



LOAD SENTRY MANUAL

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SECTION 1 INTRODUCTION

1.1 Product Overview

The Rexcon Load Sentry is the ultimate machine monitoring device that measures, monitors, and displays tonnage.

By continuously monitoring machine loads, the Load Sentry provides operator and supervisors with information about actual load distribution, set-up adjustments and tooling conditions. All of this information is organized in a fast and efficient manner so the information can be used for future reference.

Operating characteristics and features of the Rexcon Load Sentry include:

- * Allows parameters to be set independently on 2,4,6, or 8 corners.
- * Provides early detection of tonnage changes for preventive maintenance.
- * Monitors up to four strain gauges at a rate of 2000 times per second checking each reading against user entered high and low tonnage settings.

SECTION 2 INSTALLATION

The Rexcon Load Sentry machine tonnage monitoring unit has components that must be installed. The tonnage monitoring has up to 8 strain gauges and a rotating electric cam switch (If one is not currently present) and the control/display unit. Cables and wires will need to be installed.

2.1 Site Requirements

The following are suggestions that should be considered when a new installation of the Rexcon family of machine monitoring devices is being performed.

DIRT: All Rexcon devices are housed in a NEMA TYPE 12 oil-tight enclosure. The micro-electronics in the Rexcon devices are not very tolerant of a dirty environment. It is important that they not be removed from the supplied enclosure and to make sure that the enclosure remains tightly sealed at all times. If holes are punched in the enclosure, they need to be located and sealed so as to maintain NEMA TYPE 12 standards.

VIBRATION: All Rexcon devices are intended to be used with machines and are designed to survive in such an environment. However, Rexcon devices should be installed in the most vibration free location available. If possible, mount the devices on the controls panels located off the machine. Rubber shock absorbing mounts are recommended and are supplied with each unit.

ELECTRICAL NOISE: The micro-electronics that make up the Rexcon family of devices can be highly susceptible to "**ELECTRICAL NOISE**". While every precaution has been taken in design and manufacture to avoid noise related problems, there are several installation considerations which can further protect against electrical noise.

2.2.1 CONTROL/DISPLAY UNIT

There are three factors to consider when locating and mounting the control/display unit:

The control/display unit should be mounted within sight and reach of the machine operator.

It should be located in an area free from fluids or metal particle contamination.

It should be mounted so that it can't be bumped or damaged due to an accident with an overhead crane, forklift, etc....

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2.2.2 ELECTRIC ROTATING CAM SWITCH

The electric rotating cam switch is a 1:1 ratio of ram motion that provides the Rexcon Load Sentry with the necessary signals that are needed to measure tonnage. Every press should currently have a rotating cam switch. However, if one is not present, we recommend you use Rexcon part number RC80-108-D-SP-X.

As they are other electric rotating cam switches that can be used, we are unable to provide you with installation instruction. Please contact our service department for detail assistants.

The signal that are provided by this unit has two functions:

- * Provides a signal for resetting the strain gauges to zero.
- * Provides a signal to tell the monitor to measure tonnage just as it is increasing and to stop measuring tonnage returns to zero.

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2.2.3 Strain Gauges

The strain gauges are the heart of any tonnage monitoring system. Strain gauges work by measuring small amounts of tension and compression applied to the two ends of the cell. Because of the small amount of that they are detecting, the strain gauges must not be mounted in a stressed conditions.

Specific placement of the strain gauges varies from machine to machine with the following factors to be considered:

- * Strain gauges should be mounted in a location that stretches or compresses with the machine operating loads.

- * Select the thinnest cross section of that member on which the strain gauges are to be mounted.
- * Mounting site must have a surface that is flat with 0.020 inches. If surface is irregular or curved, it must be ground flat.
- * They should be mounted in a place where they will not get damaged.

2.2.3.1 Standard

1. Select mounting sites for the strain gauges.

Note: Due to the number of different style presses, we cannot specify where to mount the strain gauges in this manual. For location recommendation, please consult factory.

2. Using a #7 drill bit, drill a hole 1/2" deep and tap for a 1/4 X 20 thread.

CAUTION: When drilling make sure the holes are at a right angle to the surface. The strain gauge will not work properly if the holes are cocked or angled.

NOTE: Make sure to scrape the surface to remove any paint or plastic filler that will affect strain gauge readings.

3. Mount the drill fixture, (supplied) and plumb the fixture using a level, and tighten the screw.
4. Using the drill fixture as a guide, drill four #7 holes making sure that they are at a right angle.
5. Remove the drill fixture and tap the holes with a 1/4 X 28 tap.
6. Mount the strain gauges and tighten the bolts finger tight.
7. Proceed to **Section 3 Electrical Connections**.

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2.2.3.2 Weld Pad

1. Select mounting sites for the strain gauges. (See Figure 2-3)
2. Attach the weld pads (supplied) to a positioning fixture.

CAUTION: The strain gauges must not be subjected to welding temperatures. Use the positioning fixture when welding the pads to the machine. If welding temperatures are applied to the strain gauges, their warranty is voided.

3. Weld the pads to the machine.
4. Make sure that the will withstand a minimum of 50 pounds of shear force.
5. Once the pads are cooled, remove the positioning fixture.
6. Mount the strain gauges to the pads using the mounting bolts, tighten finger tight only.
7. Proceed to **Section 3 Electrical Connections**.

2.2.3.3 Adhesive Pad

NOTE: This procedure requires that the press be shut down for a minimum of 24 hours.

1. Fabricate a strain gauge mounting jig with mounting holes exactly like those on the strain links or use a weld fixture. Use the jig or fixture in place of the strain gauge when mounting the pads to the machine. (See Figure 2-3)
2. Select the mounting sites for the strain gauges. (See Figure 2-1)
3. Mount the pads (provided) to the jig making sure that the assembly is straight and tighten the bolts.
4. Sand the paint from the mounting site and clean the pads and mounting site with a solvent such as alcohol, toluene, etc...

CAUTION: The surface where the pads will be mounted must be thoroughly clean. If there is even a thin coat of oil, the pads will not adhere properly.

5. Place the jig/pad assembly on the mounting site. Scribe the pad position on the press.
6. Mix the pre-measured bag of epoxy type cement according to the instruction to the package.
7. Apply an even 1/8" coat of cement to the entire foot of the pads.

8. Clamp the unit firmly on the scribed positions. Pads must be clamped for a minimum of 24 hours.

NOTE: Do not operate machine for a minimum of 24 hours while pads are clamped to machine. Epoxy must have this time to fully cure.

9. Remove the jig from the pads.

10. Mount the strain gauges to the pads finger tight.

11. Proceed to **Section 3 Electrical Connections**.

SECTION 3 Electrical Connections

NOTE: When running cables and wires observe the following precautions:

- 1. Make all connections as direct as possible: keep cable and wire lengths to a minimum.**
- 2. Keep wires and cables as far away as possible from field generating sources like electric motors, transformers, solenoids, relays, etc.....**
- 3. Low voltage signals wires should not run in the same conduit as high voltage wires.**
- 4. Keep wires and cables protected and out of the way of fork lifts, push carts, or foot traffic.**

3.1 Strain Gauge

1. Connect the wires from each strain gages to the correct terminals located on the right hand edge of the circuit board.

(See Figure 3-2 Electrical Connections)

3.2 INPUT/OUTPUT (I/O)

All I/O connections to the Rexcon Load Sentry (except Strain Gauges) are made through optically isolated I/O modules. The modules are available in several versions including **DC INPUT** (white), **DC OUTPUT** (red), **AC INPUT** (yellow), and **AC OUTPUT** (black).

Both **DC** modules are polarity sensitive. If using two wires for the **DC** modules, the leftmost of the two terminals (odd numbers) is the positive terminal and the right terminal (even numbers) is the negative or ground terminal. **12 VDC** power is not supplied with the Load Sentry. There has to be a separate power supply available.

Both **DC** modules have a **LED** located on the top of the module to indicate that the module is active (voltage is applied).

The **DC** output modules are a fuse protected unit. The fuse is a button type fuse located at the bottom of the module. Please refer to the **SPARE PARTS LIST** for replacement information.

The **AC** modules work on the same principle as the **DC** module. The **AC** modules are capable of handling up to 250 VAC. However, the recommended voltage for this type of application is 120 VAC maximum.

As in the case of the **DC** modules, the **AC** modules have a **LED** located at the top to indicate that a signal is being received or sent. The **AC** output module also has a button type fuse located at the bottom of the module to protect the unit from damage. Please refer to the **SPARE PARTS LIST** for replacement information.

The Rexcon Load Sentry provides an output that allows the machine to be stopped by the device if a fault condition has been detected. The output is **TONNAGE FAULT**. The output is labeled on the circuit board **FAULT** for tonnage faults. (See Wiring Diagram Figure 3-2)

FIGURE 3-2



Small, illegible text located to the right of the red 'x' icon.

3.3 AC Power

The Rexcon Load Sentry operates on 100-120 VAC, 60 Hz. that feeds a power supply that converts this to +5 VDC. This +5 VDC is used to provide power to the sensitive micro-electronics.

NOTE: The AC power must be as noise free as possible.

Connect the AC power leads to the straight through terminal block located on the lower shelf of the Load Sentry next to the 3 AMP slow-blow fuse. (See Figure 3-3)

NOTE: Some newer devices may have a combination Fuse/Switch installed rather than the conventional 1/4 turn glass fuse holder. If the unit has a Fuse/Switch



installed, remember to make sure that it is in the "ON" position.

SECTION 4 OPERATION

4.1 Load Sentry Operation

This section deals specifically with using the Load Sentry from a machine operators position. The front panel of the Load Sentry is described in detail first, followed by general operation information.

4.1.1 The Front Panel (See Diagram on opposite page)

A - Four Corner Tonnage Display Windows: These windows are used to display the last cycle peak tonnage for each of the four corners of the machine.

B - Tonnage Warning Windows: These windows give a visual indication of how close the last peak tonnage for a corner came to the corners set point. A tonnage that is halfway in between the High and Low settings for that corner will light only the middle green LED. As the tonnage gets closer to the high set point, the yellow LED and eventually the red LED will light. If the yellow LED and eventually the red LED light below the middle green LED, this indicates that the tonnage is reaching or has reached the low tonnage set point.

C - MESSAGE WINDOW (TOTAL): The message window is used to display Total average tonnage of the corners that are in use.

D - NEXT BUTTON: This button is used to select the desired tonnage window while setting the High and Low Set points.

E - ARROW BUTTONS (UP and DOWN): These buttons are used to change values when setting the High and Low Tonnage set points.

F - ENTER BUTTON: This button is used to store changes that have been made to the High and Low tonnage settings.

G - KEY SWITCH: The key switch is used to enter **SETUP MODE** or to clear tonnage faults. To clear Tonnage Faults, turn the key to **RESET** for a moment, then turn it back to **RUN**. To understand the **SETUP** position, read the Modes of Operation, which follows.



Load Sentry Front Panel FIGURE 4-1

4.1.2 Load Sentry Operation

The Rexnet Load Sentry has three modes of operation, **RUN**, **RESET** and **SET** (**SETUP**). The three modes of operation can only be selected by using the keys provided to switch between them. The following is an explanation on how these three modes of operation work.

SET Mode (SETUP) - This mode is used to make changes in the tonnage high and low settings.

During the setup mode, you are limited to 50 cycles of the machine. The machine will not run more than the predetermined 50 cycles. The reasoning for this is that all the faults are monitored but will not shut the machine down due to this faults. Once 50 cycles are reached, the machine message display will display the message "**RUN**". If more than 50 cycles are needed for setup, you can place the key switch back to the "**RUN**" mode and then back to "**SETUP**". This will give you another 50 cycles.

Once setup is complete, place the key switch back into the "**RUN**" position. The machine is now ready to assume normal operations.

RUN MODE - This is used during normal machine operation and should have little operator interface. However, he may have to reset the one error condition that is associated with this device which is a **TONNAGE FAULT**. This error condition is explained in the following paragraph.

TONNAGE FAULTS - This condition is recognized by the HIGH or LOW LED's (RED) being illuminated in the TONNAGE WARNING WINDOWS of the front panel. It only takes one of these HIGH or LOW LED's to be illuminated to caused this condition. If this condition exists, determine and repair what caused this fault to happen. Once the problem has been corrected, insert key into key switch and turn to "**RESET**" then turn by to "**RUN**". The error condition is now cleared and the machine is ready to go back into production.

RESET MODE - The mode is used to reset any tonnage over or under faults.

SECTION 5 CALIBRATION

All Rexcon tonnage monitoring devices **MUST** be calibrated before they can be used. This section explains the calibration process. It is necessary to have a tonnage reference device such as a portable load cell system in order to calibrate a Rexcon tonnage monitoring device.

Two things must happen before a device can be calibrated. One is that the device must be in the **INSTALL** mode and the other, is that the strain gauges must be properly install and aligned.

5.1 INSTALL MODE

The first step in aligning and calibrating the device is to power up the device and place it in the **INSTALL** mode. The instruction that follow describes this procedure.

1. Open the front cover of the device and located the four position dip switch. Located just left of the center of the circuit board. (See Figure 5-1)
2. Place switch number 4 to the **OFF** or **OPEN** position.
3. Close the front cover and move the key switch to the **SET** position. The device is now in the **INSTALL** mode.

5.2 ALIGNING STRAIN GAUGES

After the strain gauges have been installed, the alignment must be checked to insure that they are not under stress due to twisting or uneven surfaces. To check this alignment follow the procedure listed below.

1. The first message you will see is "**TT=XXX**" (Total Tonnage).
2. Now press the **NEXT** button once until the message "**Install**" is displayed. If you accidentally press the **NEXT** button more than once, simply keep pressing it until the message "**INSTALL**" appears again.
3. Once the display reads "**INSTALL**" and the four corner **HIGH/GOOD//LOW** display lights up, the strain gauges can now be checked and aligned if necessary.
4. The bar graphs for each corner should have the center green LED lit for a properly installed and aligned strain gauge. If the Yellow LED's either above or below the Green LED is lit, you have a borderline installation. If the RED LED is lit, this indicated that the particular strain gauge is improperly installed.
5. Adjust the necessary strain gauge by loosening or tightening the bolts as needed to get the green LED's to light. In some cases, it maybe necessary to shim a particular strain gauge to obtain a green LED reading. Once all strain gauges are aligned, you can now proceed to calibrate the device.

NOTE: If the machine was previously calibrated and you had to re-align the strain gauges, it will be necessary to recalibrate the device again.

5.3 CALIBRATING

1. Inch the machine down to **BDC** (Bottom Dead Center) and turn the machine off.
 2. Place the portable load cells under the connecting arms to insure even distribution of the load to the machine frame or the tie rods. It may be necessary to place precision parallels under the loads cells to bring the load cells with a 1/4" of the ram surface.
- IMPORTANT:** Parallels must be precision and true to size and must be free from oil and grease. Insure bottom side of ram is also clean.
3. Turn machine power on and cycle machine back to **TDC** (Top Dead Center).
 4. Adjust ram down a few thousands of an inch and cycle machine. Continue to adjust the ram down and single cycle machine until contact with the load cells is indicated.
 5. Once contact is indicated, continue to adjust ram down a few thousands at a time and single cycle press until the portable load cells indicate approximately 40% of total tonnage capacity of the press. For example: 40% of a 200 ton press would be 80 tons. Each load cells should read 20 tons.

6. Each load cell tonnage reading should be within 3% of each other. If not, it will be necessary to shim the load cells to equally distribute the load between all four load cells.

NOTE: When shims are used, the amount that an area is shimmed relates to the amount that the ram is off in that area and may need separate adjustment.

7. Continue to adjust ram down a few thousands at a time and single cycle press until the portable load cells indicate approximately 75% of total tonnage capacity of the press. For example: 75% of a 200 ton press would be 150 tons. Each load cells should read 37.5 tons.

8. If 75% of total tonnage has been reached but the four corners are not within 3% of each other, re-shim as necessary to equal out the load and adjust ram down again a few thousands and cycle press.

It is important that the tonnage on a corner represent an average operating load. An average load will provide a more accurate calibration than a Too Low or Too High of a load.

Now that the machine is calibrated you must enter these values into the Rexcon device to calibrate it. The following are the procedures to follow to accomplish this.

1. With the device still in the **INSTALL** mode, press the **NEXT** button until the message in the window reads "**CAL TONS**" (Calibrate Tons).

2. Press the **ENTER** button. This will blank out three of the four digital readout windows leaving the window labeled **LF** (left front) displaying information.

3. Cycle the machine once and read the tonnage from the portable load cell for the left front corner.

4. Using the **Up** and **Down** arrow keys, enter the value into the Rexcon device. When the value matches the value read from the portable load cells, press the **ENTER** button. The message display should be asking for verification to use the new values. Actual message is "**PRESS ENTER TO CALIBRATE OR NEXT TO CANCEL**".

5. Press the **ENTER** button again. The message window will display the message "**STORED**" for several seconds and then "**CALIBRATION TONNAGE - NEXT = NEXT CORNER - ENTER = STORE VALUE**". This message will continue to scroll across the screen until direction are followed.

6. Press the **NEXT** button to move onto the next corner and repeating steps 4 and 5 until all corners are calibrated.

NOTE: If a corner is not going to be used, set its tonnage to zero (0).

When the **NEXT** button is pressed after the last corner (**RF** - Right Front) has been calibrated, the tonnage display window will go blank and the next message to appear will be "**CAL TONS**". With "**CAL TONS**" being displayed, run a few cycles and check that the tonnage's from the Rexcon device match those on the portable load cells. If any changes need to be made, simply press **ENTER** again to go back into the corner calibration sequence.

If the tonnage's being read from the Rexcon device are accurate, calibration is complete. Before leaving the **INSTALL** mode however, there is one more step that should be taken. The calibration values are stored in the devices memory (even through power outages) and should be written down in case the vales are destroyed for some reason or the device needs to be replaced. It is possible to re-calibrate the device by using the previous numbers.

To see what the current settings are, press the **NEXT** button repeatedly, while still in the **INSTALL** mode, until the message window displays "**VIEW TONS**" (**VIEW TONNAGE'S**). **VIEW TONS** displays the current calibration tonnage for all four corners. Record these numbers and label them **ORIGINAL CALIBRATION TONNAGES**.

Once these numbers are recorded, press the **NEXT** button again and the message window will read "**VIEW CON**" (**VIEW CONSTANTS**). **VIEW CON** displays an internal **CALCULATED CALIBRATION CONSTANT** for all four corners. Record these numbers and label them Calibration Constant. The **CALCULATED CALIBRATION CONSTANT** may have letters in the three digit display. This is not a display fault. **NOTE:** If a corner is unused, its **CALCULATED CALIBRATION CONSTANT** is not important and need not be recorded.

5.4 EXITING INSTALL MODE

Once all calibration is complete, to take the device out of the **INSTALL** mode complete the following:

1. Open front cover.
2. Return switch 4 to the **ON** position.
3. Close and lock front cover.
4. Move the key switch back to the **RUN** position.

NOTE: If you move the key switch to **RUN** and haven't placed switch 4 back to the **ON** position, you will get an error message that says "**WARNING: CALIBRATION IS STILL ENABLED.**"

