4 Rev Setpoint
Line 8	CH0 Capacity	CH1 Capacity	CH2 Capacity	CH3 Capacity	CH4 Capacity

where CH0 corresponds to the total, CH1 corresponds to channel 1, etc.

- Each row's value is separated by a comma.
The new-line characters (ASCII <CR> <LF>) separate each of the rows.

- All values are stored in standard ASCII format, including decimal points (when applicable).

- Note that only enabled channels are written to the file.
2-channel units will only include CH0, CH1, and CH2 load values and statuses.
8-channel units will include CH0, CH1, CH2, CH3, CH4, CH5, CH6, CH7, CH8, and CH9 load values and statuses.

II.   Reading the "jobdata.csv" file

- Any application that accesses the "jobdata.csv" file must follow this sequence:

  o   Open the file.
  o   Read the contents.
  o   Close the file.

- SlimWare will not be able to update the file if it remains opened.

- SlimWare updates the "jobdata.csv" every 1 second. Any application that reads this file should not attempt to read it more frequently than this interval.

- The "jobdata.csv" was designed to be read a line at a time.
  The first line read will return the job number and job name, with a comma separating the values. Note: Job names must not contain commas.
  The second line read will return the high setpoint values, starting at CH0 (the total) and ending with the highest configured channel, with a comma separating each value.
  Similarly, lines 3-8 will return the low setpoint, high %, low %, benchmark, reverse setpoint, and capacity values.

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14.   Signature CSV File Format

While SlimWare continues to save signatures in its proprietary .sig file format, it will also save signatures in comma-separated-value (.csv) format when using the Automatic Signature Save feature. The .csv files contain all the information required to analyze the signature including press angle, load data per press angle, CCM (Critical Curve Monitoring) data per press angle, peak load for the stroke, job number loaded, and date/time of stroke. Additional tonnage monitor configuration data is also included.

> Note: In the following documentation, "Outer slide" refers to channels 0-4 and "Inner slide" refers to channels 5-9.

> Note: For time-based signatures, time in milliseconds is used rather than the press angle.

- The first 250 lines of the .csv signature file contains load and CCM data for 250 press degrees   (35° – 284°) or time samples. The structure of each line is detailed below.

Press Angle or Time	Load Data										CCM Data – Outer		CCM Data – Inner	
	CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	Total (CH0)	Corner (CH1-4)	Total (CH5)	Corner (CH6-9)

Each line for an 8-channel signature will contain 15 values, each separated by a comma and terminated with a line feed. Note that the number of values per line depends on the total number of load channels. For a 4-channel load monitor, the load data for CH5-CH9 and the CCM data for CH5-9 are not included. Therefore, a 4-channel signature will contain 8 values per line.

- Line #251 in the .csv file contains the peak load data for each channel, as detailed below.

Peak Load Data									
CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9

This line for an 8-channel load monitor will contain 10 values, each separated by a comma and terminated with a line feed. For a 4-channel load monitor, the peak data for CH5-CH9 are not included, so this line will contain only 5 values.

- Line #252 in the .csv file contains the capacity value for each channel, as detailed below.

Capacity									
CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9

This line for an 8-channel load monitor will contain 10 values, each separated by a comma and terminated with a line feed. For a 4-channel load monitor, the capacity values for CH5-CH9 are not included, so this line will contain only 5 values.

- The final line (#253) in the .csv file contains the following information.

Job Number	Number of Channels	Decimal Point	Date/ Time

This line includes the job number loaded, the number of channels (4 for a 4-channel load monitor [CH0-4], or 9 for an 8-channel load monitor [CH0-9]), the configured number of decimal points (0-3), and the date/time that the signature was saved (in YYYY-MM-DD hh:mm:ss format). This line will always contain 4 values, each separated by a comma and terminated with a line feed.

- The completed structure of the .csv signature file is illustrated below.

Line #	Angle/ Time	Load Data										CCM Data – Outer		CCM Data – Inner	
		CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	Total (CH0)	Corner (CH1-4)	Total (CH5)	Corner (CH6-9)
1	35														
2	36														
3	37														
4	38														
.															
.															
.															
247	281														
248	282														
249	283														
250	284														
251	CH0 Peak	CH1 Peak	CH2 Peak	CH3 Peak	CH4 Peak	CH5 Peak	CH6 Peak	CH7 Peak	CH8 Peak	CH9 Peak					
252	CH0 Cap	CH1 Cap	CH2 Cap	CH3 Cap	CH4 Cap	CH5 Cap	CH6 Cap	CH7 Cap	CH8 Cap	CH9 Cap					
253	Job #	Max CH	Dec Pt	Date/ Time											

Figure 2-33: Signature .csv File

- The following example details a .csv signature from an 8-channel load monitor.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	35	-1.5	-0.8	-0.4	-0.2	-0.1	-1.9	-1.3	-0.2	-0.1	0.3	8.1	2	34.7	8.7
2	36	-1	-0.8	-0.3	-0.2	0	-2.2	-1.3	-0.5	-0.3	0	8.1	2	34.7	8.7
3	37	-0.6	-0.8	-0.2	-0.2	0.1	-1.8	-1.3	-0.4	-0.3	0.1	8.1	2	34.7	8.7
4	38	-0.9	-0.6	-0.3	0	0.1	-1.6	-1.1	-0.5	-0.1	0.1	8.1	2	34.7	8.7
5	39	-1.6	-0.8	-0.4	-0.2	0	-1.9	-1.2	-0.5	-0.2	0	8.1	2	34.7	8.7
6	40	-1	-0.8	-0.2	-0.2	0	-1.5	-1.3	-0.4	-0.4	0.1	8.1	2	34.7	8.7
143	177	27	7.7	9	4	6.3	41.1	11.8	13.5	6.2	9.8	80	20	120	30
144	178	23.8	8	7.7	1.4	6.5	32.8	12.4	8.7	0.2	11.2	80	20	120	30
145	179	20.9	8.1	5.6	0	7.1	31.6	12.4	8.3	0	10.9	80	20	120	30
146	180	19.4	8	3.6	0	7.6	29.5	12.3	5.3	0.1	11.8	80	20	120	30
147	181	21.3	7.4	3.6	2.6	7.8	33.2	11.3	5.5	4	12.1	80	20	120	30
148	182	22.9	7.1	3.8	4.1	7.9	35.4	10.4	6	7.6	12.8	80	20	120	30
149	183	24	6.7	3.8	4.9	8.1	35.7	10.3	5.4	9	12.5	80	20	120	30
247	281	0.3	0.3	0.1	0.1	0.1	0.6	0.4	0.1	0.2	0.1	8.1	2	34.7	8.7
248	282	0.2	0.2	0.1	0.1	0	1.2	0.2	0.3	0.1	0.2	8.1	2	34.7	8.7
249	283	0.5	0.3	0.1	0.2	0	0.7	0.3	0.2	0.2	0	8.1	2	34.7	8.7
250	284	0.4	0.2	0.1	0.1	0	1.2	0.2	0.3	0.1	0	8.1	2	34.7	8.7
251	31.7	8.1	9.3	8.9	8.3	48.5	12.4	13.8	13.5	12.8					
252	80	20	20	20	20	120	30	30	30	30					
253	1	9	1	########											
254				2019-12-11 10:39:23											

Rows 1-250 contain the signature data. Column A is the press angle, columns B-K are the load values, and columns L-O are the CCM values. Performing a scatter plot of A1-A250 vs B1-B250 yields the following graph.
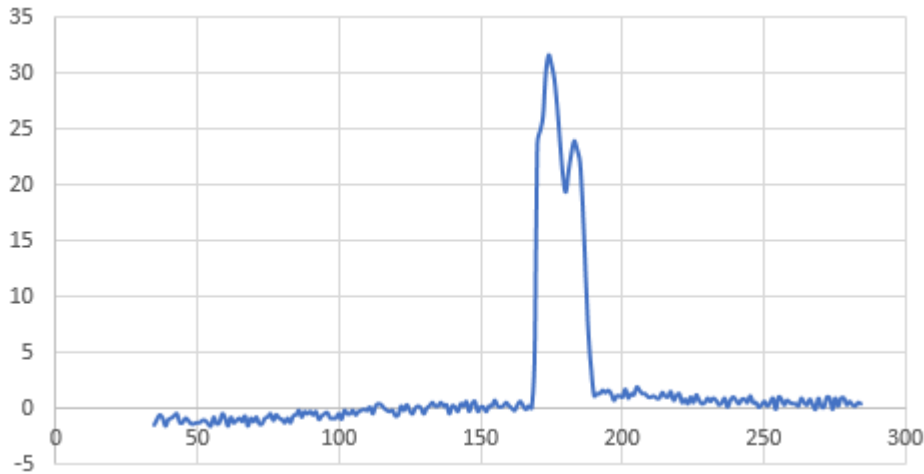
This is the signature for the outer slide's total (CH0).

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To plot the corresponding CCM curve for the outer slide, you can perform a scatter plot of A1-A250 vs L1-L250.
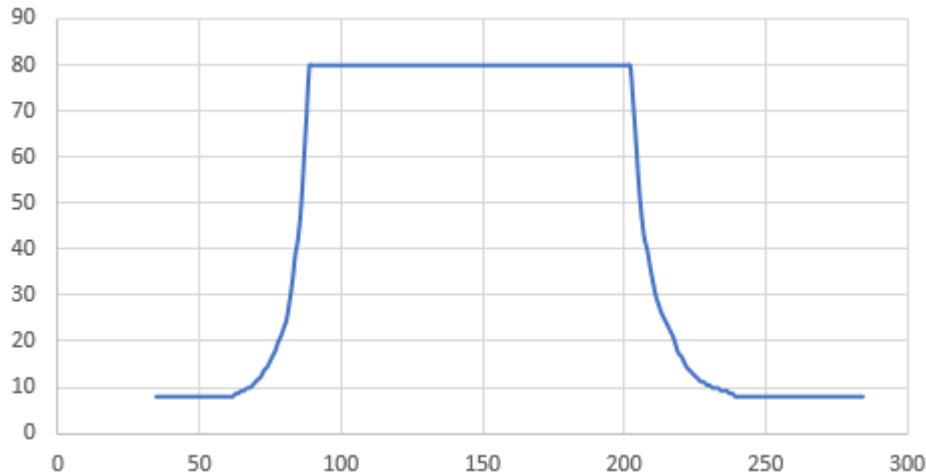
In addition to the signature data, the .csv file contains other useful information.

251	31.7	8.1	9.3	8.9	8.3	48.5	12.4	13.8	13.5	12.8
252	80	20	20	20	20	120	30	30	30	30
253	1	9	1	########						
254			2019-12-11 10:39:23							

Row #251 shows the outer slide's total peak load (A251) for the stroke was 31.7 tons. The outer slide's corner peak loads (B251-E251) are shown as well. The inner slide's total peak load (F251) was 48.5 tons. The inner slide's corner peak loads (G251-J251) are shown as well.

Row #252 tells us that the outer slide's capacity (A252) is set to 80 tons and the inner slide's capacity (F252) is set to 120 tons. The outer slide's corner capacities (B252-E252) are each set to 20 tons, while the inner slide's corner capacities (G252-J252) are each set to 30 tons.

Analyzing row #253, we can see that job #1 was loaded (A253), the maximum channel number is 9 (B253), the load monitor is configured to display 1 decimal point (C253), and the stroke occurred on December 11, 2019, at 10:39:23 (D253).

➢ Calibration Procedure

In order for the LS-ZT to display accurate tonnage information, the unit must be properly calibrated. Calibration is performed by using SlimWare and the Analog module (see above) which is located inside the LS-ZT enclosure.

Note: If calibrating an 8-Channel unit, there will be two Analog modules - one for CH1-4 and one for CH6-9.

1) **Login to SlimWare. Default password is "m".**

2) **Go to the Configure → Hardware/Trigger page.**

   a)   Select options similar to the following figure.

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b) Enter the press capacity on the Capacity tab.

c) Choose the appropriate trigger method on the Trigger tab. If using resolver or encoder for triggering, set the offset so that the resolver angle matches the press angle.

3) Enable "Setup Mode" to bypass the high and low limits.
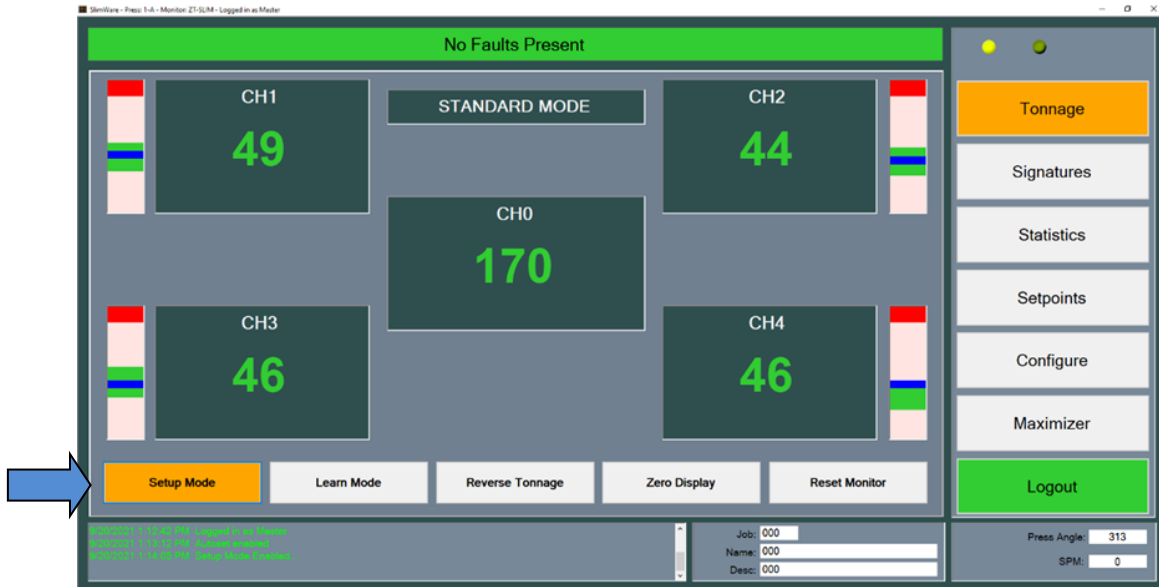
4) Find the shut height of the press.

a) Jog the press until the ram is at bottom dead center (BDC) or 180° without any load cells or die in the press.

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b) Determine the amount of spacers needed with your load cells. Cycle the press without load cells to ensure correct height.

5) Place the load cells in the correct position in the press.

a) All load cells should be equal distance from the sides and front and rear. For example, 12" from the sides, 10" from the front and rear. Load cells are typically placed at each corner of the press's bed.

b) Cycle the press without hitting the load cells first.

c) Place cardboard on the top and bottom of the load cells.

6) Balance the tonnage sensors.

a) Make sure the press is under no load.

b) Set the Analog module dip switches as shown. Set all gain pots to fully clockwise, then dial each gain pot about 12 turns counterclockwise to start.
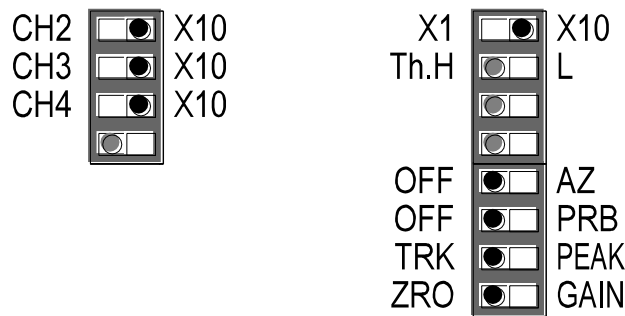
c) On the Analog module, set the Display channel selector to **1** for Channel 1. The Bar-graph voltmeter now shows the balance of Channel 1.

d) Adjust the Channel 1 ZERO pot until the bar-graph has only the 2 yellow **0.0V** LEDs lit. This indicates a balanced or zeroed state.
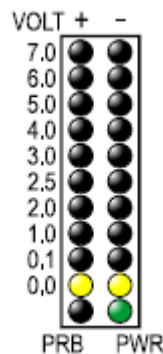
e) Repeat steps c) and d) for Channels 2, 3, and 4.

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f) Go to SlimWare's Configure → Calibration page (see figure below).

g) Push the "Display Balance" button.

h) The Balance/Gain fields should be close to zero. If not, push the "Zero the Balance" button. The "Balance/Gain" column should become all zeroes.

i) If calibrating an 8-Channel unit, repeat step 6 with the 2nd Analog module for CH6-9.
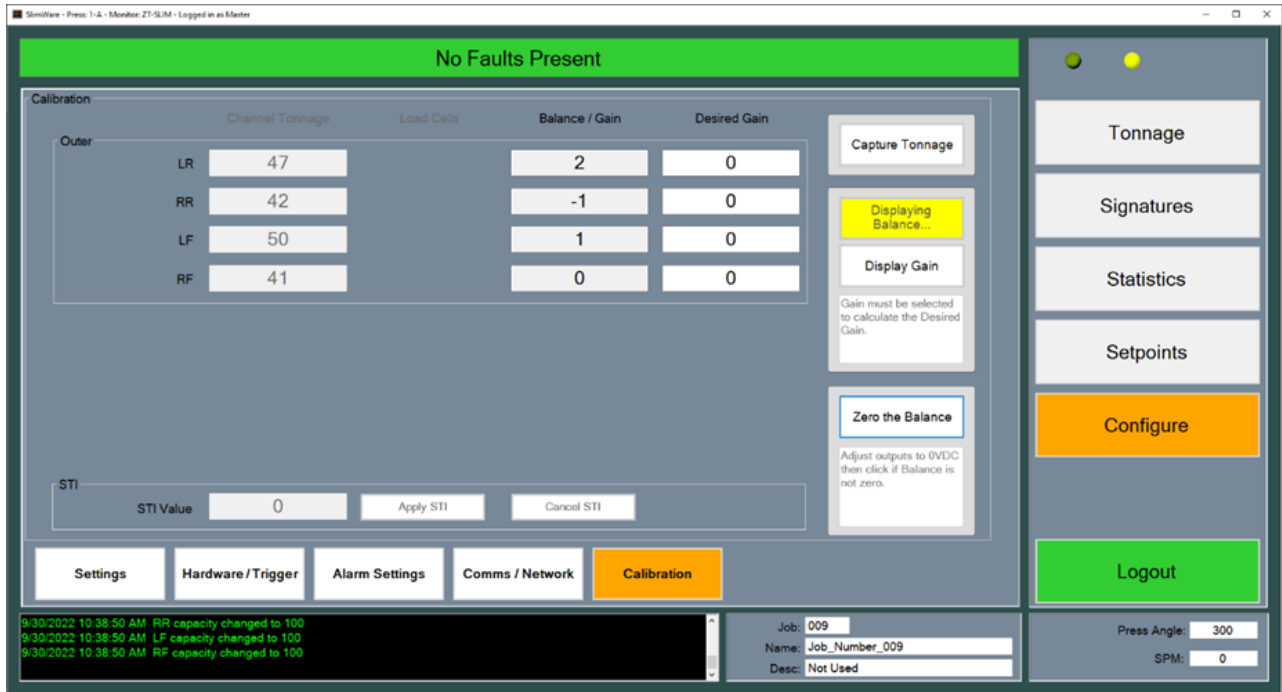
7) Cycle the press.

a) Press the "Capture Tonnage" button in SlimWare.

b) Further adjust the shut height so that the press impacts the load cells and generates a load at 100% of press capacity. See the following warning.

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 situation from happening, do 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 at capacity, use (4) 250 Ton load cells instead of (4) 100 Ton load cells.

8) Adjust the gain.

    a) Cycle the press a few times.

    b) The peak tonnage is shown in the "Channel Tonnage" column.

    c) Push the "Display Gain" button. The gain values are shown in the "Balance/Gain" column.

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d) Enter the load cell values in the "Load Cells" column.
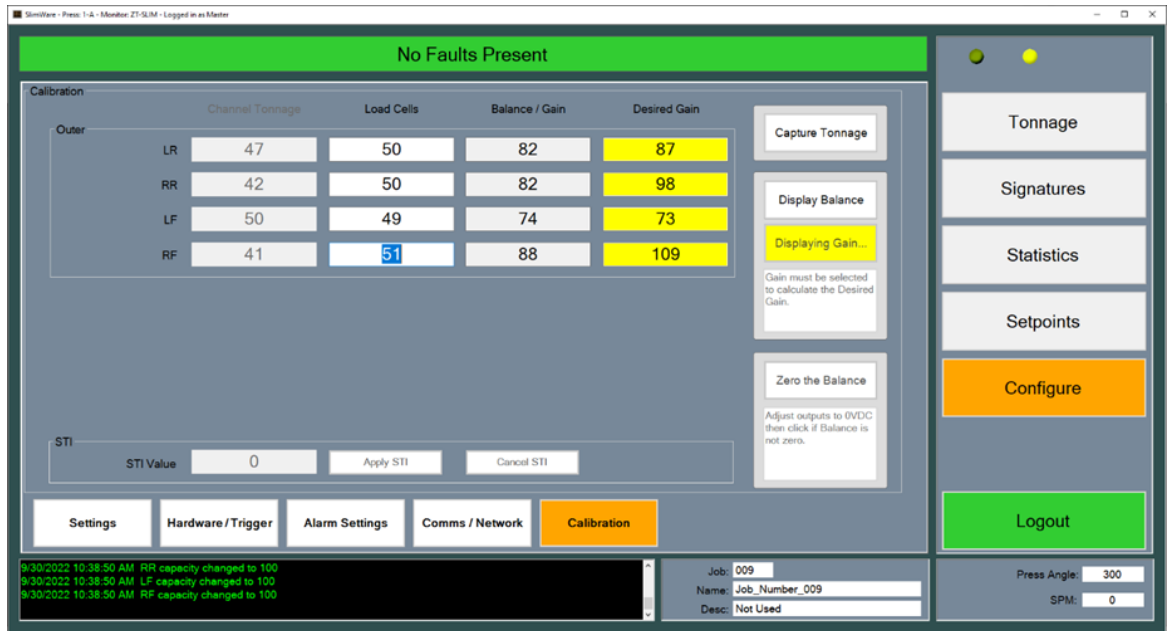
e) If the values in the "Load Cells" column match the values in the "Channel Tonnage" column, the Analog module is already set to the correct gain. You can now skip to Step 9.

f) Adjust the Gain pot for each channel until its Gain value matches the value in the "Desired Gain" column. If less gain is needed, change the channel's Gain switch to X1.

g) Press the "Capture Tonnage" button.

h) Cycle the press. The values in the "Channel Tonnage" column should match the values on the load cells. If not, repeat from step 8 a).

9) Record Gain Numbers.

a) The values in the "Desired Gain" column are the Gain Numbers. Record these gain numbers (instead of, or in addition to, the DC voltage gain) on the calibration card located on the side of the Analog module. Refer to the figure below.

10) Document the LS-ZT Settings.

   a)   Fill out all applicable settings including Press No., resolver dip switch configuration, capacities, and trigger method on the calibration card located on the side of the Control module. See the example below.

11) Make linearity check.

a) Go to the Tonnage page (see figure below).

b) Raise the shut height in .020 to .030 inch increments to decrease tonnage.

c) Cycle the press and impact the load cells.

d) Compare the tonnage applied to the load cells to the tonnage displayed on the LS-ZT. Record these data on the Calibration Sheet (Form #1224) provided at the end of this procedure.
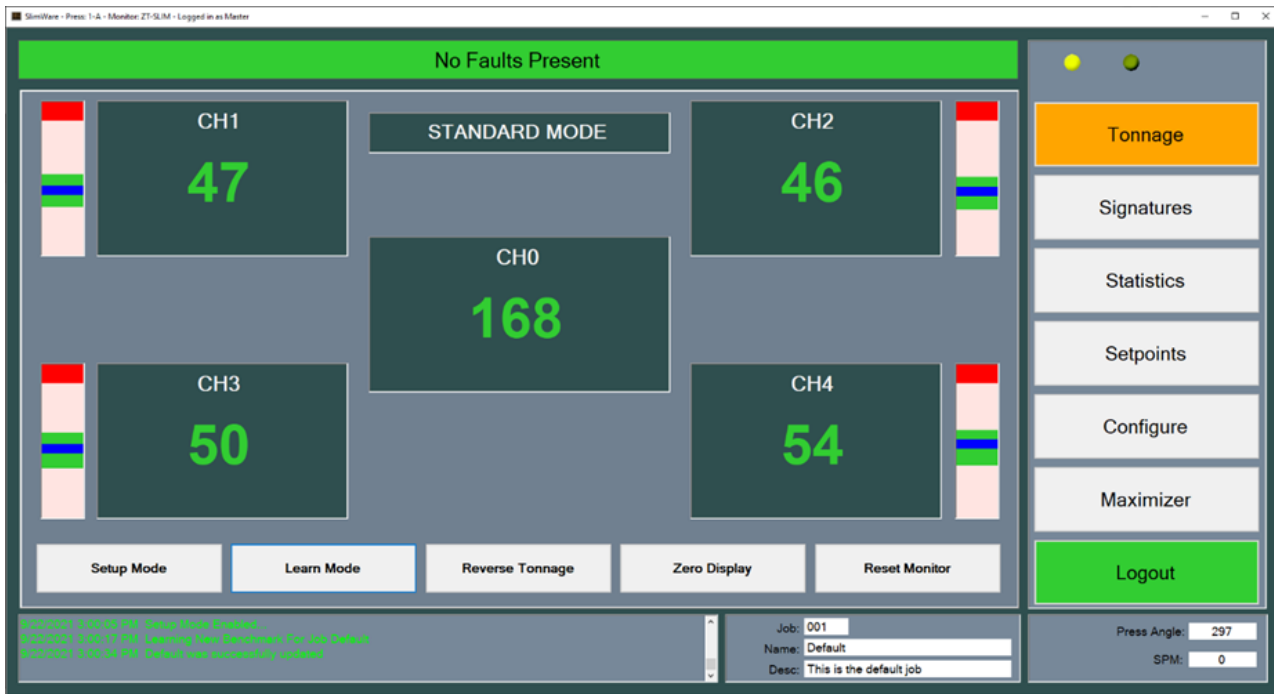
12) Calibration complete.

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, 8:00AM to 5:00PM.

➢ Operator's Guide
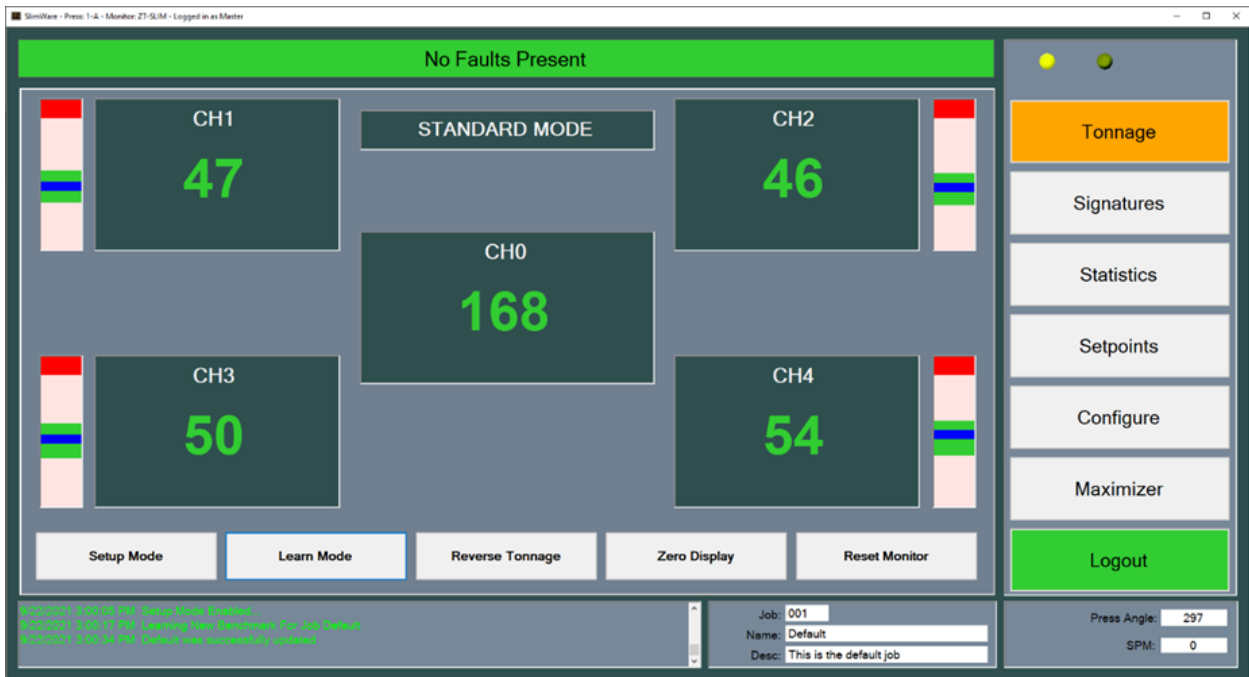
- The LS-ZT tonnage monitor reads the force generated as a stamping press produces parts. By comparing this force to a known, good benchmark tonnage, the LS-ZT can generate high and low limits (setpoints) and check the force from each stroke to ensure that it falls within this acceptable range. The LS-ZT can generate alarms and stop the press when the tonnage gets too high or too low, which protects the quality of the parts produced, as well as protecting the press and die from dangerous over-capacity tonnage.

- When setting a new die in the press, place the LS-ZT into Setup Mode by pressing the **Setup Mode** button on the Tonnage screen. Run material through the press until a good part is formed, then place the LS-ZT into Learn Mode by pressing the **Learn Mode** button. After 8 strokes, the LS-ZT establishes a new benchmark and calculates new high and low setpoints based on the percentage settings from the Setpoints screen.

- If the LS-ZT is not configured to automatically generate high and low setpoints, the setpoints can be manually entered on the Setpoints screen.

- Once a benchmark and setpoints have been established for a particular die, all settings can be saved in a job file by pressing the grey Job box at the bottom of the screen. Select the **Create New Job** tab, enter a unique job number, name, and description and press the **Create New Job** button to save.

- To load a job file for a previously run die, simply press the grey Job box at the bottom of the screen, select the job file that you want to load, and press the **Load Existing Job** button. All stored setpoints will be recalled and loaded.

- When an alarm occurs, the shutdown relay opens to stop the press and the status bar at the top of the screen will flash red and display a message to indicate the type of alarm. In the case of tonnage alarms, the faulted channel(s) on the Tonnage screen will also flash red to indicate the location of the problem. To reset the alarm, first correct the situation that caused the alarm, then press the red flashing status bar, the faulted corner, or the **Reset Monitor** button to clear the alarm and close the shutdown relay.

- To avoid nuisance alarms and shutdowns while adjusting the press, put the LS-ZT in Setup Mode. The press will still be protected from an over-capacity hit, but high and low setpoint violations will be ignored.
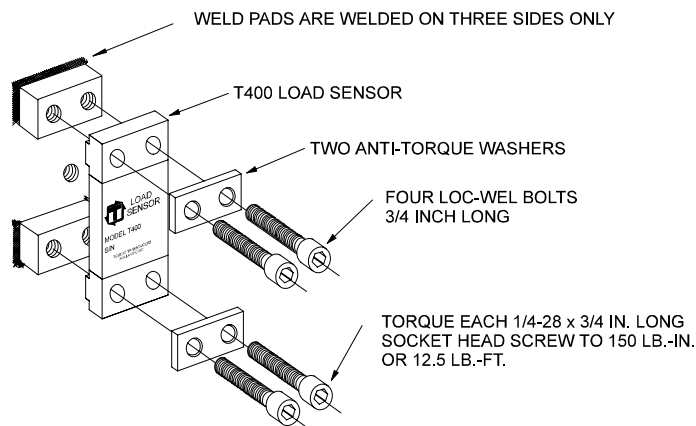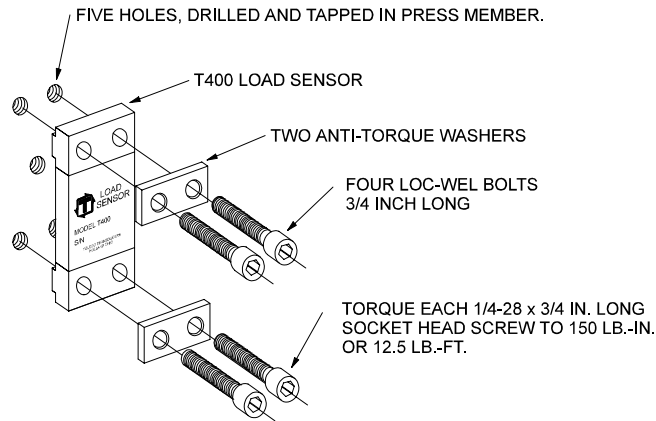
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Appendix

A)   **Sensor Installation (Doc# 11080)**

B)   **Calibration Sheets (2) (Form# 1224)**

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INSTALLING T400 LOAD SENSORS

FIVE HOLES, DRILLED AND TAPPED IN PRESS MEMBER.

T400 LOAD SENSOR

TWO ANTI-TORQUE WASHERS

FOUR LOC-WEL BOLTS
3/4 INCH LONG

MODEL T400
S/N

TORQUE EACH 1/4-28 x 3/4 IN. LONG
SOCKET HEAD SCREW TO 150 LB.-IN.
OR 12.5 LB.-FT.

WELD PADS ARE WELDED ON THREE SIDES ONLY

T400 LOAD SENSOR

TWO ANTI-TORQUE WASHERS

FOUR LOC-WEL BOLTS
3/4 INCH LONG

MODEL T400
S/N

TORQUE EACH 1/4-28 x 3/4 IN. LONG
SOCKET HEAD SCREW TO 150 LB.-IN.
OR 12.5 LB.-FT.

The above illustrations represent the proper arrangement of Model T400 Load Sensor kit parts using either the Drill and Tap method or the Weld method.

A proper installation is necessary to produce good results.

Before installing the sensors, please read the appropriate instructions listed below.

NOTES:

1) (2) SENSORS REQUIRED
2) (2) SENSOR ENCLOSURES ARE INCLUDED. THESE HELP PROTECT THE T400 SENSOR GAUGES. THESE ENCLOSURES INCLUDE 1/2" KNOCK-OUT HOLES. IF CONDUIT IS USED, WE SUGGEST USING 1/2" STRAIN RELIEFS IN THE KNOCK-OUT HOLES.

SENSOR PLACEMENT

Sensor location must be determined. You have two locations. The front or the rear of the press. (Shown in the shaded area.)

HOW TO DETERMINE THE BEST LOCATION

* MEASURE THE REAR THICKNESS

_____ REAR

* MULTIPLY BY THREE   X 3 = [   ]

* MEASURE THE FRONT THICKNESS

_____ FRONT

If the front thickness is smaller than value in [   ], then mount sensors in the front. (This is the most common.) If the front thickness is larger, then place the sensor in the rear. Adjust the input connection for compression readings instead of tension.

L = LENGTH OF COLUMN OR UPRIGHT

1/3 L.
1/3 L.
1/3 L.

CROWN OF PRESS

COLUMN / UPRIGHT

BEST SENSOR LOCATION IS IN THE MIDDLE 1/3 LENGTH OF COLUMN / UPRIGHT ON THE CENTER LINE OF THE TIE ROD.

THE CLOSER A SENSOR IS TO THE TIE ROD THE BETTER ITS PERFORMANCE WILL BE.

IF POSSIBLE INSTALL SENSORS ON THE INSIDE PRESS WALL FRAME, IF IT IS A DOUBLE WALL FRAME PRESS.

AVOID INSTALLING SENSORS CLOSER THAN 12" FROM THE TOP EDGE OR BOTTOM EDGE OF THE HOLES THAT ARE CUT OUT IN THE PRESS FRAME.

RULE OF THUMB FOR CAST FRAME PRESSES OR VERY HEAVY FRAME PRESSES: INSTALL SENSORS IN AN AREA OF LEAST CROSS SECTION. AVOID HOLES AS DESCRIBED ABOVE.

IN ALL CASES, IF POSSIBLE, AVOID LOCATING SENSORS CLOSER THAN (1) COLUMN WIDTH FROM THE CROWN OR BOLSTER.

BOLSTER / BED

TIE ROD AND NUT

CONDUIT FOR LOAD SENSOR WIRES ONLY. CAUTION: DO NOT RUN CONDUIT NEAR TIE ROD HEATING OPENINGS.

LOAD SENSOR AND ENCLOSURE

VIEW TO SHOW BOTH SENSORS.

CABLE TORQUE WASHER. HERE ONLY.

T400 LOAD SENSOR. TWO SENSORS REQUIRED.
LOCATED 180 DEGREES OPPOSITE ON CIRCUMFERENCE

TORQUE CABLE BAR AND CLAMP. REPLACE TORQUE WASHER. Pt. #2403-252

1/4 in. I.D. TYGON TUBING. SEE NOTE. Pt. #2415-882

STRAIN RELIEF CONNECTOR WITH LOCK NUT. Pt. #2405-252

TUBE TERMINATION BOX. BY CUSTOMER.

TORQUE EACH 1/4-28 x 3/4
SENSOR BOLT TO 150 LB-IN
OR 12.5 LB-FT.

CONDUIT TO NEXT TUBE TERM. BOX
AND THEN OUT OF THE MOVING SLIDE.

RAM / SLIDE.

SLIDE ADJUSTMENT HOUSING.

PITMAN

NOTE:

THE TUBE LOOP IS
FOR CABLE SLACK
NEEDED WHEN THE
PITMAN MOVES DUE
TO SLIDE ADJUSTMENT.

USING THE T400 SENSOR
INSTALLATION FIXTURE KIT No. 1977-749

# (METRIC INSTALLATION FIXTURE KIT No. 1974-749)

DRILL AND TAP METHOD FOR MOUNTING SENSORS

BE SURE THE SENSOR LOCATION FOLLOWS THE BEST
LOCATION DESCRIBED ON THE PREVIOUS PAGES.
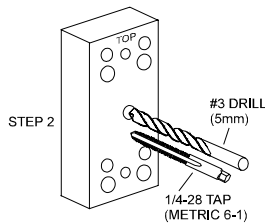
STEP 1   Remove all paint and grease from sensor mount area. If the machine surface is flat (total indicated reading of .002") and smooth (125 μ in.) the load sensor can be bolted directly to the surface.

STEP 2   Drill and tap the center hole for mounting the fixture to the press member. This hole should be ½ inch (13mm) deep.
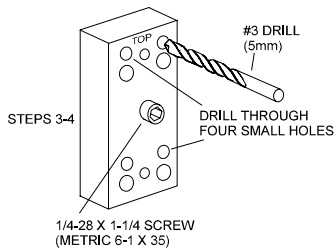
STEP 3   Bolt the fixture to the press member using the ¼-28 by 1-¼ inch (M6-1 x 35) long socket head cap screw in the center of the fixture.

STEP 4   Insert the number 3 drill (5mm) into the smaller corner hole and drill out all four holes to a depth of ¾ of an inch (19mm.)
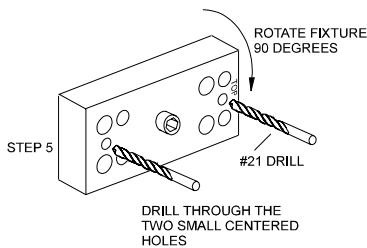
STEP 5   Loosen the fixture. Rotate the fixture 90 degrees clockwise. Tighten the center screw of the fixture. Insert the number 21 drill into the small centered hole and drill out both holes to a depth of 3/8 of an inch. These holes are for mounting the sensor enclosure. The fixture does not allow for tapping these holes. They are tapped without the fixture. Enclosure mounting is not done in metric.
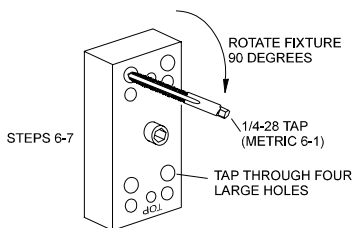
STEP 6   Loosen the fixture. Rotate the fixture another 90 degrees clockwise such that the larger corner holes line up with the holes drilled in Step 4. Insert a tap to be sure the holes line up. Lock the fixture in place by tightening the center screw.

STEP 7   Insert the tap into the larger tap guide holes and tap each hole.

BE SURE TO USE PLENTY OF TAPPING FLUID.
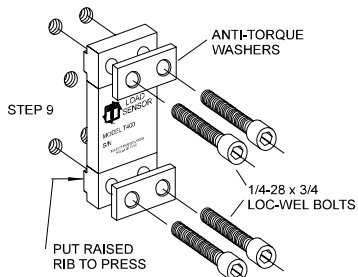
STEP 8   Remove the fixture and repeat Steps 1-7 for each additional sensor mounting position.

STEP 9   Mount the sensor with the raised rib to the press. The anti-torque washers should go between the screw and the sensor body. Torque each ¼-28 x ¾ in. long socket head cap screw to 150 LB.-IN or 12.5 LB.-FT.

USING THE T400 SENSOR
INSTALLATION FIXTURE KIT No. 1977-749

WELD PAD METHOD FOR MOUNTING SENSORS

BE SURE THE SENSOR LOCATION FOLLOWS THE BEST
LOCATION DESCRIBED ON THE PREVIOUS PAGES.
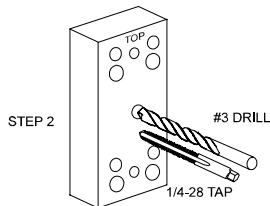
STEP 1 Remove all paint, grease, and or rust from surface to be welded. (Surface should be flat T.I.R. 1/32 of an inch.)

STEP 2 Drill and tap the center hole for mounting the fixture to the press member. This hole should be ½ inch deep. (Optional)
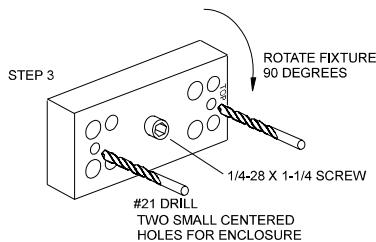
STEP 3 Bolt the fixture to the press member using the ¼-28 by 1-¼ inch long socket head cap screw in the center of the fixture. Orient the fixture as shown and drill out the #21 holes to a depth of 3/8 of an inch for the enclosure mounting. The fixture is not used for tapping these holes. (Optional)
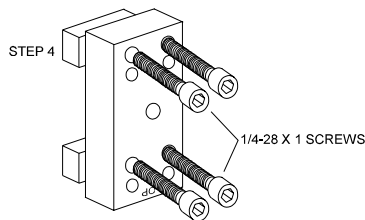
STEP 4 Remove the fixture from the press member. Bolt the weld pads to the fixture with ¼-28 by 1 inch long socket head cap screws provided. Reattach the fixture with the weld pads bolted on using the center hole as in Step 3. Orient the fixture as shown.
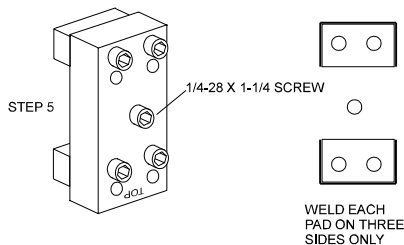
STEP 5 Weld the weld pads to the press member. (BE SURE TO ONLY WELD THE WELD PADS ON THREE SIDES AS SHOWN.) A single pass is sufficient. Do not remove the fixture until slag is removed and or assembly has cooled. When welding cast iron, use a dry nickel rod such as: Lincoln Electric "Soft Weld", Hobart "NI Cast 99", or MB Weld Prod. "MG 210. Strike arc on steel then puddle into the cast iron.
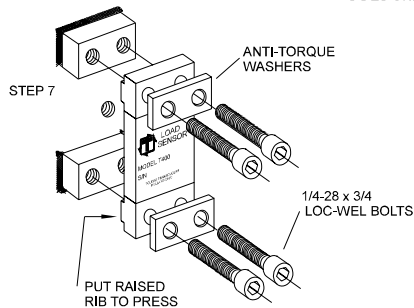
STEP 6 Remove the weld fixture. <u>DO NOT WELD AFTER FIXTURE IS REMOVED.</u> The 4 screws holding the pads to the fixture and the 1 center screw may be discarded. <u>DO NOT USE THE FOUR 1 INCH LONG SCREWS TO ASSEMBLE SENSOR.</u> The sensor kit contains four ¾ inch long screws for assembling the sensor to the press member. Weld pad surface must be clean – no weld bumps, scratches, etc. Be sure the weld pad tapped holes are clean and bottom of holes are free of weld flash.

STEP 7 Mount the sensor with the raised rib to the press. The anti-torque washers should go between the screw and the sensor body. Torque each ¼-28 x ¾ in. long socket head screw to 150 LB.-IN or 12.5 LB.-FT.

SENSOR ENCLOSURE MOUNTING

USE 10-32 TAP IN THE TWO 3/8 DEEP
HOLES THAT WERE DRILLED WITH THE
FIXTURE IN THE PREVIOUS INSTRUCTIONS.
MOUNT THE ENCLOSURE TO THE PRESS
MEMBER AND RUN 1/2 INCH CONDUIT
TO THE LOAD MONITOR ENCLOSURE.

RUN SENSOR CABLE THROUGH CONDUIT. PLACE
SENSOR ON MOUNTING HOLES. PLACE ANTI-
TORQUE WASHERS OVER SENSOR HOLES.
SCREW IN SENSORS BOLTS, (4) EACH, FINGER
TIGHT. USE ONLY THE 1/4-28 x 3/4 "LOC-WEL"
BOLTS THAT ARE IN THE SENSOR PACKAGE.
TORQUE EACH 1/4-28 x 3/4 SCREW TO 150 LB.-IN.
OR 12.5LB.-FT. ASSEMBLE BOX COVER.

TAP THESE HOLES
WITH 10-32 TAP

CONDUIT

LOAD
SENSOR

MODEL T400

S/N

10-32 x 3/8 PAN HEAD MACHINE SCREW.

1/4-28 x 3/4 SOC. HD. SCREW

SENSOR ENCLOSURE

COMPANY: _____

_____

_____

CONTACT: _____

PHONE: (_____) _____

SERVICE ORDER #: _____

DATE: _____

PRESS SERIAL No: _____

PRESS (Type and & No.): _____

PRESS CAPACITY: _____

LOAD MONITOR MODEL: _____

MONITOR SERIAL No. _____

SLIDE-ADJUST INDICATOR

TONNAGE APPLIED TO LOAD CELLS ON PRESS

| LR | | TOTAL | | RR |
| LF | | | | RF |

| LR | | TOTAL | | RR |
| LF | | | | RF |

| LR | | TOTAL | | RR |
| LF | | | | RF |

| LR | | TOTAL | | RR |
| LF | | | | RF |

TONNAGE DISPLAYED ON LOAD MONITOR

| LR | | TOTAL | | RR |
| LF | | | | RF |

| LR | | TOTAL | | RR |
| LF | | | | RF |

| LR | | TOTAL | | RR |
| LF | | | | RF |

| LR | | TOTAL | | RR |
| LF | | | | RF |

IDEAL LINEARITY

LINEARITY PLOT USING TONS SHOWN ON "TOTAL" DISPLAYS

"TOTAL" LOAD DISPLAYED ON MONITOR

Ø

"TOTAL" TONNAGE APPLIED TO LOAD CELLS ON PRESS ➡

F1224 Rev. A

LEFT REAR COLUMN

RIGHT REAR COLUMN

PRESS No. _____

MATERIAL FLOW
(draw arrowhead)

SHUNT RESISTORS:

ONE MEG ? YES _____ NO _____

OTHER RESISTORS:

CHAN. 1 _____

CHAN. 2 _____

CHAN. 3 _____

CHAN. 4 _____

LEFT FRONT COLUMN

RIGHT FRONT COLUMN

FRONT OF PRESS BED

TYPE OF LOAD CELLS: _____   TYPE OF LOAD CELL READOUT: _____

TONNAGE SENSORS

SENSOR NUMBER	SERIAL NO.	CAL. NO.	X 10	LOCATION (LF, RF, LR, RR)
1				
2				
3				
4				

CALIBRATION LOAD CELLS

CELL NUMBER	CAPACITY TONS	SERIAL NO.	CAL. NO.
1			
2			
3			
4			

CCM TYPE: _____   CCM OFFSET: _____   STI REFERENCE NUMBER: LOW: _____   HIGH: _____

STI DEGREES IN CHANNEL No. 1: _____

TRIGGERED FROM PROBE ?   YES _____   NO _____   (Show threshold value if not triggered from probe): _____

TRIPPED ALARM RELAY STOPS PRESS ?   YES _____   NO _____   EXPLAIN: _____

ALL STICKERS AND DOCUMENTS FILLED OUT ?   YES _____   NO _____   IF NOT, EXPLAIN WHY: _____

TFP No.:   HIGH 2 _____   LOW 2 _____   HIGH 4 _____   LOW 4 _____   HIGH 6 _____   LOW 6 _____   HIGH 8 _____   LOW 8 _____

COMMENTS: _____

TESTS MADE BY: _____   TESTS ACCEPTED BY: _____   DATE: _____

COMPANY: _____

_____

_____

CONTACT: _____

PHONE: (_____) _____

SERVICE ORDER #: _____

DATE: _____

PRESS SERIAL No: _____

PRESS (Type and & No.): _____

PRESS CAPACITY: _____

LOAD MONITOR MODEL: _____

MONITOR SERIAL No. _____

SLIDE-ADJUST INDICATOR	TONNAGE APPLIED TO **LOAD CELLS** ON PRESS	TONNAGE DISPLAYED ON **LOAD MONITOR**

LR — TOTAL — RR
LF — — RF

LR — TOTAL — RR
LF — — RF

LR — TOTAL — RR
LF — — RF

LR — TOTAL — RR
LF — — RF

IDEAL LINEARITY

"TOTAL" LOAD DISPLAYED ON MONITOR

LINEARITY PLOT USING TONS SHOWN ON "TOTAL" DISPLAYS

Ø

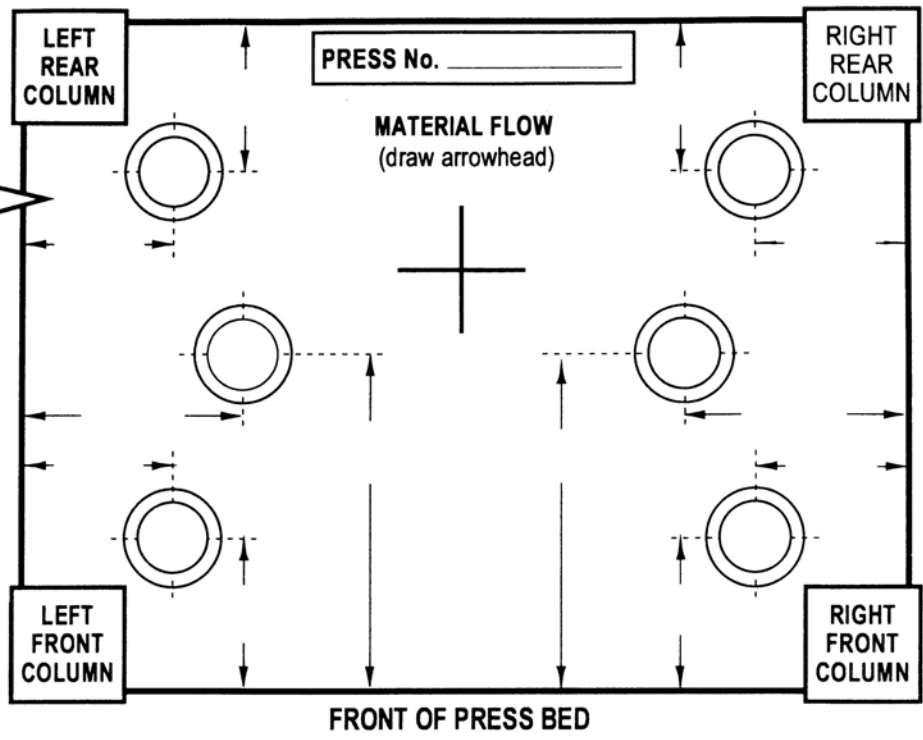**"TOTAL" TONNAGE APPLIED TO LOAD CELLS ON PRESS** ➡

DRAW IN :
- CHANNEL NUMBER
- SENSOR LOCATION
- MONITOR LOCATION
- LOAD CELL LOCATION
- DIRECTION OF MATL. FLOW

SHUNT RESISTORS:

ONE MEG ? YES ___ NO ___

OTHER RESISTORS:

CHAN. 1 _____

CHAN. 2 _____

CHAN. 3 _____

CHAN. 4 _____

LEFT REAR COLUMN

PRESS No. _____

MATERIAL FLOW
(draw arrowhead)

RIGHT REAR COLUMN

LEFT FRONT COLUMN

RIGHT FRONT COLUMN

FRONT OF PRESS BED

TYPE OF LOAD CELLS: _____   TYPE OF LOAD CELL READOUT: _____

TONNAGE SENSORS

SENSOR NUMBER	SERIAL NO.	CAL. NO.	X 10	LOCATION (LF, RF, LR, RR)
1				
2				
3				
4				

CALIBRATION LOAD CELLS

CELL NUMBER	CAPACITY TONS	SERIAL NO.	CAL. NO.
①			
②			
③			
④			

CCM TYPE: _____   CCM OFFSET: _____   STI REFERENCE NUMBER: LOW: _____   HIGH: _____

STI DEGREES IN CHANNEL No. 1: _____

TRIGGERED FROM PROBE ?   YES ___   NO ___   (Show threshold value if not triggered from probe): _____

TRIPPED ALARM RELAY STOPS PRESS ?   YES ___   NO ___   EXPLAIN: _____

ALL STICKERS AND DOCUMENTS FILLED OUT ?   YES ___   NO ___   **IF NOT, EXPLAIN WHY:** _____

TFP No.:   HIGH 2 ____   LOW 2 ____   HIGH 4 ____   LOW 4 ____   HIGH 6 ____   LOW 6 ____   HIGH 8 ____   LOW 8 ____

COMMENTS: _____

_____

_____

_____

TESTS MADE BY: _____   TESTS ACCEPTED BY: _____   DATE: _____