Co-Pilot

Automation and Control with Signatures
By Toledo Integrated Systems

Installation and Operation Manual
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Limited Warranty

This unit is warranted by the manufacturer, Toledo Transducers, Inc., 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 Transducers, Inc.
6834 Spring Valley Drive
Holland, Ohio 43528

The express warranty set forth herein is in lieu of all other warranties, expressed 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.
**Features Overview**

The Co-Pilot is a press automation and control system with signatures. It integrates tonnage monitoring, die protection, programmable limit switches, brake monitoring, motion detection, signatures with enveloping, and more into ONE resolver-based system. The display is a 6.5” color screen. Signatures and press information can clearly be seen from many angles.

**FEATURES**

- 2 or 4 channel tonnage monitoring
- Reverse tonnage
- 16 die protection inputs
- 8 or 16 programmable limit switch outputs
- PLS relays - mechanical or solid state
- Signatures - each press corner and total
- 5 signature zones for enveloping
- Critical Curve Monitoring - CCM
- Brake monitoring with 90 degree stop test
- Motion detection
- Drift detection fault
- Part, stroke, batch, and good part counters
- Speed compensation
- Up to 200 job storage
- 3 password levels

**OPTIONS**

- Additional 2 or 4 channels for tonnage monitoring or analog input
- Shut-height control
- Counterbalance control
- Part measurement control
- Servo-feed interface
- Preventative maintenance
- TR-1 Resolver
- Universal Sensor Interface box
- Press Pilot clutch/brake control
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 @ 500mA max
  (Short circuit protected)
- Sensor Input Connections: 7-pin .2" pitch Phoenix connector
- Automatic Zero Balance: Yes
- Balance Range: +/- 1mV/V of offset (digitally controlled)
- Gain Range: 100 to 11,000x (digitally controlled)
- Analog Output: 1.25VDC @ Press Capacity
- Analog Output Connection: .15" pitch Phoenix connector
- Inaccuracy: +/- 1% of full scale max
- Non-linearity: +/- .1% of full scale max
- Frequency Response: Flat DC to 6 KHz
- Resolution: Each channel provides a 4-digit load value in
  - 1024 count resolution
- Calibration Shunts: Calculation based on 1 Meg Ohm shunt resistor

PLS
- 8 outputs
- Position output: Up to 2 on/off windows
- Timed output: 1 to 10 seconds
- Speed compensation: Individual speed compensation value for each output
- Turn on every # of cycles: Every 1 to 250 cycles
- Mechanical relay: N.O. and N.C. contacts
  - 10 AMP @ 250VAC
  - 10 AMP @ 30VDC
- Solid state relay (optional): N.O. contact
  - 3 AMP @ 140VAC

Die Protection
- 16 inputs
- Sensor type: Momentary (1 to 50 max cycle)
  - Maintained (1 to 50 max cycle)
  - Static N.O.
  - Static N.C.
- Built in power for sensors: 24VDC
  - 750mA max.

Motion Detect
- Start time limit: Adjustable up to 800ms
- SPM limit: Max and min limits
- SPM motion output relay (Same relay type as selected in PLS)
- Drift detection: Alarm when 3 degrees or more of incorrect motion is detected
- Brake monitor: Adjustable stop time limit
  - 90 degree stop test
- Dual safety valve input: 110VAC mechanical relay (other voltage available)
| **Counters** | Stroke counter  | 9-digit, for Press Preventive Maintenance |
|             | Part counter    | 8-digit, 1 to 10 parts/stroke (programmable) |
|             | Good part counter | 8-digit |
|             | (2) Batch counters | 8-digit, Top stop |
|             |                   | Toggle or pulse control relay for diverter |

| **Job Storage** | 200 jobs |

| **Password** | Master level | For supervisor |
|             | Setup level  | For die setter |
|             | Operator level | For general operation |

| **Speed Limit** | Up to 400 SPM |

| **Human Machine Interface (HMI) Unit** | Display | Bright 6.5" diagonal TFT LCD display |
|                                        | Keypad  | Menu driven keypad with alpha-numeric input |
|                                        | Flash Disk | 16 Mega Byte CompactFlash for data storage and transfer |
|                                        | Serial Port | RS-232 for data transfer |

| **Shutdown Relays** | Top Stop relay and Mechanical relay with N.O. and N.C. contacts |
|                     | E-Stop relay | 10 AMP @ 250VAC |
|                     |             | 10 AMP @ 30VDC |

| **General** | Resolver | Built-in excitation supports standard 5000Hz rotor excited positional resolver |
|             | Computer Interface | (3) RS-422/232 serial ports (9,600 to 115,200 baud) |

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

| **Operating temperature** | 0-50 degrees Celsius |

| **Dimensions** | 12.5" W x 14.5" H x 7.53" D, or |
|               | 318mm W x 368mm H x 191mm D |
Mounting the Co-Pilot

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

The Co-Pilot 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 below provides the mounting dimensions and demonstrates the proper attachment of the provided shock mounts.

![Figure 1: Mounting Dimensions](image-url)
Co-Pilot Components

![Diagram of Co-Pilot Components]

Figure 2: Co-Pilot Components
Conduit Hole Selection

Follow Figure 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.

Figure 3: Conduit Hole Selection
AC Power Requirement

With the proper jumper settings, the Co-Pilot can be powered by either 115 VAC or 230 VAC (Factory set at 115 VAC.) The jumpers are located on the Power I/O Board as shown in Figure 4, and on the Analog Card as shown in Figure 5. Both sets of jumpers must be set for the desired AC voltage.

**Figure 4: Power I/O Board AC Power Jumper Settings**

**Figure 5: Analog Card AC Power Jumper Settings**
AC Power Connection

AC power is connected to the Co-Pilot as shown in Figure 6. Use Conduit Hole #1 (see Figure 3) for the AC Power Wiring. Use the proper fuse as indicated.

Figure 6: AC Power Wiring
Tonnage Sensor Connection

Refer to Figure 7 for the procedures below to connect tonnage sensors properly:

1) Power down the unit. Open the door of the Co-Pilot enclosure.

2) Run Tonnage Sensor Cables through the Conduit Hole #4 (see Figure 3), and route cables upward to the right of the Analog Card.

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

4) Remove the four 7-pin Phoenix plugs from the analog card and wire each sensor cable as described in Illustration B on page 16.

5) The 7-pin phoenix plugs can then be inserted into the corresponding sockets. The tonnage sensor cable connections are now complete.
Figure 7: Tonnage Sensor Input
Illustration A - Sensor Cable Termination

1) Strip the sensor cable as shown in Figure 8 below. Be sure not to nick any of the signal conductors or cut the braid shield.

![Figure 8: Tonnage Sensor Cable Stripping](image)

2) Strip approximately \(\frac{1}{4}\)" 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 Co-Pilot accepts the signals from Toledo Transducers T-400 sensors as well as other strain gage sensors. Figure 9 illustrates the sensor connections.

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

If two sensors share the same connector, the black wires from both sensors are wired to the black terminal. Wire the shield and green wires from both sensors in a similar manner.

Figure 9: Tonnage Sensor Wiring
Networking Connection

The PN1 RS422 serial port is available for interfacing the Co-Pilot with a computer running the PressNet networking software. RS422 allows the implementation of a daisy chain (multi-drop) serial network as a standard feature.

The PN1 port can be configured for the following baud rates:
- 9600
- 38400
- 76800
- 115200

Configuration is performed via the HMI (see System\Settings\Communication detail screen in the Operation section of the manual).

The PN1 port can be found on the Digital Card and its location is detailed in the illustration below. Wiring diagrams can be found on the next page.

![PressNet Serial Connection Diagram]

Figure 10: PressNet Serial Connection
Figure 11: Computer to single monitor wiring

![Diagram of computer to single monitor wiring]

Figure 12: Computer to multiple monitors wiring (Networking)

![Diagram of computer to multiple monitors wiring]

**Diagram Notes:**
- **Figure 11:** Computer to single monitor wiring shows the connection between a 25-pin "D" connector and a 9-pin "D" connector, with specific pin connections and cable length details.
- **Figure 12:** Computer to multiple monitors wiring (Networking) illustrates the connection setup with additional notes about pin connections and resistor requirements.

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**Legend:**
- **COMPUTER RS232 PORT:** "These are the connections for a 25 or 9-pin 'D' connector.
- **9 PIN CONNECTIONS:** Pin 2 to Sencon Rx 232, Pin 3 to Sencon Tx 422/232, Pin 5 to Sencon COMMON
- **25 PIN CONNECTIONS:** Pin 7 to Sencon COMMON
- **RESISTORS:** 120 ohm resistor must be connected at the converter between the common and the Rx422/232.
- **CABLE LENGTH:** 9600 baud: 50 feet max., 115,200 baud: 10 feet max.
- **MONITOR INTERFACE:** Use Belden cable #8103, cable length 4,000 ft max., to the last unit.
Resolver Connection

The Co-Pilot 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 Co-Pilot supplies excitation voltage to the resolver and is wired directly to the resolver. In Slave Mode, the Co-Pilot 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 #3 (see Figure 3) for the Resolver Cable. The resolver input consists of the following components:

![Resolver Input Descriptions Diagram](image)

**Figure 13: Resolver Input Descriptions**
Master Mode Wiring:

Figure 14: Resolver Master Mode Wiring

Slave Mode Wiring:

Figure 15: Resolver Slave Mode Wiring
Resolver Input Setup

1) Set all DIP switches to the OFF (right) position.

2) Determine whether the resolver input should be in MASTER mode or SLAVE mode and make the proper setting.

   Master Mode
   
   No Scale
   
   Scale Down 2X
   
   Scale Down 3X
   
   Scale Down 5X

   Slave Mode
   
   No Scale
   
   Scale Down 4X

3) Make resolver connection.

4) With the system on (press can be either running or not running), check to see if the “ROT” LED turns on. Scale down the rotor input voltage by 4X if the “ROT” LED does turn on.

   No Scale
   
   Scale Down 4X

5) With the press running, check to see if the “STAT” LED turns on. If it turns on, scale down both stator input voltages first by 2X. If it still turns on, scale it down further by 3X and then by 5X until the “STAT” LED is not turned on. Perform the test in this order to give our unit the highest workable voltage and therefore more accurate results.

   NOTE: Two stator inputs must have the same scale down factor. Therefore, the setting of STAT1 must be the same as STAT2.

   No Scale
   
   Scale Down 2X
   
   Scale Down 3X
   
   Scale Down 5X

6) Record all DIP switch settings on the calibration card.

7) Setup is basically completed. Refer to the Operation Manual for resolver offset adjustment.
Analog Output

The analog outputs are provided on an 11-pin connector for easy access and for interfacing with other peripherals. Use Conduit hole #4 (see Figure 3) for Analog Output wiring.

Analog Voltage Output:
- Swing between ± 5V
- 1.25V @ Capacity

Com = Common
CH 0 = Channel 0 (Tonnage)
CH 1 = Channel 1 (Tonnage)
CH 2 = Channel 2 (Tonnage)
CH 3 = Channel 3 (Tonnage)
CH 4 = Channel 4 (Tonnage)
AN 0 = Channel 0 (Analog) or Channel 5 (Tonnage)
AN 1 = Channel 1 (Analog) or Channel 6 (Tonnage)
AN 2 = Channel 2 (Analog) or Channel 7 (Tonnage)
AN 3 = Channel 3 (Analog) or Channel 8 (Tonnage)
AN 4 = Channel 4 (Analog) or Channel 9 (Tonnage)

Figure 16: Analog Output Wiring
**Die Sensor Input**

All sensor inputs require an active low (NPN type) signal. Therefore, a ground signal is required to turn on an input, and a high signal (24VDC) or an open circuit is required to turn off an input.

The corresponding Input LED will turn on when an input is active. Connection is usually made to Die sensor interface box. Use Conduit Hole #3 (see Figure 3) for the Die Sensor Cable.

**Figure 17: Die Sensor Input Wiring**

Input Terminal - Group 3
Reserved for custom applications

Input Terminal - Group 2
S16  = Sensor Input #16
S15  = Sensor Input #15
S14  = Sensor Input #14
S13  = Sensor Input #13
S12  = Sensor Input #12
S11  = Sensor Input #11
S10  = Sensor Input #10
S9   = Sensor Input #9

Input Terminal - Group 1
G    = Ground
Vo   = 24VDC (.5A Max) Output which supplies power to the 16 Die Sensors
S8   = Sensor Input #8
S7   = Sensor Input #7
S6   = Sensor Input #6
S5   = Sensor Input #5
S4   = Sensor Input #4
S3   = Sensor Input #3
S2   = Sensor Input #2
S1   = Sensor Input #1
**PLS Output (Mechanical Relay Version)**

Each PLS output provides both Normally Open (N.O.) and Normally Close (N.C.) contacts. The standard unit comes with the PLS1 to PLS8 outputs. The PLS9 to PLS16 outputs are available as an option.

If the PLS output is used to control an inductive load (i.e. solenoid valve), a RC network (electrical noise suppresser) is required to be installed across the “Hot” and “Neutral” terminals at the load end. Do not install RC network at the PLS output relay end. The non-polarized RC network can be installed in either direction. The RC networks come with the Co-Pilot unit.

Use Conduit Hole #1 or #2 (see Figure 3) for the PLS Output Wiring.

![Figure 18: PLS Output Wiring](image)

<table>
<thead>
<tr>
<th>PLS Terminals</th>
<th>Relay Contacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLS1 = PLS Output #1</td>
<td>NC = Normally Close Contact</td>
</tr>
<tr>
<td>PLS2 = PLS Output #2</td>
<td>C = Common</td>
</tr>
<tr>
<td>…</td>
<td>NO = Normally Open Contact</td>
</tr>
<tr>
<td>…</td>
<td>Ratings: 10 AMP @ 250VAC or 30VDC</td>
</tr>
<tr>
<td>PLS16 = PLS Output #16</td>
<td>Type: Mechanical Relay</td>
</tr>
</tbody>
</table>
**Shutdown Relays**

The Co-Pilot provides a Top Stop Relay and an E-Stop (Emergency Stop) Relay. Each relay provides both Normally Open (N.O.) and Normally Close (N.C.) contacts. A toggle switch is provided to manually bypass the shutdown relays, if necessary.

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**CAUTION**

Bypassing the shutdown relays is a potentially dangerous situation. The monitor will not shut down the press when this switch is in the bypass position. Equipment can be damaged and personnel may be seriously injured without shut down protection.

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Use Conduit Hole #1 (see Figure 3) for the Shutdown Relay Wiring.

---

**Shutdown Relay Terminals**

Top Stop = For use in the Press Top Stop circuitry
E-Stop    = For use in the Press Emergency Stop circuitry

**Relay Contacts**

NC        = Normally Close Contact
C         = Common
NO        = Normally Open Contact

Ratings: 10 AMP @ 250VAC or 30VDC
Type:     Mechanical Relay

---

**Figure 19: Shutdown Relay Wiring**
SPM Limit (Motion Detection) Relay

This relay is energized when the press is running within the user defined SPM Limits. It provides both Normally Open (N.O.) and Normally Close (N.C.) contacts.

Use Conduit Hole #2 (see Figure 3) for the SPM Limit Wiring.

Figure 20: SPM Limit Relay Wiring

Relay Contacts
NC = Normally Close Contact
C  = Common
NO = Normally Open Contact
Ratings: 10 AMP @ 250VAC or 30VDC
Type: Mechanical Relay
**Brake Input Relay**

This relay is served as an input relay. It is connected in parallel with one of the coils in the Dual Safety Valve (DSV) that control the Press Clutch/Brake circuitry. This input relay is used to provide the press starting and stopping signals for the Motion Detection and Brake Monitor functions in the Co-Pilot.

If this Brake Input is used, a RC network (electrical noise suppresser) is required to install across the “Hot” and “Neutral” terminals at each coil of the DSV end. Therefore, two RC networks are required. Do not install RC network at the Brake input relay end. The non-polarized RC network can be installed in either direction. The RC networks are come with the Co-Pilot unit.

Use Conduit Hole #2 (see Figure 3) for the Brake Input Wiring.

**Figure 21: Brake Input Relay Wiring**

<table>
<thead>
<tr>
<th>Relay Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>Connected to the Hot Terminal of a coil in the DSV</td>
</tr>
<tr>
<td>L2</td>
<td>Connected to the Neutral Terminal of the same coil in the DSV</td>
</tr>
<tr>
<td>Ratings</td>
<td>120VAC (Other voltages are available as an option)</td>
</tr>
<tr>
<td>Type</td>
<td>Opto-Coupler</td>
</tr>
</tbody>
</table>
Shut Height Control (optional)

This feature is provided to measure and adjust the shut height automatically. It supports up to two shut height systems. There is one Linear Displacement Transducer (LDT) input and two control relays for each shut height system.

Linear Displacement Transducer Wiring

![Diagram of Linear Displacement Transducer Wiring](diagram)

**NOTES:**

1) THE LINEAR TRANSDUCERS FOR BOTH THE OUTER AND INNER SLIDES MUST BE MOUNTED IN THE SAME DIRECTION OF TRAVEL.
2) TERMINATE UNUSED WIRES IN A MANNER THAT THEY WILL NOT SHORT.
3) SEE DRAWING #11487 FOR UNIVERSAL TERMINATION KIT ASSEMBLY.
4) SEE DRAWING #11488 FOR UNIVERSAL EXTENSION CABLE ASSEMBLY.

Figure 22: Linear Displacement Transducer Wiring
Control Relays

This feature comes with relays to interface with shut height adjustment circuitry for up to two shut height systems. Each relay provides both Normally Open (N.O.) and Normally Close (N.C.) contacts.

If the shut height relays are used to control an inductive load (i.e. solenoid valve), a RC network (electrical noise suppresser) is required to be installed across the “Hot” and “Neutral” terminals at the load end. Do not install RC networks at the Shut Height relay end. The non-polarized RC network can be installed in either direction. The RC networks come with the Co-Pilot unit.

Use Conduit Hole #1 or #2 (see Figure 3) for the Shut Height Relay Wiring.

Shut Height Relay Terminals
- PLS16 = For use in the Shut Height Increase circuitry for LDT1
- PLS15 = For use in the Shut Height Decrease circuitry for LDT1
- PLS12 = For use in the Shut Height Increase circuitry for LDT2
- PLS11 = For use in the Shut Height Decrease circuitry for LDT2

**note:** Refer to the shut height section of the Operation Manual for instructions on configuring the PLS for shut height operation in the HMI.

Relay Contacts
- NC  = Normally Close Contact
- C   = Common
- NO  = Normally Open Contact

Ratings: 10 AMP @ 250VAC or 30VDC
Type: Mechanical Relay

**Figure 23: Shut Height Control Relay Wiring**
CounterBalance Control (optional)

This feature is provided to measure and adjust counterbalance pressure automatically. It supports up to two counterbalance systems. There is one pressure transducer input and two control relays for each counterbalance system.

Pressure Transducer Specifications

Electrical Output: 4-20mA  2-wire
Input Pressure Range: 0-100 psi
Excitation: 10VDC

Pressure Transducer Wiring

![Pressure Transducer Wiring Diagram]

**Notes:**

1. Twisted pair cable with braid shield is required.
2. Do not install cable along with any high voltage/current wiring or devices. If noise becomes an issue, install this cable in a metal conduit.
3. Connect cable shield at the "SHL" terminal only if the shield is not connected at the sensor end.

**Figure 24: Pressure Transducer Wiring**
Control Relays

This feature comes with relays to interface with counterbalance pressure adjustment circuitry for up to two counterbalance systems. Each relay provides both Normally Open (N.O.) and Normally Close (N.C.) contacts.

If the counterbalance relays are used to control an inductive load (i.e. solenoid valve), a RC network (electrical noise suppresser) is required to be installed across the “Hot” and “Neutral” terminals at the load end. Do not install RC networks at the CounterBalance relay end. The non-polarized RC network can be installed in either direction. The RC networks come with the Co-Pilot unit.

Use Conduit Hole #1 or #2 (see Figure 3) for the CounterBalance Relay Wiring.

### CounterBalance Relay Terminals
- **PLS14** = For use in the CounterBalance Fill circuitry for CounterBalance #1
- **PLS13** = For use in the CounterBalance Dump circuitry for CounterBalance #1
- **PLS10** = For use in the CounterBalance Fill circuitry for CounterBalance #2
- **PLS9**  = For use in the CounterBalance Dump circuitry for CounterBalance #2

**note:** Refer to the CounterBalance section of the Operation Manual for instructions on configuring the PLS for CounterBalance operation in the HMI.

### Relay Contacts
- **NC**  = Normally Close Contact
- **C**   = Common
- **NO**  = Normally Open Contact

Ratings: 10 AMP @ 250VAC or 30VDC
Type: Mechanical Relay

![Figure 25: CounterBalance Control Relay Wiring](image-url)
Appendix

I) Sensor Installation (Doc# 11080)
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.

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<th>Instruction</th>
<th>Page</th>
</tr>
</thead>
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<td>Press Frame</td>
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<td>Pitman Mount</td>
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<tr>
<td>Drill and Tap Method of Installing Sensors</td>
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<td>Weld Method of Installing Sensors</td>
<td>6</td>
</tr>
<tr>
<td>T400 Enclosure Mounting Details</td>
<td>7</td>
</tr>
</tbody>
</table>
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.
TIE ROD AND NUT

CROWN OF PRESS

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

COLUMN / UPRIGHT

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

LOAD SENSOR AND ENCLOSURE

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.

BOLSTER / BED

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.
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.

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

TORQUE EACH 1/4-20 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.

VIEW TO SHOW BOTH SENSORS.
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. DO NOT WELD AFTER FIXTURE IS REMOVED. The 4 screws holding the pads to the fixture and the 1 center screw may be discarded. DO NOT USE THE FOUR 1 INCH LONG SCREWS TO ASSEMBLE SENSOR. The sensor kit contains four ¼ 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

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