

# TQM

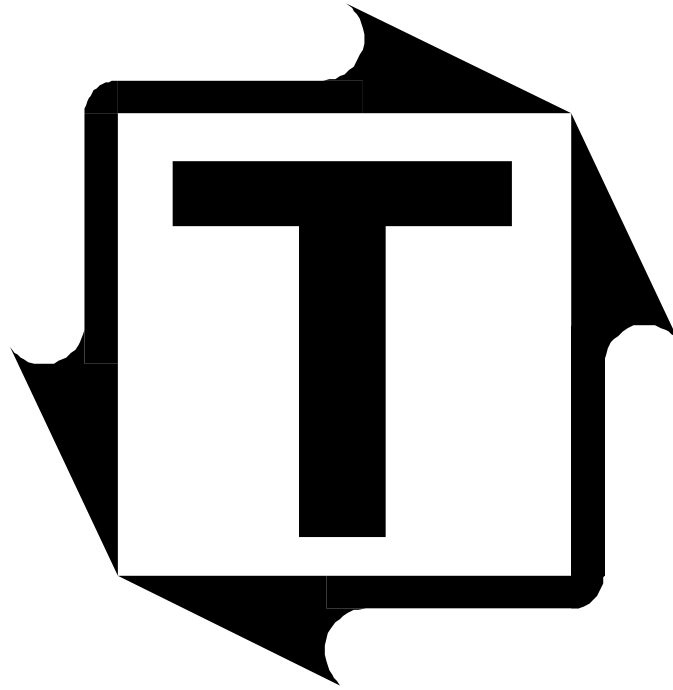


## Single Channel Tonnage Monitor

By Toledo Integrated Systems

Installation and Operation Manual





**TQM**  
**Installation and**  
**Operation Manual**

**Revision: C**



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## **LIMITED WARRANTY**

This unit is warranted by the manufacturer, Toledo Integrated Systems, to be free of defects in workmanship and material for one year from date of manufacturer's shipment. The completed **TQM** Calibration Form on Page 16 must be returned to Toledo Integrated Systems, to insure proper procedures were followed. The warranty becomes valid upon receipt of the completed Calibration Form. 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 F.O.B., Toledo Integrated Systems, 1345 Ford Street, Maumee, Ohio 43537, for examination, repair, or replacement.

**THE EXPRESS WARRANTY SET FORTH HEREIN IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANT-ABILITY 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.

# OVERVIEW

The **TQM** (Toledo Quality Monitor) is a simple, easy-to-use, stamping tool. It will display the stamping force of your press or machine, up to 2000 strokes per minute.

This versatile instrument will monitor the force of your press that will relate directly to quality. Once an out-of-tolerance hit occurs the unit “alarms” enabling you to achieve “Total Quality”.

Though small in size, this single channel monitor is large in output. The **TQM** gives you the opportunity to complete your plant wide monitoring by interfacing to a computer and doing it at a reasonable cost.

This manual provides easy-to-follow instructions for rapid installation, set-up, and calibration. “Walking through” this manual from cover-to-cover will take you through complete installation, calibration and operation. Remember to activate your Warranty, fill out the “CALIBRATION PROCEDURE” found on Pages 16 to 18 of this manual and fax or mail it back to Toledo Integrated Systems. This will also help us provide better Technical Support. The Operating Instructions found on Page 19 may be copied and given to the machine operators.

Numbered diagrams of the front and back panels of the **TQM** are provided for quick reference, and are referred to throughout this manual.

The following is a brief description of each Section contained in this manual:

**I. Front & Rear Panel Descriptions**

Will familiarize you with the layout of the unit; explaining the functions of each switch or button.

**II. Installation Guide**

A step-by-step guide, detailing the installation of your **TQM** Monitor.

**III. Programming Your Monitor**

A step-by-step guide for “personalizing” the **TQM** for your specific press.

**IV. TQM Calibration Procedure**

A step-by-step guide for calibrating your **TQM** and activating your warranty.

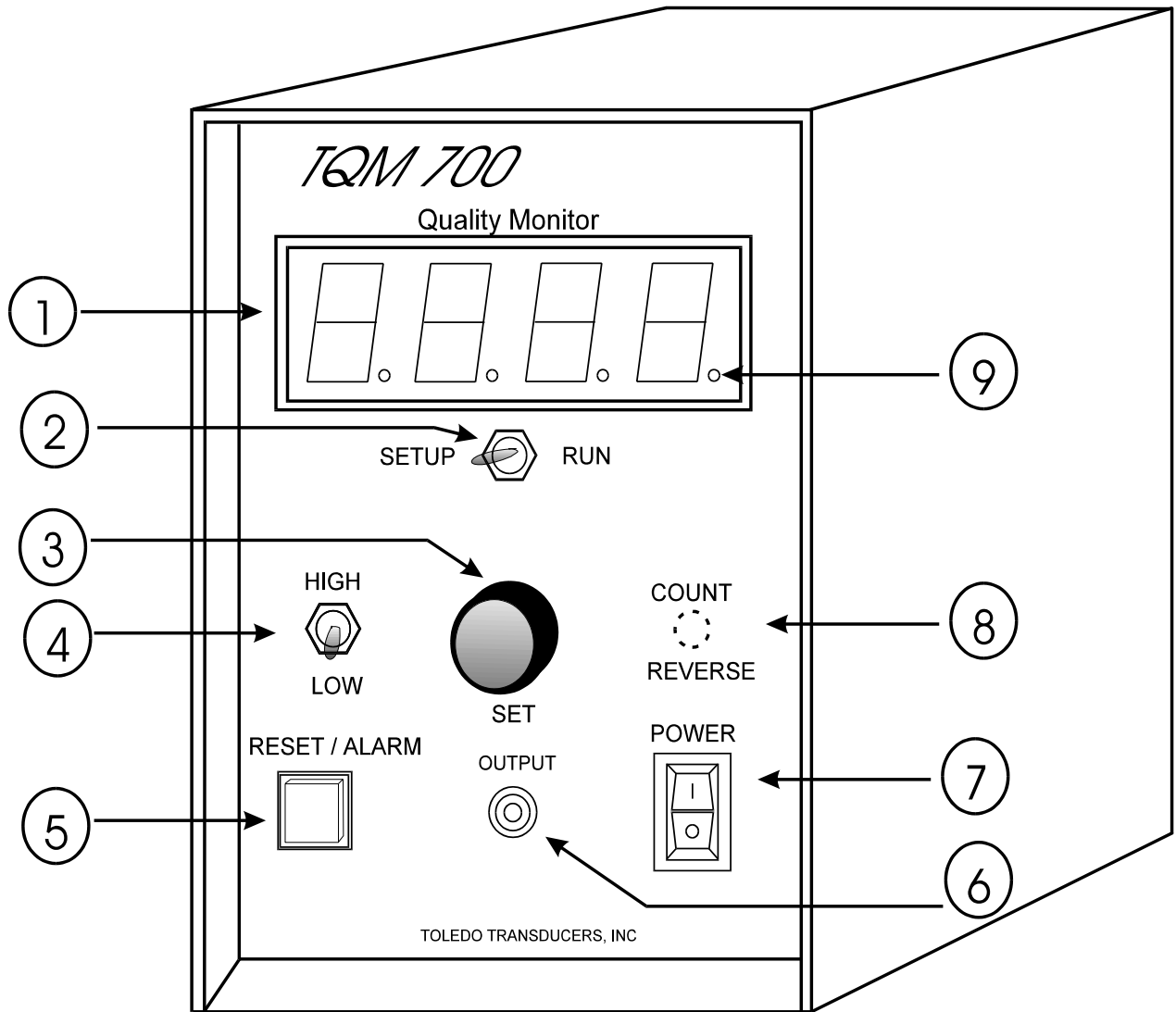
**V. Operators Guide**

Clear guidelines for machine/press operators.

**VI. TT Graph for Windows Option**

**VII. A Definition of Terms**

**VIII. TQM Specifications**



**Front Panel**



# Front Panel Description

## 1. DISPLAY

There are two display options available, a four digit display unit, normally used for displaying tons or a six digit display unit, normally used for displaying pounds. With the six-digit display unit, the last two (right most) digits will always show dead zeros if the unit is in any mode except *RUN* mode.

## 2. SETUP/RUN

When in *SET UP* mode, the high limit set point will only be active at the capacity of the machine. If in *RUN* mode, the Low and High limit will be active.

## 3. SET SWITCH

Used to adjust or select system parameters. This switch will rotate continuously right or left.

## 4. HIGH/LOW SWITCH

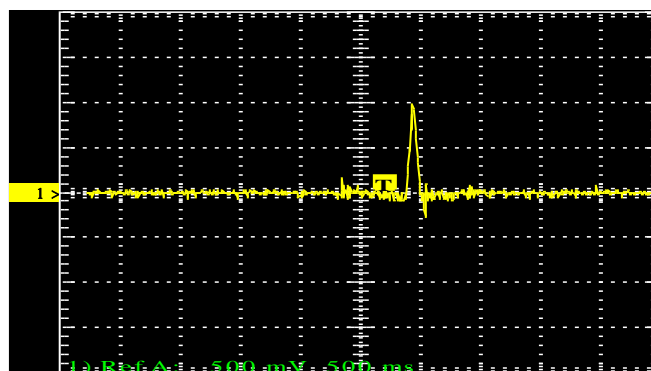
Displays high and low set points. This is a momentary contact toggle switch.

## 5. RESET/ALARM BUTTON

If a high limit, low limit or capacity limit is exceeded this button will illuminate. The unit provides “after the cycle” protection (not immediate stop protection) by triggering the shutdown relay. The shutdown relay will activate as the pressure is released. This will prevent a second overload stroke. Pushing the *RESET/ALARM* button it will reset the relay and again allow the machine to cycle.

## 6. ANALOG OUTPUT JACK

This jack provides electrical signals that are directly proportional to the load. This signal can be viewed using an oscilloscope or track recorder. (2.5 VDC = Capacity of Machine).

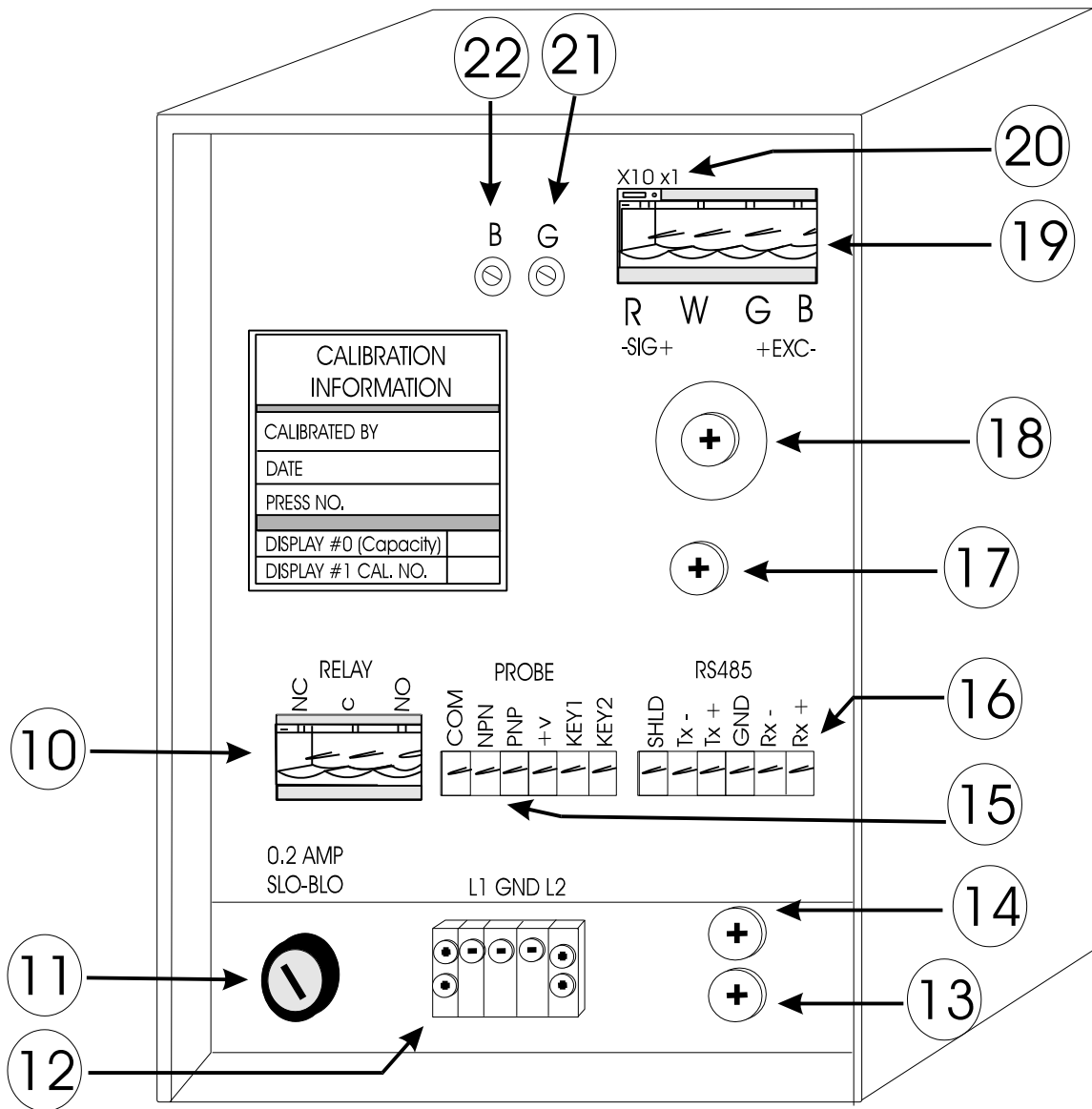


## 7. POWER ON/OFF SWITCH

## 8. COUNT REVERSE OPTION

## 9. THRESHOLD / PROBE LED

During each press cycle, this LED is turned ON whenever the unit is receiving an Above Threshold or Probe signal and turns OFF after the signal ends.



**Rear Panel**

## Rear Panel Description

10. **SHUT-DOWN RELAY PLUG**

Relay is rated at 7.5A -- 120 VAC  
7 A -- 240 VAC  
1/6 HP -- 120 VAC  
1/3 HP -- 240 VAC

11. **FUSE - 0.2 AMP (Slo-Blo) (5mm x 20mm)**

12. **POWER INPUT**

100 VAC - 130 VAC 50-60 Hz with good earth ground.

13. **CORD STRAIN-RELIEF for power cord.**

14. **CORD STRAIN-RELIEF for probe/computer hookup**

15. **PROBE INPUT**

See Page 9 for wiring connection information.

16. **RS485 COMPUTER PORT**

See Page 10 for wiring connection information.

17. **CORD STRAIN-RELIEF for sensor cable**

18. **SENSOR-SHIELD GROUND TERMINAL**

19. **SENSOR INPUT PLUG**

See **Installation Instructions on page 8** for proper connection.

20. **GAIN X 10 JUMPER**

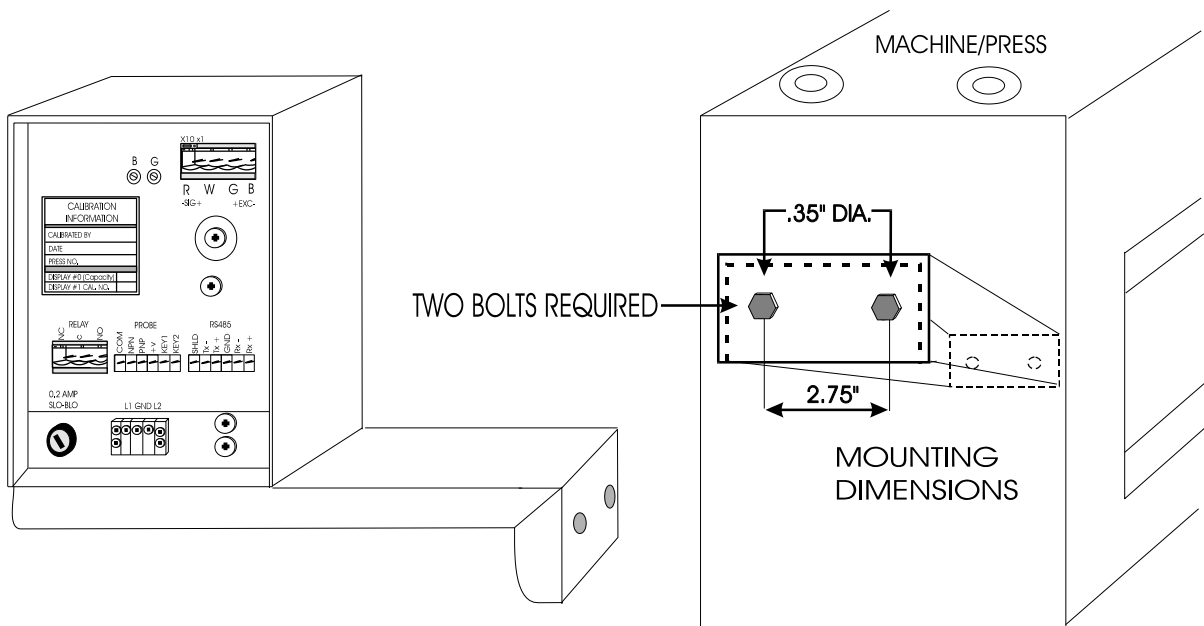
Can only be reached with a pair of tweezers or small needle nose pliers.

21. **GAIN ADJUSTMENT**

Information can be found on Page 17.

22. **BALANCE ADJUSTMENT**

Information can be found on Page 17.



## II. Installing the TQM

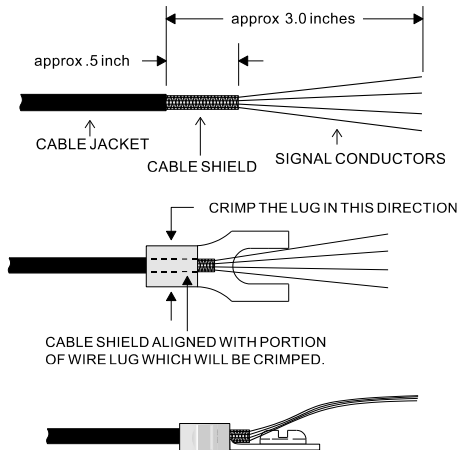
- Step 1** Install the **TQM** mounting bracket near the operator control panel where the **TQM** can be easily seen and used, yet out of the way of potential damage. See Diagram above.
- Step 2** Install the sensor(s) according to the **Sensor Installation Instructions** included in the sensor kit. The sensor cables do not necessarily need to be run in conduit unless the cables will be in an area where they could be damaged. ( $\pm 5v$  DC maximum voltage.)

If you have custom designed load cells that fit into your press the **Sensor Installation Instructions** do not apply. When routing your sensor cable, make sure it does not snag anything as the press/machine cycles. (Make sure you ground the shield through the lug as shown on Page 9.)

Connect the sensor cable to the sensor input plug (#19) on the rear panel. If more than one sensor is mounted on the press, the cables may be paralleled into the connector.

The shielding on all sensor cables **must** be connected according to the **Sensor Cable Shield Installation** diagram on the following page, and connected to Terminal #18 on the rear panel. **Caution: If it is not connected in this way you may have erratic readings.** This connection is for shielding from electrical noise. All sensor cables must be routed through the cord strain relief (#17) on the rear panel.

When the T400 type sensor location is in tension, the wires should be connected to the corresponding color inputs, red, white, green, and black. If the sensor is in compression, the red and white wires should be reversed in the plug. The load cells that Toledo Integrated Systems manufactures operate in compression but can be wired as if in tension. (Red to Red, White to White, etc.) If another type of sensor is used refer to sensor color code for signal and voltage polarity. The input color code is Red (-) signal, White (+) signal, Green (+) excitation and Black (-) excitation.

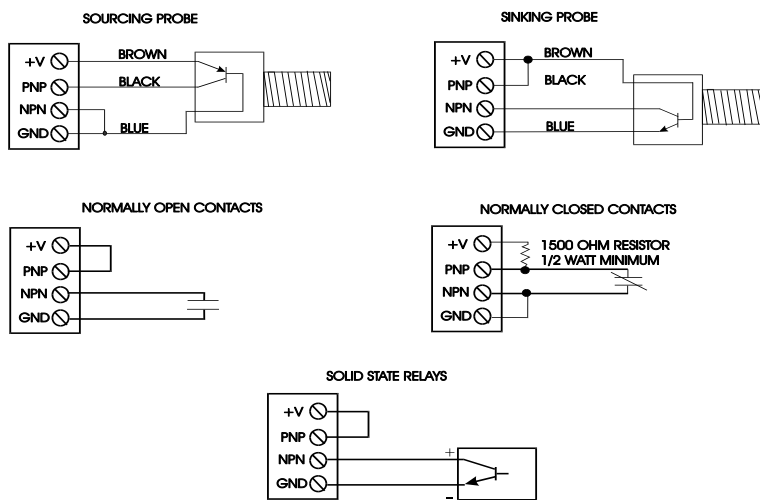


**Step 3** Power is supported through the power input connector (#12) on the rear panel, the power cord must be run through the cord strain relief (#13). This unit operates on 110 VAC, and must be properly grounded. We suggest using Loc-tite to prevent press vibration from loosening these screws. Also, the use of ring lugs is recommended.

**Step 4** The Top Stop relay from the press should be connected to the shut-down relay plug (#10) on the rear panel. This 3-pin terminal block is removable. In most cases, the common (C) and normally open (NO) are wired into the top-stop circuit of the press. These contacts are held closed and will open when an alarm occurs. The relay is rated at: 7.5A – 120 VAC, 7A - 240 VAC, 1/6HP – 120 VAC, and 1/3 HP -- 240 VAC. If using more power than this we suggest putting another control relay in the circuit to prevent failure.

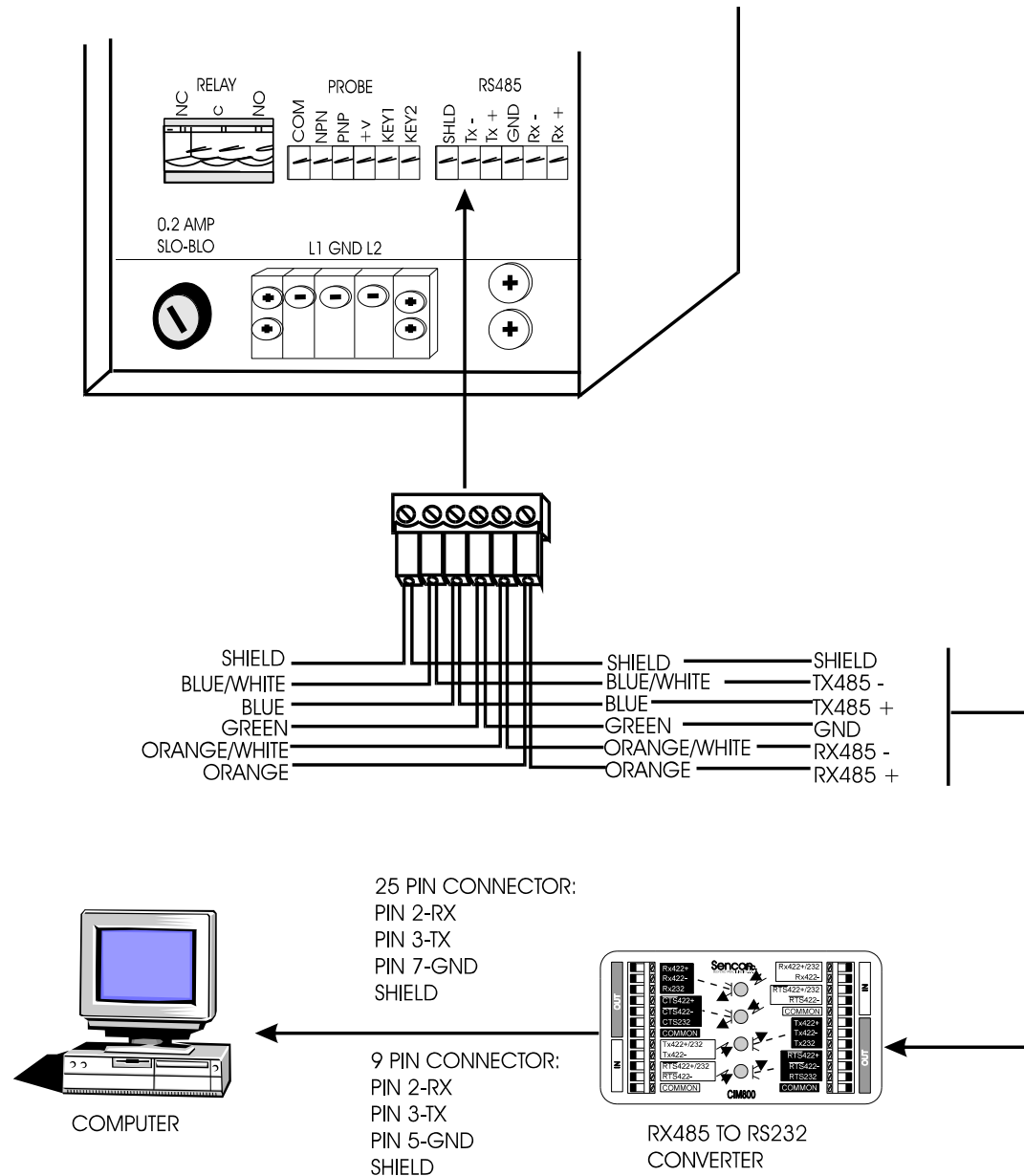
**Step 5** While the TQM can function using a threshold parameter to trigger the monitor, for best results we recommend connecting a probe (timing-cam (proximity) switch). See Input Wiring Diagram below for proper connection of probe input. The wires for the probe should be routed through the cord strain relief (#14) and connected to the probe input plug (#15) on the rear panel.

It is recommended that the cam turns *ON* at 150°, and *OFF* at 220°.



N700 CAM PROBE INPUT

**Step 6** Plug (#16) is for connecting an RS485 computer interface to the **TQM**, if this option is installed. For wiring instructions see **Computer Interface Connections** below.



**Step 7** The **TQM** is protected by a 0.2 amp Slo-Blo Fuse (#11) on the rear panel. If replacement becomes necessary, an identical fuse must be used. The size of the fuse is 5mm x 20mm.

**Step 8** Each time the **TQM** is powered up, it will automatically run through a series of self-diagnostic tests. While these tests are being performed, the monitor will display *Auto*. When complete the unit will display "0", "0.0" or "0.00" depending on the decimal point position. If the display only shows the Probe LED continuously ON when powering up, then the unit is in fault and must be balanced to true zero. See Section IV, Step 8.

## III. PROGRAMMING YOUR MONITOR

*Program* mode allows the user to load all press parameters necessary for proper operation of the **TQM** monitor. Each press has its own unique parameters.

Two terminals, Key 1 and Key 2 (#14), must be shorted to allow changing the set-up data. During this test, simply install a wire to connect these two points. (Should come installed from Toledo Integrated Systems) Remove jumper upon completion.

You are now ready to program your **TQM**.

### ENTERING PROGRAM MODE

To begin programming, push and **hold** the *RESET/ALARM* button (#5) while turning the power ON. Continue holding *RESET* until the word *PrOG* appears. When you release the *RESET/ALARM* button (#5) the first of six parameters will appear on the display, approximately four seconds later the **value** of selected parameter is displayed. Pressing the *RESET/ALARM* button (#5) again will enter the current value into memory and return to the parameter name. To select the other *program* mode parameters, when current parameter name is on the display, (not the value), press the *RESET* (#5) again and again until the name of the program parameter you wish to change is displayed. The display will always change to show the value of the selected parameter after four seconds.

The following is a list of the seven program parameters available:

#### 1 *dP* -- Number of Decimal Positions

The **TQM** monitor can display zero to three (0 - 3) decimal places, depending upon the capacity of the press and the resolution necessary (Example: a 60-ton press capacity can be shown at 60, 60.0 or 60.00.)

To set the decimal place - Four seconds after *dP* appears, the current value of decimal places appears. Use the *SET* switch (#3) to increase or decrease the value. When the proper value is displayed, press the *RESET* button (#5) to enter the value into memory. When the *dP* label reappears, pressing *RESET* (#5) will advance to the next parameter.

#### 2 *CAP* - Press Capacity

Press capacity is usually set at the maximum capacity of the press. You should be able to find a data plate on the press indicating the capacity rating. Capacity is normally set in U.S. Tons.

To set capacity - Four seconds after *CAP* appears, the current capacity setting will appear. Use the *SET* switch (#3) to set the value. When the proper value is displayed, press *RESET* (#5) to enter the value into memory. When the *CAP* label reappears, pressing *RESET* (#5) will advance to the next parameter. (By pressing the *HIGH/LOW* toggle in *HIGH* it will fast advance.)

#### 3 *tHr* -- Threshold Value

Set Threshold value to "0" if a probe is going to trigger the unit to update. See Page 9 for probe input wiring connections. **This is a requirement for presses that are operating faster than 400 st/min., dies doing more than one operation and variation of dies in the press.**

To set Threshold to "0" - Four seconds after *tHr* appears, the current Threshold value will appear. Turn the *SET* switch (#3), counter-clockwise to set the value to "0". After reaching "0" continue to turn the *SET* switch knob counter-clockwise for one more turn. The display should still show "0" after the final turn of

the knob. Press *RESET* (#5) to enter the “0” value into memory. When the *tHr* label reappears, pressing *RESET* (#5) will advance to the next parameter.

If you choose to operate from a threshold tonnage instead of a probe trigger, we suggest dialing in the threshold to 10% of the capacity setting from (Step 2). Enter threshold as load value not percent (for example, CAP = 60 Ton, Enter 6 for 10% threshold.).

You may experience double updates using a 10% threshold, resulting from mechanical vibration, therefore you may have to increase the threshold to correct this problem.

To set Threshold - four seconds after *tHr* appears, the current Threshold value will appear. Use the *SET* switch (#3) to set the value. When the proper value is displayed, press *RESET* (#5) to enter the value into memory. When the *tHr* label reappears, pressing *RESET* (#5) will advance to the next parameter.

#### 4 **Hydr – Hydraulic Tonnage Display**

Hydraulic presses typically have forming cycles that take several seconds to complete. Sometimes, it is advantageous for the operator to observe the load prior to the peak. The **TQM** can display the live/track tonnage during the stroke, followed by the peak tonnage when the stroke completes, by enabling Hydraulic Tonnage Mode.

To enable Hydraulic Tonnage Mode in *Program* mode, press *RESET* button (#5) until *Hydr* is displayed. After four seconds the current mode value will be displayed. Turn the *SET* switch (#3) clockwise to set the value to 1 to enable Hydraulic Tonnage Mode. Turn the *SET* switch (#3) counter-clockwise to set the value to 0 to disable it. When the desired value is shown, press the *RESET* button (#5) to enter the value into non-volatile memory. When the *Hydr* label reappears, pressing *RESET* (#5) will advance to the next parameter.

#### 5 **Addr -- Computer Interface Address**

The **TQM** is capable of transmitting and receiving serial data via the RS485 port. When more than one unit is attached to the serial lines each device must have a unique identification or “address”. The *Addr* function is provided to set this address. Your selection is from 0 to 31.

To set the address in *Program* mode, press *RESET* button (#5) until *Addr* is displayed. After four seconds the current address value will be displayed. Turn the *SET* switch (#3) clockwise to increase the value and counter clockwise to decrease it. When the desired address is shown, press the *RESET* button (#5) to enter the value into non-volatile memory. When the *Addr* label reappears, pressing *RESET* (#5) will advance to the next parameter.

#### 6 **“SCNr” - Setup Count**

One of the biggest obstacles to using tonnage monitors is human forgetfulness. Forgetting to put the unit into a run mode to set high and low limits. We have designed a way for you to remind the press operator to change the unit from *SETUP* mode to *RUN* mode.

*SETUP* mode is good for changing dies and setting the press up. Also, *SETUP* mode is good for operations that vary in a lot of tonnage. The press capacity is the only limit that will function in *SETUP*. For example, if you are working on a 30 Ton press, it will not shutdown on any tonnage lighter than 30.

Setup count is a safety feature that allows you to control the number of strokes that can be cycled in the *SETUP mode* before switching to *RUN* mode. Number of strokes can be set from 1 to 200. Setting the value to zero will disable this feature and therefore the unit will run continuous in *SETUP* mode. When it shuts down on this type of alarm, the display shows *rUn*. This is only a reminder to the operator to put the unit in *RUN* mode.



To activate the setup count feature in *Program* mode, press the *RESET* button (# 5) until *SCNt* is displayed. After four seconds the current value will be displayed. Turn the *SET* switch (# 3) clockwise to increase the value and counterclockwise to decrease it. When the desired count number is shown, press the *RESET* button (# 5) to enter the value into non-volatile memory. When the *SCNt* label reappears, pressing *RESET* (#5) will advance to the next parameter.

## 7 **CAL - Calibration Numbers.**

The **TQM** should be adjusted to some standard form of measurement. Normally we use U.S. Tons as a unit of measure. With this number adjusted in, your unit will read accurately

If your **TQM** has been purchased with a pre-calibrated load cell, it will include a Calibration Data Sheet of the load cell. On this Calibration Data Sheet you can find the calibration number generated during testing of the load cell, usually measured in Tons or Pounds. This value may already be adjusted into your unit if the unit and load cell were purchased as a system. Nevertheless, it is good idea to double-check the value entered in the unit.

If you did not receive a pre-calibrated load cell, then skip the following step, turn power off and go to the **TQM Press Calibration Procedure** in Section IV of this manual.

### **Displaying the Calibration Number:**

**NOTE:** When using a six-digit unit, the two right most display digits always show dead zeros. These digits do not change unless the unit is in RUN mode.

To display the calibration number - Four seconds after *CAL* appears, the balance setting is displayed. By using the *High/Low* toggle switch, the displayed value switches from the Balance setting to the Gain (Calibration Number) setting.

- To display the Balance, toggle the *High/Low* to *Low* and release. Balance is always the first value displayed after the *CAL* parameter name but the *High/Low* toggle still operates as stated above.
- If the display is not zero, adjust the balance pot (#22 on the Back Panel) with a small screwdriver until your value goes to “0”, “0.0” or “0.00” depending on the decimal position. See Section IV, Step 8 to properly adjust the balance to true zero.
- To display the Gain (Calibration Number), toggle the *High/Low* to *High* and release.
- If the Gain (Calibration Number), displayed on the unit is not the same as the number on the pre-calibrated load cell data sheet, adjust the gain pot (#21 on the Back Panel) to the calibration number on the data sheet.

After the proper adjustments have been made to the Balance and Gain, press *RESET* (#5). When the *CAL* label reappears, pressing *RESET* (#5) will advance to the next parameter.

If your load cell data sheet only shows a (mV/V) Calibration number, you will need to calculate the TQM Calibration number. Go to the **Calculating a TQM Calibration Number from (mV/V) Output** section on Page 15 to determine the TQM Calibration number. Once you obtain the proper TQM Cal. Number, return to the above step and adjust the gain pot to show this number.

Please FAX the load cell Calibration Data Sheet back to us with a copy of your Company’s letterhead. (Our FAX number is 419-867-4180.) This will activate your warranty.

**IMPORTANT:** If your load cell capacity is ever changed you will need to readjust this calibration number back into your unit.

### **Exit Program Mode**

Simply turn the Power OFF and ON to enter the normal operating condition.

If you have a pre-calibrated load cell, you are ready to go to the “Operators Guide”. You can remove Key #1 to #2 jumper in the back of the unit if you do not want to make adjustment to the high and low limits. If you want to make high and low limit adjustments, leave Key #1 to #2 in. If you do not have a pre-calibrated load cell go to **Section IV: TQM PRESS CALIBRATION PROCEDURE. Page 16.**

## CALCULATING A TQM CALIBRATION NUMBER FROM (mV/V) OUTPUT

Load cells are milli-volt per volt devices. Many times a load cell and the TQM instrument have not been calibrated together as a system. This section describes a way to obtain a TQM Calibration Number measured in tons or pounds using information from a load cell calibration data sheet.

Information needed from data sheet:

- *Full Load Capacity* rating of load cell; usually measured in tons or pounds
- *Cal No.*, measured in (mV/V)
- *Voltage Output at Capacity* when testing the cell. This is the (mV/V) output the load cell read when it was calibrated. The test data will indicate the maximum Machine Force applied and the resulting output listed under the {Run 1 Reading} column, measured in (mV/V). This is the *Voltage Output at Capacity* of the load cell.

-- Formula to Use --

$$\frac{\text{Full Load Cap. (lbs)} \times \text{Cal. No. (mV/V)}}{\text{Volt Output @ Cap. (mV/V)}} = \text{TQM Cal. Number (lbs)}$$

*(The units for TQM Cal number and Full load Cap. could be in Tons)*

The number calculated above needs to be rounded off to only 4 digits for entry into the TQM unit. The number could include a decimal point.

### **NOTE: Compare the Shunt Resistor value of the load cell to the Shunt Resistor value of the TQM unit.**

Locate the Shunt Resistor value the Load Cell was calibrated with. It is listed on the data sheet under the Cal. No.

Locate the Shunt Resistor value of Tonnage Unit, it can be found on the TQM units data plate located on the bottom of the unit: The first number is the model and the second is the shunt value in ohms.

If it is labeled 701-1 meg Shunt Resistor = 1 meg  $\Omega$  = 1,000,000  $\Omega$   
If it is labeled 701-57k Shunt Resistor = 57k  $\Omega$  = 57,000  $\Omega$

If the Shunt Resistance on the TQM unit is the same as listed on load cell data sheet, the TQM Cal. Number found in the above formula is satisfactory.

If the TQM unit and the load cell have different Shunt Resistor values, the TQM Cal. Number must be adjusted by the ratio of the differing resistance.

$$\frac{\text{Shunt Res. Load cell } (\Omega)}{\text{Shunt Res. Unit } (\Omega)} \times \text{TQM Cal. Number} = \text{Adjusted TQM Cal. Number}$$

Use the Adjusted TQM Cal. Number when programming the Gain value into the unit if the Shunt Resistor of the unit and load cell are of different values.

Name of Company \_\_\_\_\_ Contact Name \_\_\_\_\_

Model Number \_\_\_\_\_ Serial Number \_\_\_\_\_ (Located below AC power terminal)

Date Received \_\_\_\_\_ Machine Type \_\_\_\_\_ Machine Capacity \_\_\_\_\_

Company Address \_\_\_\_\_

City, State, Zip Code \_\_\_\_\_

Phone Number (\_\_\_\_\_) \_\_\_\_\_

Today's Date \_\_\_\_\_

NOTE: If Toledo Integrated Systems has calibrated this unit these three pages can be ignored. If not this information must be completed and mailed or Faxed to Toledo Integrated Systems to activate the warranty.

## IV. TQM Press Calibration Procedure

- Step 1** It is assumed that the best sensor location has been chosen and the sensors properly torque down to 150 in/lbs. (See the **Sensor Installation Instructions** that came with the sensor kit for details.)
- Step 2** Connect the top stop relay. (See page 9 for more information).
- Step 3** Press capacity and decimal point are entered in. (See page 11 for more information). Record unit serial # \_\_\_\_\_ from back of unit.
- Step 4** If a cam switch is available, set threshold to zero and connect switch to the unit. (See page 9 for more information). If a cam switch is not available, adjust the threshold tonnage to 10% of the press capacity.
- Step 5** Without cells in the press, cycle the press and stop it at BDC (Bottom Dead Center). Measure the shut height of the press from the bolster to the ram. The shut height is \_\_\_\_\_. Now measure the height of your load cell. (AC100 type cells are 4.000 inches) Now subtract the load cell height from the shut height. This is the amount of solid steel spacer block you will need to generate tonnage. Remember to be careful that your blocks are not too high.
- Step 6** Cycle the press until the ram goes back to the top and place the load cell and spacers in the bed of the press. Then slightly raise your ram adjustment up (around .030 inches).
- Step 7** Cycle the press and make a hit upon the load cells. Your first hit upon the load cell should not generate any tonnage if you measured correctly. If it does, then continue to raise the shut height of your press. Now after every cycle, slightly lower the shut height. Take note of the amount of force for each cycle and be careful not to overload the press. Also, be careful not to stop on the load cell when cycling the press. The ram may stick on the bottom if you stop on the bottom.

**Step 8** Once you have reached your ideal tonnage (in most cases this will be press capacity), you are now ready to adjust your **TQM** to read accurately. (If you are using more than one load cell, each cell should read the same tonnage. To increase tonnage on a cell, you can shim, using a piece of paper on the light cell, until they are equal.

Setting the zero balance on the **TQM**: Turn power off, then on again while holding in the **RESET** button (#5). Wait until the word **PrOG** appears, release **RESET** (#5) then press it again and again until your unit shows **CAL**. This value should be adjusted to zero by adjusting the balance pot (#22 ) with a small screwdriver. Turn the balance pot 20 turns clockwise, then turn it counter-clockwise until you reach zero on the display. When completed, exit **PROGRAM** mode by turning the power OFF and ON again.

NOTE: If the balance will not adjust, it is due to your sensor not being mounted properly.  
See the **Sensor Installation Instructions** that came with the sensor kit concerning flatness.

**Step 9** Setting the gain amplifier on **TQM**: Cycle the press hitting the load cell. We suggest calibrating your press at its rated capacity found on the press's data label. Adjust the gain pot (#21) (next to the balance pot) after each press cycle until the number displayed on the unit matches the number displayed on the load cell. If your readings remain too high on the **TQM**, change the x1 x 10 jumper to x1.

**Step 10** Now that your readings match at capacity, document the accuracy at other tonnage values throughout the range by raising the ram every hit. Record values for your own records,

Load Cell	<b>TQM</b>
_____ Full Load	_____
_____ 3/4 Load	_____
_____ 1/2 Load	_____
_____ 1/4 Load	_____
_____ 1/10 Load	_____

These will become important later especially if the integrity of the **TQM** is questioned or if there are light jobs running in the press. A light job may respond differently from press to press and the only way to be sure of the accurate tonnage will be to refer back to these records.

**Step 11** Remove the load cell, install a die and run production. The unit should update only one time during a cycle of the press. This is a stable and correct method for the **TQM** to operate.

If you have erratic or multiple updates per cycle, make sure the Threshold is set correctly by checking the following:

- a) 0 Tons if working from a cam? (See page 12).
- b) Is the cam timing set too short? We suggest at least 150° to 220° on.
- c) Consider raising the threshold tonnage higher than 10% of the capacity.

**Step 12** Recording Calibration Number. Return to the Program mode by turning the power OFF and ON again while holding the *RESET* switch (# 5) in for four seconds. Then press *RESET* again and again until you reach *CAL*. Make sure that the Balance reads zero. If not at zero, re-adjust until zero is displayed.

Toggle the High/Low Switch to High and record the Gain value displayed, #\_\_\_\_\_. This is your calibration number.

Write this value on the calibration sticker on the back of the unit. Also include the capacity of the press on this sticker.

**Step 13** Remove the Key #1 to Key #2 Jumper to “lock” in all data.

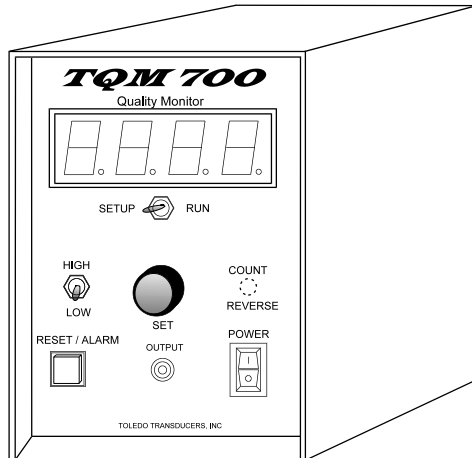
The unit is warranted for one year from purchase date. To activate this warranty, if the calibration was not completed by Toledo Integrated Systems, pages 16-18 must be filled out and mailed back to Toledo Integrated Systems.

Mail this information to:

Toledo Integrated Systems  
1345 Ford St.  
Maumee, OH 43537

Attention: Technical Support Manager

or FAX to: 419-867-4180 Attention: Technical Support Manager



## V. Operators Guide

Improves Quality by providing a simple to use readout that can automatically set high and low limits to avoid making a bad part.

### -- How To Use --

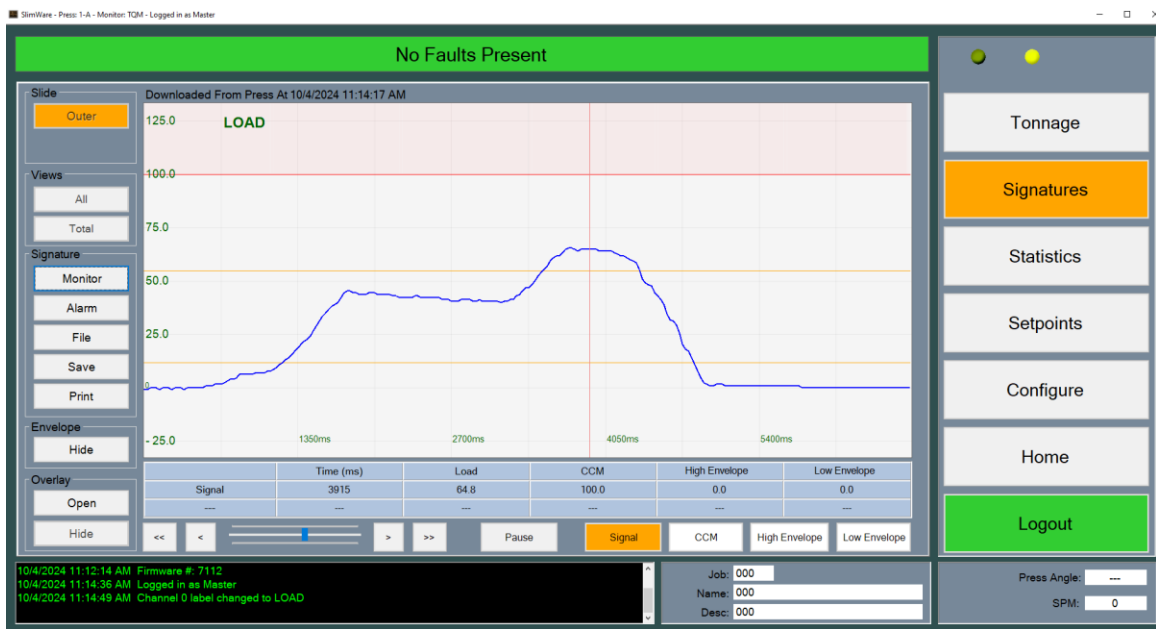
- Put in “SETUP” mode until you can repeat good parts. Then put in “RUN” mode. It will then activate the high and low trip points.
- HIGH/LOW switch momentarily displays the high or low alarm trip points. The unit will flash an alarm and stop production if a part is made higher than the high limit or lower than the low limit.
- RESET/ALARM Indicator Light turns red when an alarm condition occurs, either low or high trip point has been violated. Pressing it will reset the alarm relay and allow production to continue. If an alarm shows a rUn, this is a reminder to put the unit into RUN mode. It will continue this pattern until the operator toggles the switch from SETUP to RUN.
- If the press/machine shuts down too many times without a quality problem your limits are set too close.
- If the press/machine allows double parts and the high alarm does not activate, then your limits may be set too far apart.
- To adjust your **High Limit**, toggle *High/Low* to High and hold, use the SET dial to change the value displayed. This is a course adjustment. When the *High/Low* switch is released you now have a fine adjustment with the SET dial until the adjustment mode times out in approximately four seconds.
- To adjust your **Low Limit**, toggle *High/Low* to Low and hold, use the SET dial to change the value displayed. This is a course adjustment. When the *High/Low* switch is released you now have a fine adjustment with the SET dial until the adjustment mode times out in approximately four seconds.

**NOTE: The following options are not normally included on the standard TQM unit.**

- COUNT Pressing the COUNT/REVERSE Switch toward “COUNT” shows the amount of updates since the power has been turned on. To clear COUNT, hold the COUNT/REVERSE switch in COUNT and push the RESET button.
- REVERSE Pressing the COUNT/REVERSE switch toward “REVERSE” shows the amount of negative forces the last stroke had.

## VI. SlimWare 7.1 Software Option

- **SlimWare 7.1** software allows you to view peak tonnage, statistics, and setpoints. You can also download and save a time-based signature of the last stroke. The software and user's manual can be downloaded from the Toledo Integrated Systems website at <http://www.ttoledo.com/downloads>.





## VII. Definition of Terms

<b>Shut Height</b>	The distance from the top of the bed or bolster of the press to the bottom of the ram, when at Bottom Dead Center.
<b>Benchmark</b>	The tonnage of a good part made during the last cycle in “SETUP” mode.
<b>Calibration</b>	The process in which the Tonnage Monitor mounted on the machine is adjusted to read the same tonnage as the load cells in the bed of the press.
<b>Calibration Number</b>	A reference value dialed in during the calibration process. When the calibration number is correct the force readings displayed will be accurate. See <b>Gain</b> below.
<b>Gain</b>	Gain is the amount of amplification used by the monitor. A small amount of elongation of the sensor will need a large amount of gain to show a high reading. The gain pot is adjusted during the calibration process.
<b>Balance</b>	The balance adjustment equalizes the sensor to the monitor. The balance pot is used to bring the display to zero.
<b>Compression</b>	The reading generated by the sensor or load cell by compressing the device.
<b>Tension</b>	The reading of force by the sensor or load cell elongating (stretching) apart.
<b>Key</b>	A contact (could be a switch) from Key 1 to Key 2. When closed or shorted together allows information to be changed.
<b>Probe Input</b>	A switching input to the unit allowing tonnage to be read at a certain position in the stroke. It is obtained most of the time from a rotary cam wheel or a programmable limit switch.
<b>Alarm</b>	A reading that is out of the high or low limit range causing the relay to energize. Once alarmed, the relay opens to stop the press/machine.
<b>Threshold</b>	A force value that will allow the unit to recognize a force signal as opposed to mechanical vibration. The monitor will ignore all forces under the threshold.
<b>Reverse Load</b>	The “snap through” or damaging negative forces occurring in the machine. Typically the snap through rating is 10% of the forming capacity of the press.

## VIII. Specifications

<b>Sensor Inputs</b>	Accepts one or two 350 ohm full-bridge strain gage sensor(s).
<b>Sensor Excitation</b>	$\pm 5$ VDC (10V) at 70 mA maximum. Short circuit protected.
<b>Analog Signal Output</b>	3.5 mm stereo phone jack. 0 - 2.5 VDC = Maximum capacity of display.
<b>Sensitivity</b>	.057 m V/V to .625 m V/V for (x10) high gain range at capacity. .568 m V/V to 5.00 m V/V for (x1) low gain range at capacity.
<b>Automatic Zero Balance</b>	Automatic circuits maintain true zero during periods between measurements. This assures sensor and instrument accuracy regardless of ambient temperature excursions.
<b>Manual Zero Balance</b>	Manual zero balance range is $\pm 1$ m V/V of offset at the transducer input and is adjustable by a 25 turn trimming potentiometer on the back of the unit.
<b>Gain Ranges</b>	Two Gain ranges to allow the unit to accept either weak or strong signals from the load sensor. Low range (x1) provides a continuously variable gain range from 40 to 440. High range (x10) is continuously variable from 400 to 4400. Both gain ranges are adjustable by a 25 turn potentiometer on the back of the unit.
<b>Calibration Shunts</b>	Factory standard shunt is 1 Megohm .1% precision resistor. Other shunt values can be used depending on the type of sensors that will be attached to the unit.
<b>Frequency Response</b>	Flat to 1kHz.
<b>Speed</b>	0-400 SPM using threshold to trigger. 0-2000 SPM using cam input to trigger.
<b>Display</b>	Four or Six digit display for displaying TOTAL measurement.
<b>Computer Interface (Optional)</b>	RS485 multi-drop interface PressNet TTGraph
<b>Cam Input</b>	Accepts 10 to 30 VDC NPN or PNP proximity device. Supply current at 50 mA maximum. Limit switch may also be used.
<b>Relay Output</b>	1 form c contact, 7.5 AMP rating at 120 VAC. Bypass switch is also available for the stop circuit.
<b>Security</b>	Programming key provides protection to the monitor settings from being changed by unauthorized person.
<b>Power Requirements</b>	10 Watts. 85 to 140 VAC at 50/60 Hz or 170 to 280 VAC at 50/60 Hz.
<b>Operating Temperature</b>	0°C to 70°C
<b>Instrument Weight</b>	Approximately 7.5 lbs.
<b>Enclosure Dimensions</b>	4.33" wide x 6.06" high x 7.52" deep.
<b>Enclosure Mounting</b>	Mounting bracket allows enclosure to be positioned at every 30°.