

**N400 Tonnage Monitor
Operation Manual
For Model N404**



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Revision A

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HANDLING OF TONNAGE MONITORS

This Load Monitor contains numerous CMOS devices, which can be damaged by electrostatic discharge (ESD). The following precautions MUST be taken to protect against any damaging effects due to ESD:

1. Once the monitor is removed from its metal enclosure, it is vulnerable to ESD damage. Subsequently, anytime the monitor (or subassembly such as keyboard, control P.C. or chassis) is handled outside of its enclosure, (whether removing or installing) the technician must be grounded properly, using a static protective wrist strap. If a wrist strap is not available, grounding can be accomplished by continuously touching a ground source (i.e. press frame, water pipe, etc.).
2. Anti-Static bags or containers must always be used for any transport of a monitor, whether in plant or out of plant. (Including subassemblies also.)
3. All storage of monitors when not in regular metal enclosure, (including subassemblies), must be in anti-static bags or containers.
4. In the event anti-static bags or containers are not available, aluminum foil may be used as an adequate substitute. The aluminum foil must completely cover the monitor, leaving no uncovered holes or gaps.
5. We recommend the use of 3M Velostat products (wrist straps, anti-static bags, containers, and mats.) Additional information on these products is available from Toledo Transducers on request.

INSTRUMENT IDENTIFICATION

Name _____

Model No. _____

Serial No. _____

Date Shipped _____

Company: _____
(name)

(street address)

(city - state - zip)

(telephone number)

Purchase Order No. _____

Invoice No. _____

LIMITED WARRANTY

The products of Toledo Transducers, Inc. are warranted by the manufacturer to be free from defects in workmanship and material 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 shall be returned F.O.B., Toledo Transducers, Inc., 6834 Spring Valley Drive, Holland, Ohio 43528, 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 AND 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 hereunder and 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.

This warranty is subject to installation and operating conditions as described in the accompanying manual.

Any unauthorized repair voids this warranty.

There are no warranties, which extend beyond those expressly set forth hereinabove.

N404 ENCLOSURE MOUNTING DIMENSIONS

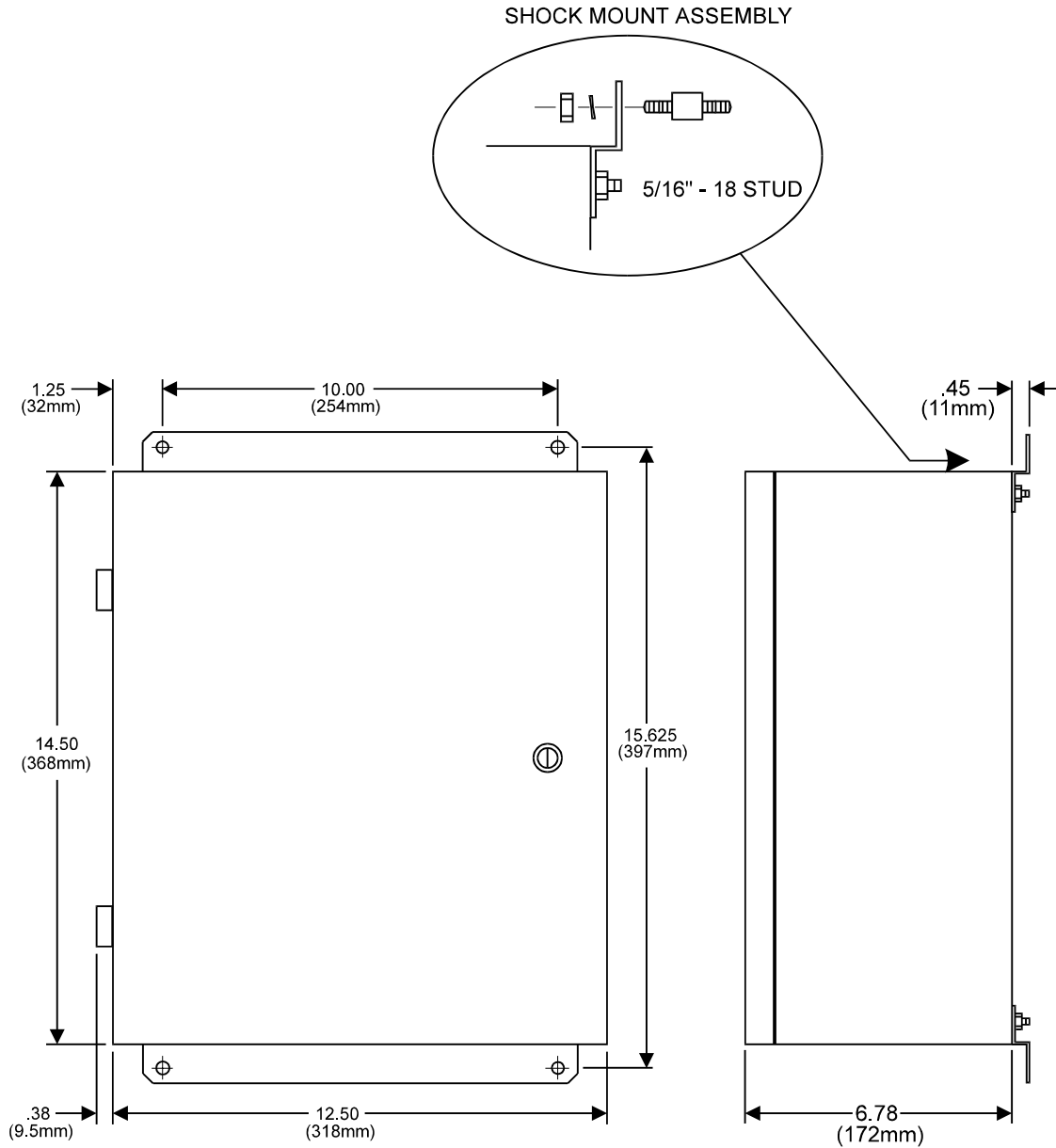


FIGURE 1

N404 FLUSH-MOUNT MOUNTING DIMENSIONS

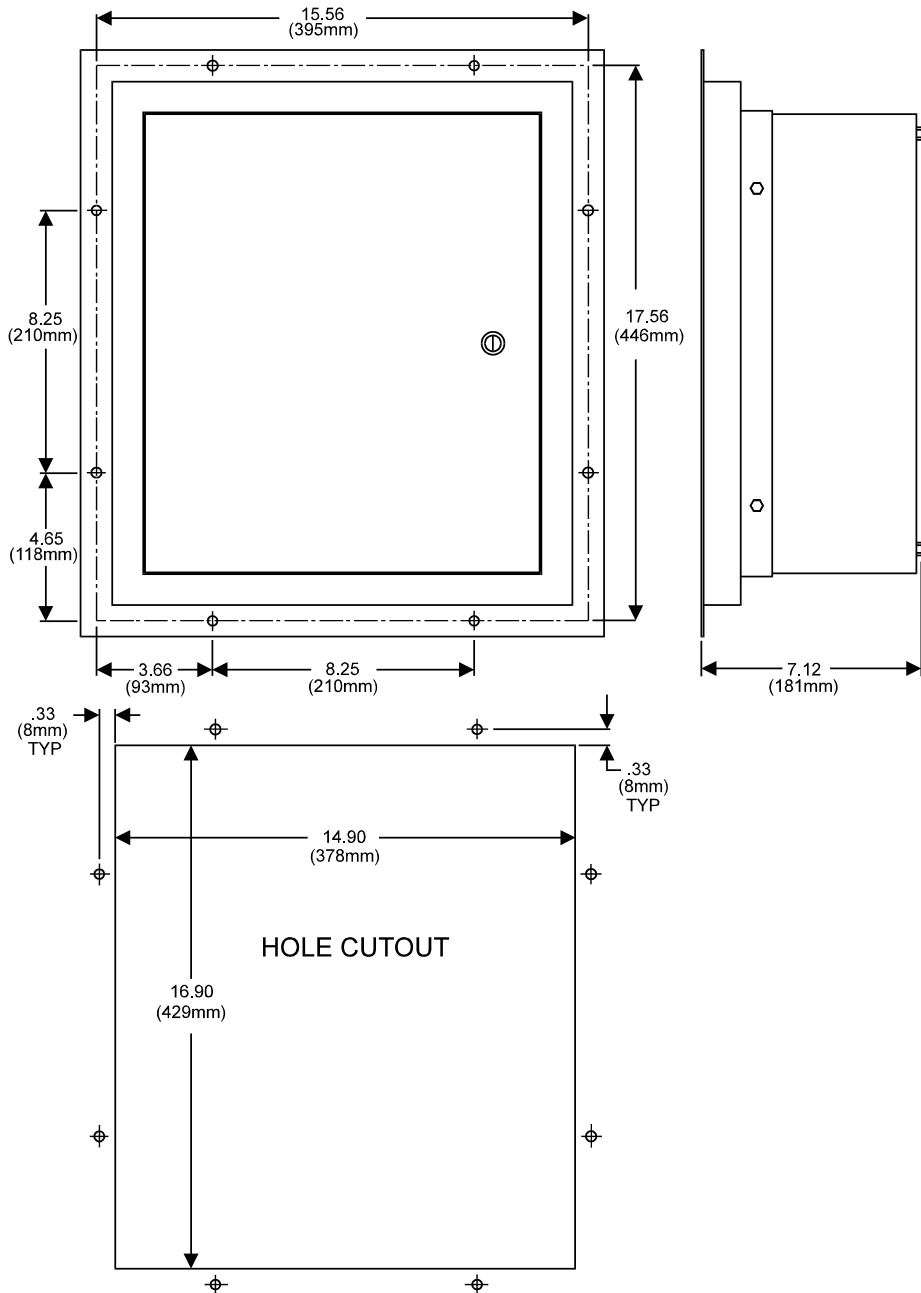
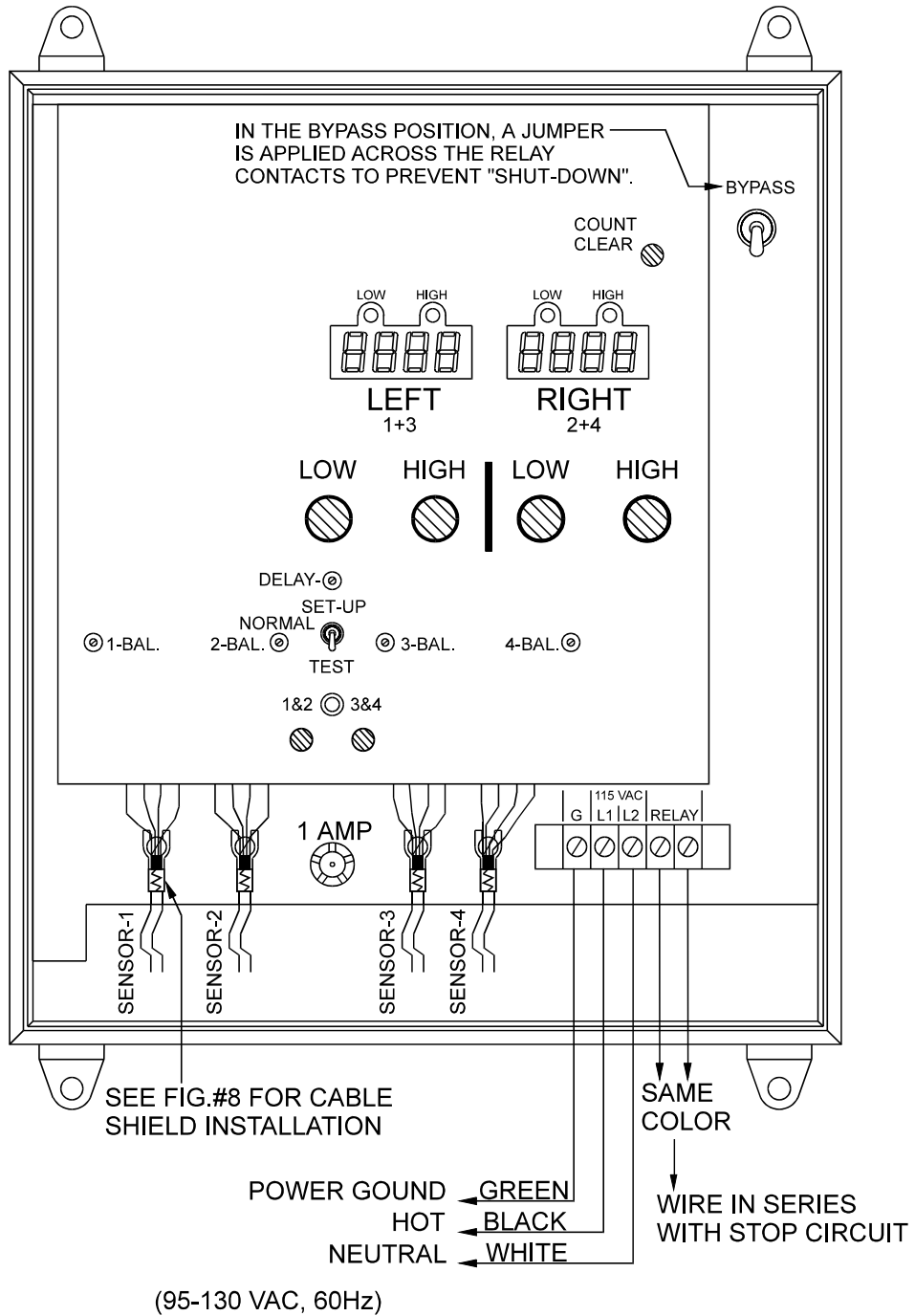


FIGURE 2

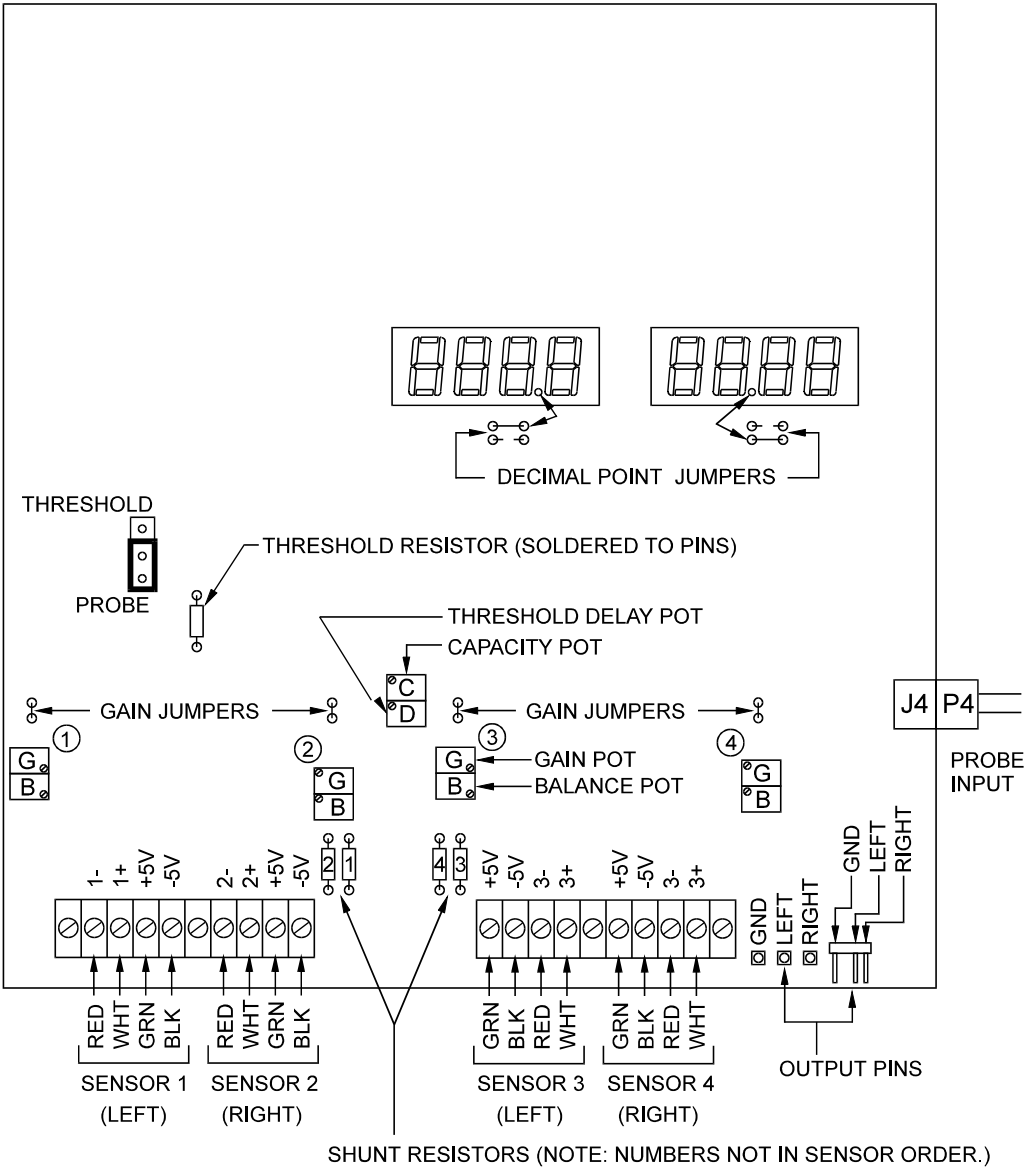
N404 POWER WIRING

FIGURE NO. 3



N404 CIRCUIT BOARD

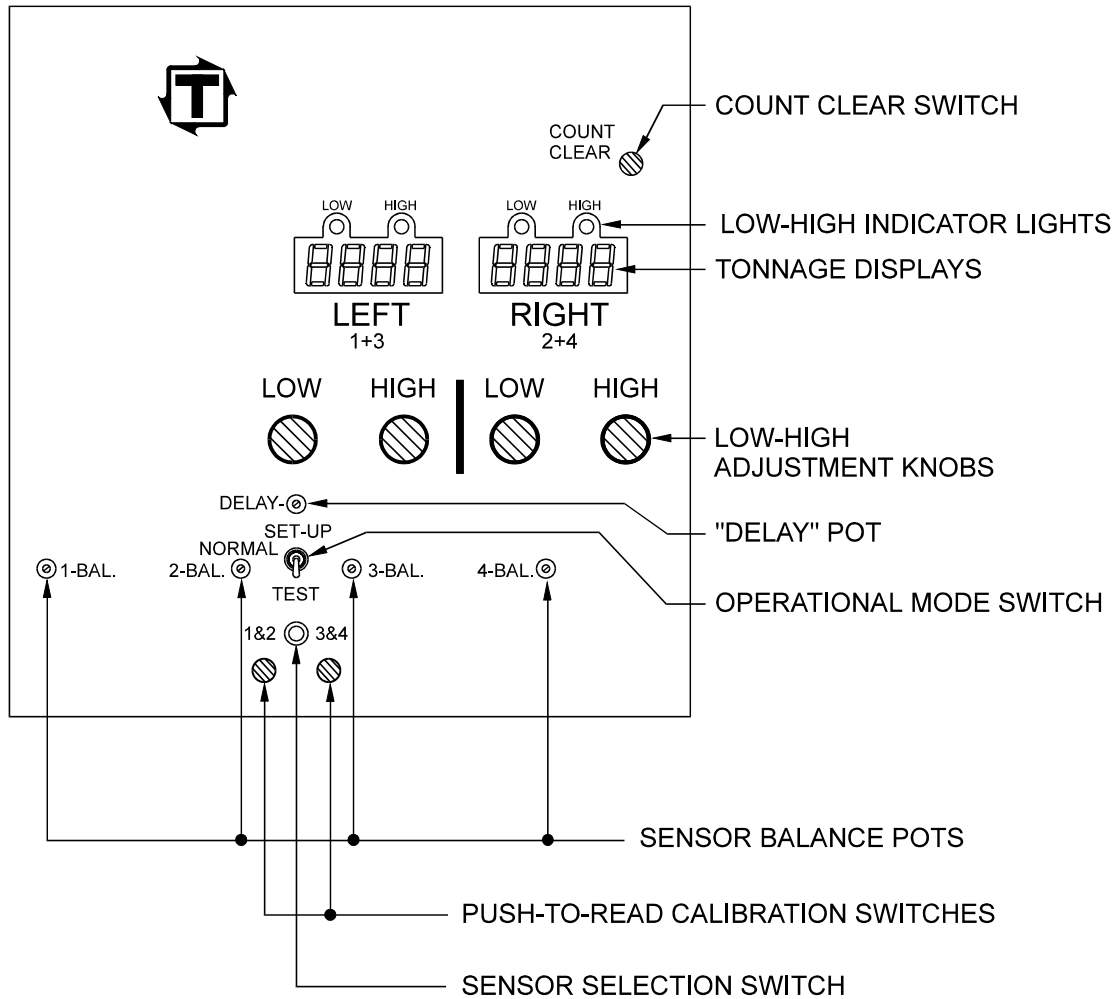
FIGURE NO. 4



NOTE: REVERSE RED & WHITE WIRES IF SENSOR IS IN COMPRESSION DURING OPERATION.

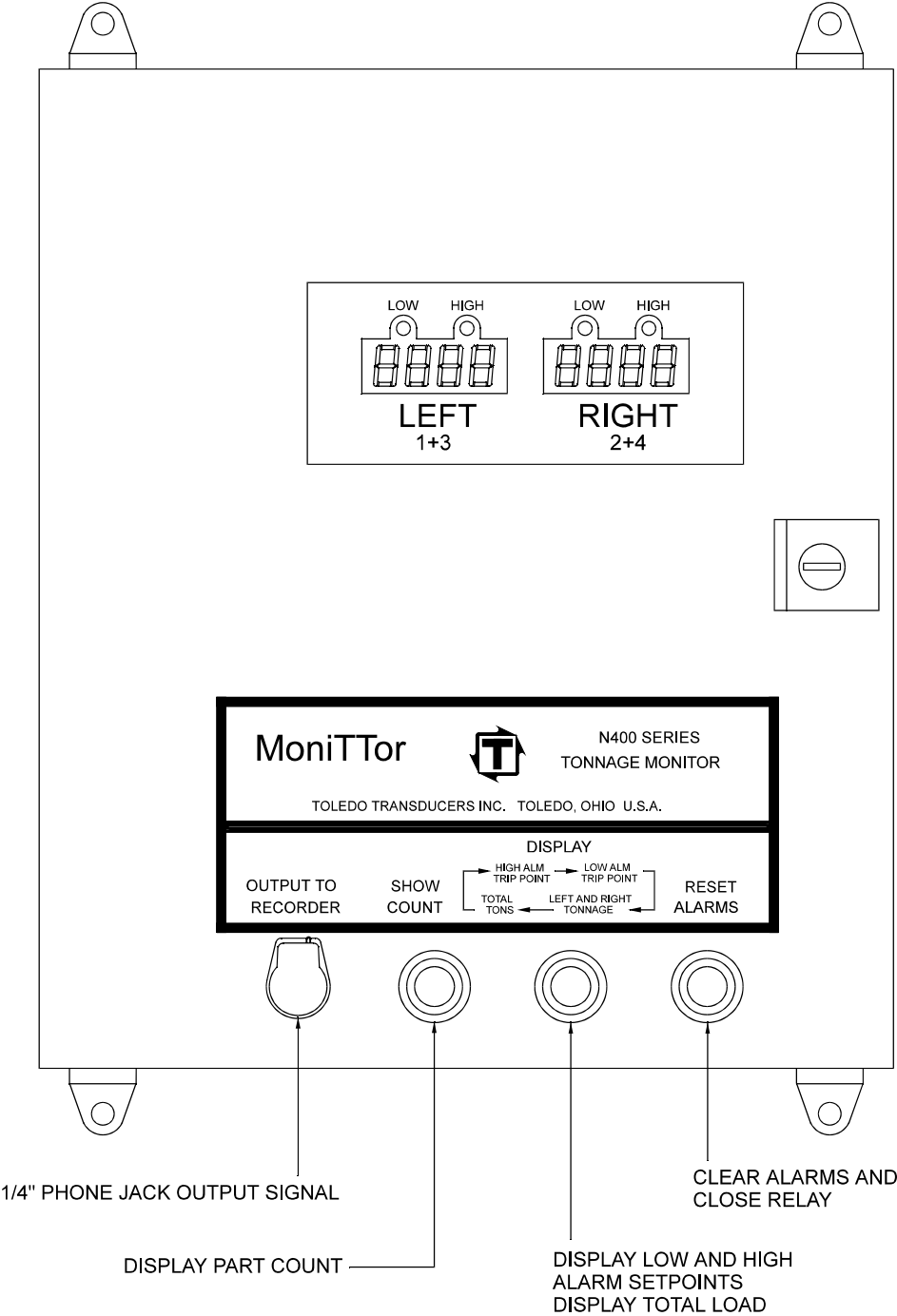
N404 FRONT PANEL

FIGURE NO. 5



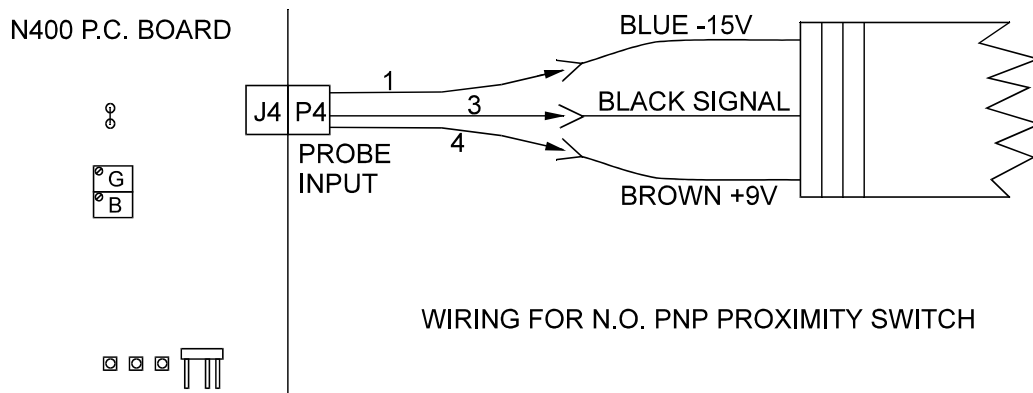
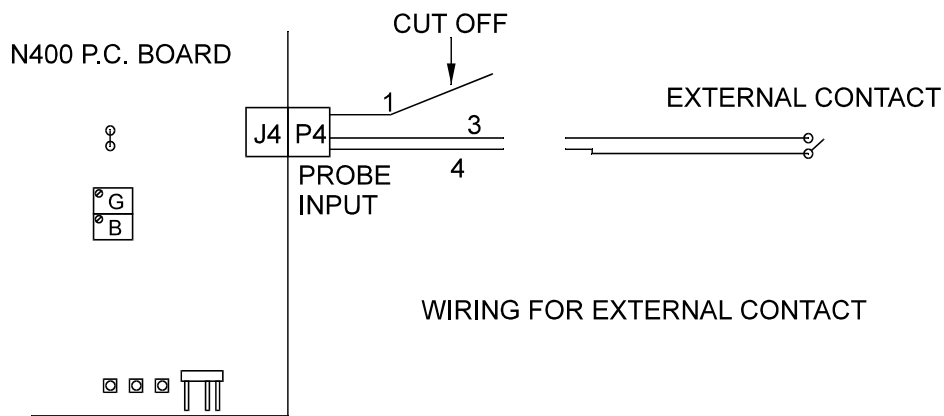
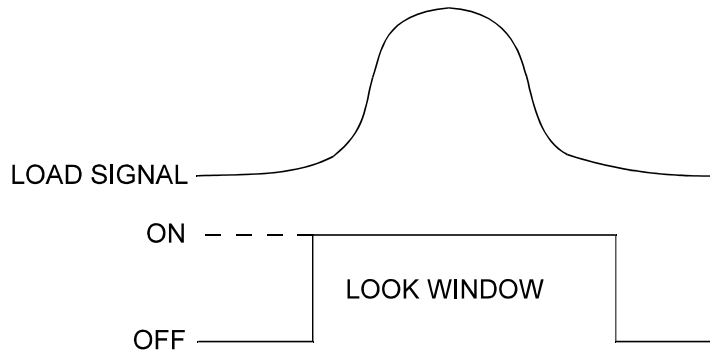
N404 EXTERNAL CONTROLS

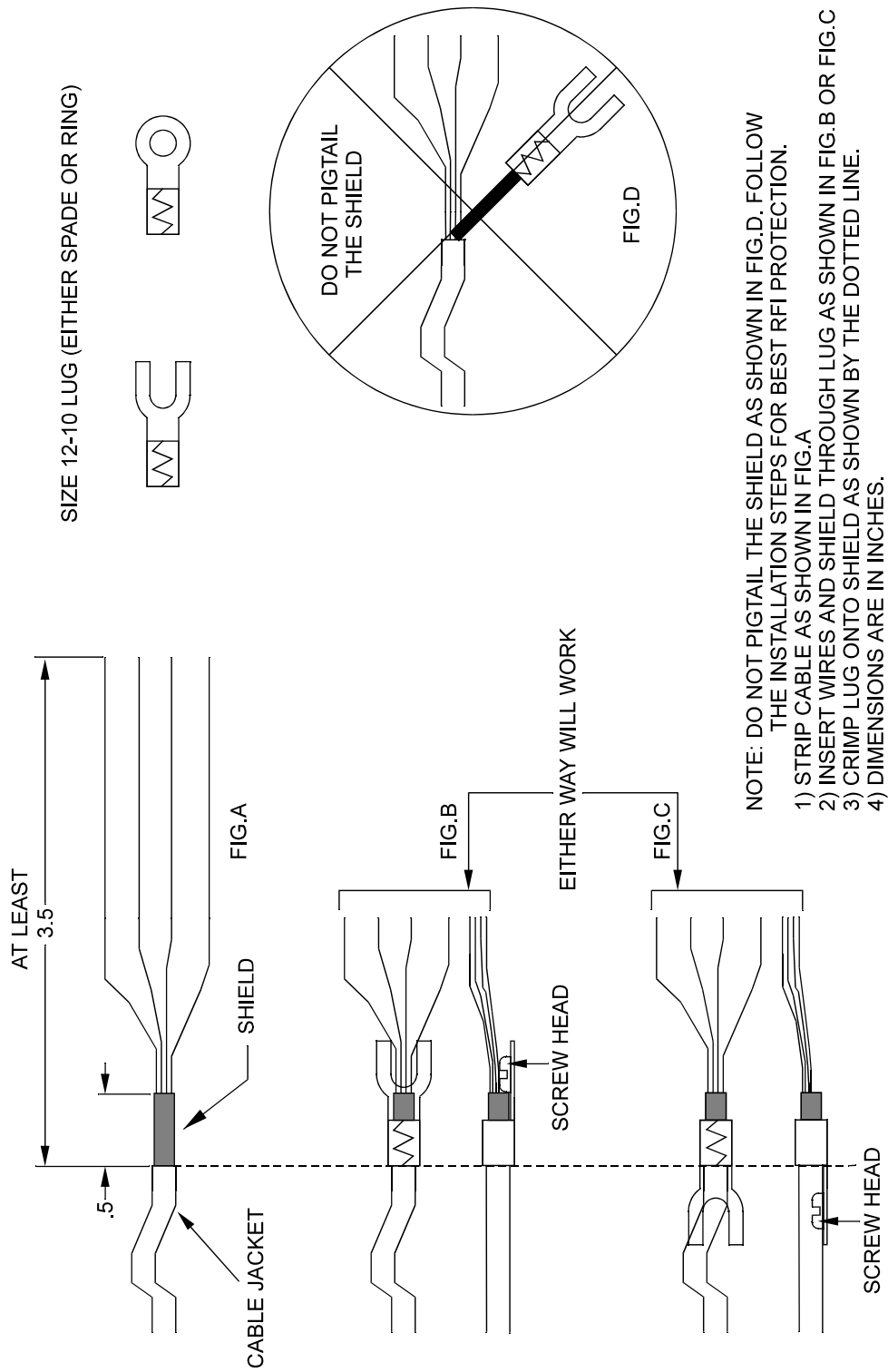
FIGURE NO. 6



Probe Connections

FIGURE NO. 7





NOTE: DO NOT PIGTAIL THE SHIELD AS SHOWN IN FIG.D. FOLLOW THE INSTALLATION STEPS FOR BEST RFI PROTECTION.

- 1) STRIP CABLE AS SHOWN IN FIG.A
- 2) INSERT WIRES AND SHIELD THROUGH LUG AS SHOWN IN FIG.B OR FIG.C
- 3) CRIMP LUG ONTO SHIELD AS SHOWN BY THE DOTTED LINE.
- 4) DIMENSIONS ARE IN INCHES.

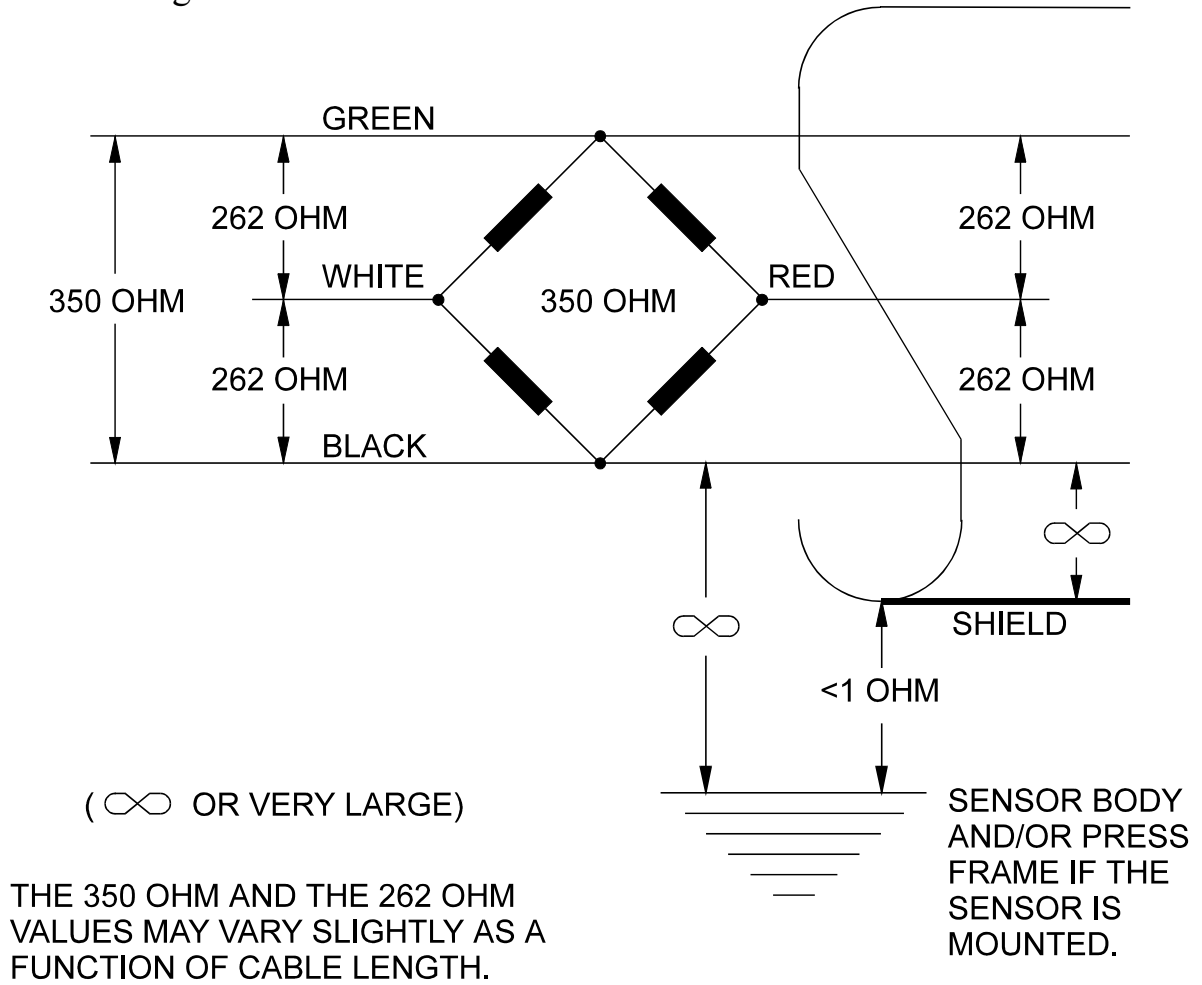
SENSOR CABLE SHIELD INSTALLATION

FIGURE NO. 8

T400 Load Sensor Electrical Characteristics

To determine if a T400 Load Sensor circuit is not open, shorted or grounded, disconnect the free end and test the leads and the shield for resistance. The values should be as shown below.

Figure No. 9



1. N404 "Load Monitor" -General Description.

The standard Model N404 "Load Monitor" has been specifically designed to monitor stamping press loads that are nominally greater than 7% (see section 2.10) of press capacity. However it is equally applicable to any machine which develops intermittent loads.

The N404 is packaged in a durable universal mounting enclosure. Four shock mounts are included with each monitor. The enclosure is painted beige. For standard mounting dimensions, see figure No. 1. For flush-mount or panel mounting dimensions, see figure No. 2.

The power requirement is 115 VAC, 60 Hz. Voltage tolerance is 105 to 125 VAC. See figure No. 3 for proper wiring. A power ground wire must be connected as shown.

See figure No. 4 for proper sensor wiring.

The N404 has two 4-digit displays, one for the left side and one for the right side of the press. Decimal points can be displayed in one of two positions. See figure No. 4. The two LEFT sensors are numbered 1 and 3. The two RIGHT sensors are numbered 2 and 4. The LEFT display shows the sum of sensors 1 and 3. The RIGHT display shows the sum of sensors 2 and 4.

The maximum press speed that the N404 can monitor is 1500 strokes per minute. The monitor checks each stroke and will shut down for an out-of-tolerance load and will display that load even if the press can not be stopped before the next stroke. The monitor updates the display twice per second for easy readability.

Each display has a LOW and a HIGH set-point (or limit control). Each display has a LOW and a HIGH indicator light. The appropriate light is turned on when a load is either too low or too high.

The N404 has two operational modes, "NORMAL" and "SET-UP", and one "TEST" mode. See figure No. 5.

In the "NORMAL" mode, the monitor measures the LEFT and RIGHT tonnage of every press stroke, and displays these values twice per second. If an out-of-tolerance occurs, the monitor relay opens, the tonnage values for that stroke are displayed and the appropriate LOW/HIGH indicator light is turned on. To restart the system, the "RESET" switch button must be pushed.

In the "SET-UP" mode the monitor continues to display tonnage values twice per second whether or not the values are out-of-tolerance. If, however, a LOW and or HIGH indicator light comes on, it will remain on until RESET.

A switch on the outside of the enclosure allows the set-point values to be displayed and it also allows the monitor to continuously display the TOTAL press tonnage. If, however, an out-of-tolerance load occurs it will show the LEFT and RIGHT values when in the NORMAL mode and just turn on the indicator lights in the SET-UP mode.

The N404 has a "TEST" mode, which is used for calibration purposes. In the "TEST" condition the individual sensors can be balanced and the amplifier gain checked.

The relay opens in 10 to 15 milliseconds.

2. Functional Description

2.1 Sensors

The Toledo Transducers T400 Load Sensors have an input resistance of 350 ohms. The N404 is designed to accept four T400's, one per press corner.

Sensor-Monitor connections depend upon whether or not the sensor sees tension or compression during the press load cycle. See chart below and figure No. 4.

	<u>Tension</u>	<u>Compression</u>
+ power	green	green
- power	black	black
+ signal	white	red
- signal	red	white

The sensor power is 10 VDC. (+/- 5 VDC).

Run sensor cables in steel conduit, free of all other kinds of electrical wires.

2.2. The Signal

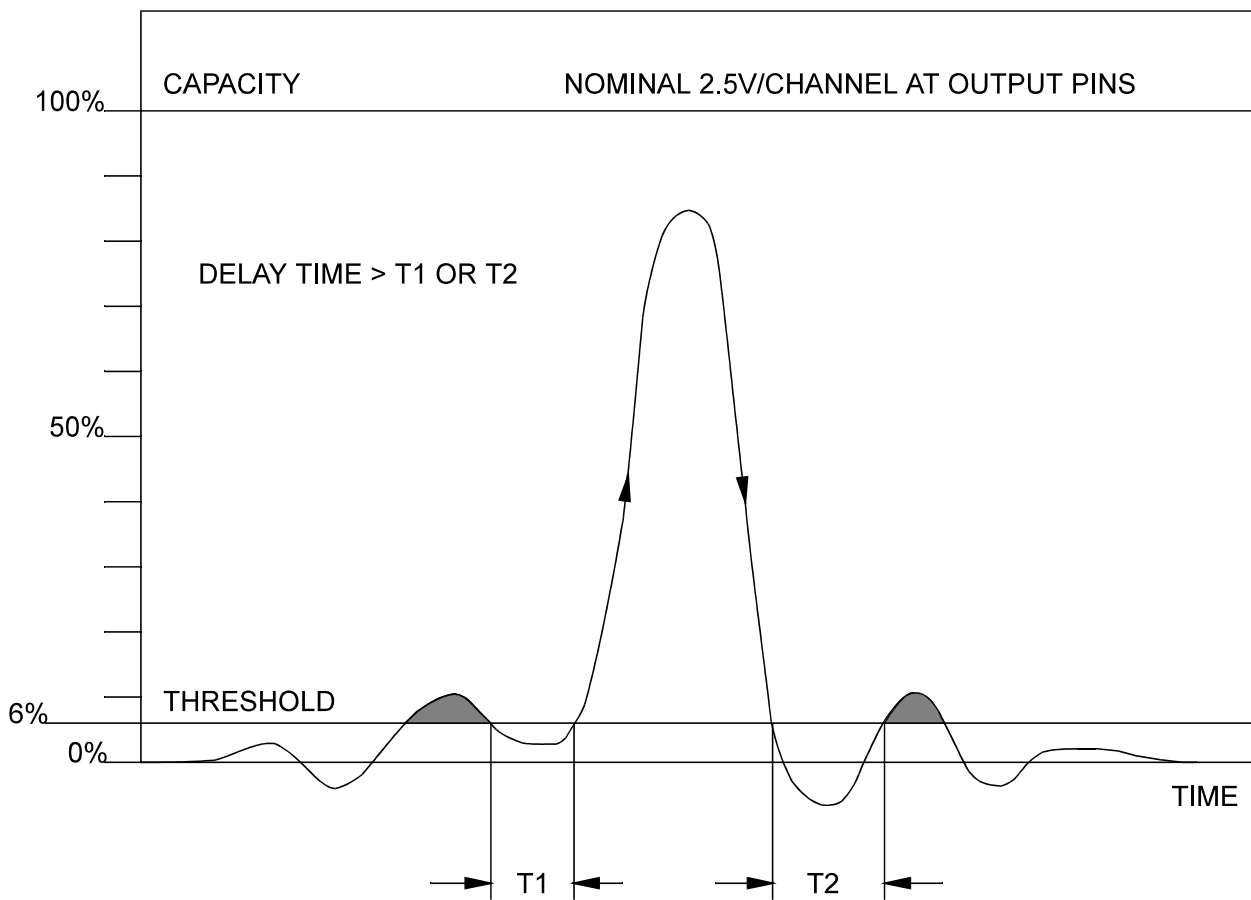
Press capacity is evenly split between the LEFT and RIGHT display channels. The monitor has a threshold of 6% of capacity. (See section 2.10) The sum of the LEFT and RIGHT signals must exceed this threshold for at least 0.001 seconds before load monitoring occurs. This is to prevent electrical noise generated signals from being monitored.

There will probably be a sensor voltage output during a no-load press condition. To counteract this, the N404 has an "auto zero" circuit which functions when the signal is less than threshold. This action is slow because the sensor no-load output change is slow.

Both the LEFT and RIGHT side have a peak signal storage circuit. When the first signal crosses the threshold the storage circuits are reset so as to "catch" and store the peaks of the then occurring load signals.

As the press load decreases a threshold delay timer starts when the last signal crosses the threshold. (See section 2.10) This delay time is set to be larger than any time that a signal irregularity exists below threshold. This prevents multiple updates due to small portions of the signal that may appear as separate signals. See figure No. 10 below.
PATENT NO. 4445093

FIGURE NO.10



2.3. Decimal Point

See figure No. 4. Read section 2.5. "Capacity".

If the application is known, the monitor will be shipped with the proper decimal point.

If the application is unknown, the monitor will be shipped with 2 decimal point jumpers per display. The decimal point desired can then be set by cutting the proper jumper. Cutting both jumpers eliminates the decimal point. Use only one cut, in case the jumper must be used again, thus making soldering together an easy task.

2.4. "Power Up"

When the monitor power is applied:

If the monitor is initially in TEST mode or if it is in NORMAL or SET-UP mode and the no-load signals are greater than 3% of capacity the relay contacts will stay open and therefore the press will not operate.

Due to installation, a sensor can have a (+) or (-) signal when there is no load on the press, called "no-load" signal.

If the monitor is in NORMAL or SET-UP mode all display digits will be "8" and all high/low indicator lights will light up for a minimum of about 5 seconds and until all no-load signals are auto-zeroed to within 3% of capacity. It is suggested to wait 10 seconds after the indicator lights go out before starting the press.

This is to allow the monitor to auto-zero nearer zero, otherwise the small portion not yet auto-zeroed may caused the relay to open on a signal that is almost equal to a set-point value.

If the monitor is in TEST mode the no-load signal values will be displayed. If the signal is above 150% of capacity HHHH will be displayed. If the signal is below a number of -999 or below -150% of capacity, LLLL will be displayed.

The HHHH and LLLL will change to numbers by adjusting the BALance pot.

All functions (such as adjusting the set-points, capacity, and time delay) can be performed as soon as power is applied.

If in NORMAL or SET-UP mode, once the auto-zeroed signals are within 3% of capacity the relay contacts will close and the press can now run. The left digit of each display goes blank and all other digits become "0". If in TEST mode the relay contacts will not close ---- a mode change, to either NORMAL or SET-UP, is required to close them.

When changing from "NORMAL" mode to "SET-UP" mode, be sure to clear any alarms by pressing "RESET". Failure to do so will result in tonnage readings, which appear to decay on each successive press stroke.

2.5. Capacity

The maximum total numerical capacity which the N404 can monitor is 6000 (or 600.0, or 60.00). This is 3000 (or 300.0, or 30.00) per press side. This allows the displaying of loads which may exceed capacity.

A table of the available capacities is shown on the following page. The selection of a decimal point allows for a wide selection of capacities with excellent resolution. See figure No. 4 for decimal point selection.

The reason that the capacity steps are in increments of 50 is to make the monitor independent of temperature.

If there is a press whose capacity is not listed, calibrate to an adjacent value. The HIGH set-point cannot exceed the capacity chosen.

The capacity per side is divided internally into 2048 parts. If the capacity per side is 2048 digits or less, the load values displayed will change by 1's. If the capacity is greater than 2048 digits the values will change by 1's or 2's depending upon where the arithmetic is internally.

By holding in the RESET button the capacity is displayed in the RIGHT display. The capacity is set by holding in the RESET button, turning the capacity pot until the desired capacity is displayed, and the indicator lights come on.

The capacity can be checked at any time by holding in the RESET button. However during this brief time the N404 is not monitoring the loads.

AVAILABLE CAPACITIES

.50	20.50	40.50	5.0	205.0	405.0	50	2050	4050
1.00	21.00	41.00	10.0	210.0	410.0	100	2100	4100
1.50	21.50	41.50	15.0	215.0	415.0	150	2150	4150
2.00	22.00	42.00	20.0	220.0	420.0	200	2200	4200
2.50	22.50	42.50	25.0	225.0	425.0	250	2250	4250
3.00	23.00	43.00	30.0	230.0	430.0	300	2300	4300
3.50	23.50	43.50	35.0	235.0	435.0	350	2350	4350
4.00	24.00	44.00	40.0	240.0	440.0	400	2400	4400
4.50	24.50	44.50	45.0	245.0	445.0	450	2450	4450
5.00	25.00	45.00	50.0	250.0	450.0	500	2500	4500
5.50	25.50	45.50	55.0	255.0	455.0	550	2550	4550
6.00	26.00	46.00	60.0	260.0	460.0	600	2600	4600
6.50	26.50	46.50	65.0	265.0	465.0	650	2650	4650
7.00	27.00	47.00	70.0	270.0	470.0	700	2700	4700
7.50	27.50	47.50	75.0	275.0	475.0	750	2750	4750
8.00	28.00	48.00	80.0	280.0	480.0	800	2800	4800
8.50	28.50	48.50	85.0	285.0	485.0	850	2850	4850
9.00	29.00	49.00	90.0	290.0	490.0	900	2900	4900
9.50	29.50	49.50	95.0	295.0	495.0	950	2950	4950
10.00	30.00	50.00	100.0	300.0	500.0	1000	3000	5000
10.50	30.50	50.50	105.0	305.0	505.0	1050	3050	5050
11.00	31.00	51.00	110.0	310.0	510.0	1100	3100	5100
11.50	31.50	51.50	115.0	315.0	515.0	1150	3150	5150
12.00	32.00	52.00	120.0	320.0	520.0	1200	3200	5200
12.50	32.50	52.50	125.0	325.0	525.0	1250	3250	5250
13.00	33.00	53.00	130.0	330.0	530.0	1300	3300	5300
13.50	33.50	53.50	135.0	335.0	535.0	1350	3350	5350
14.00	34.00	54.00	140.0	340.0	540.0	1400	3400	5400
14.50	34.50	54.50	145.0	345.0	545.0	1450	3450	5450
15.00	35.00	55.00	150.0	350.0	550.0	1500	3500	5500
15.50	35.50	55.50	155.0	355.0	555.0	1550	3550	5550
16.00	36.00	56.00	160.0	360.0	560.0	1600	3600	5600
16.50	36.50	56.50	165.0	365.0	565.0	1650	3650	5650
17.00	37.00	57.00	170.0	370.0	570.0	1700	3700	5700
17.50	37.50	57.50	175.0	375.0	575.0	1750	3750	5750
18.00	38.00	58.00	180.0	380.0	580.0	1800	3800	5800
18.50	38.50	58.50	185.0	385.0	585.0	1850	3850	5850
19.00	39.00	59.00	190.0	390.0	590.0	1900	3900	5900
19.50	39.50	59.50	195.0	395.0	595.0	1950	3950	5950
20.00	40.00	60.00	200.0	400.0	600.0	2000	4000	6000

2.6 External Controls (front of enclosure).

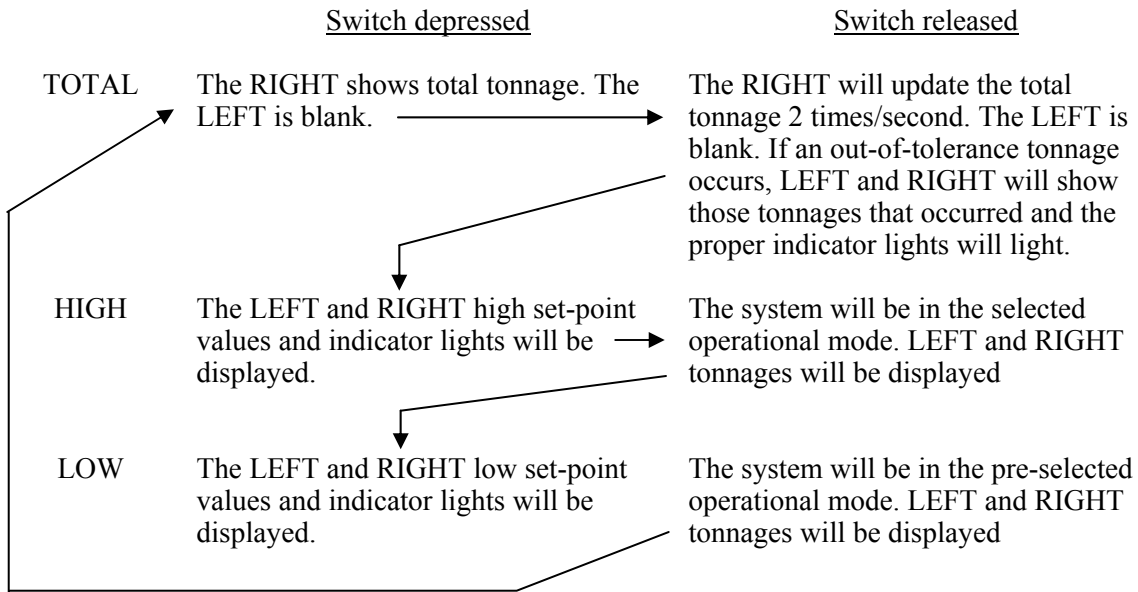
Refer to Figure No. 6

The output jack accepts a standard 1/4" stereo phone plug for attaching a scope or chart recorder. The signal level is 2.5 volts = capacity. The jack tip is the left channel, the middle ring is right, and the body is ground.

To display the count, press the COUNT pushbutton. To clear the count to zero, open the cabinet and push the COUNT CLEAR button. DO NOT CLEAR THE COUNT WHILE THE PRESS IS RUNNING.

Depressing the RESET switch turns off the indicator lights, closes the relay contacts and readies the system for another load stroke. If held in the RIGHT displays capacity and LEFT displays the delay time. Monitor will not update while RESET switch is depressed. Successive depressions of the TOTAL-HIGH-LOW switch follows the cyclic conditions shown below.

THE RESET TAKES OVER IF BOTH SWITCHES ARE DEPRESSED.



When in NORMAL mode and if while depressing the TOTAL-HIGH-LOW switch an out-of-tolerance load occurs the relay will open. Upon release, the indicator light will light and the tonnage value will be displayed. This will not happen in the SET-UP mode because the choice was made that the press is to continue running.

2.7. Sensor Balance, Gain (amplification) and Shunt Resistors

This discussion applies only to the TEST mode of operation.

Gain adjustments require the front panel to be removed.

Refer to figure No.'s 4 and 5.

The "Sensor Selection Switch" is used to see the individual sensors as shown below:

Sensor Selection Switch (SSS) position	LEFT Display	RIGHT Display
← (left)	Sensor 1	Sensor 2
(right) →	Sensor 3	Sensor 4

The SSS is a momentary switch and must be held in position to balance or adjust sensor gain. The switch is momentary to make sure that it is in the center when the system is being used.

Balance

To minimize the amount of "auto-zeroing" requires that each sensor's no-load signal be brought to zero via its balance pot. The balance pots are marked "BAL" on the front panel and "B" on the pots. To adjust the balance, put the monitor in the TEST mode then turn the balance pots until the displays read "0", or near zero. Do this for each sensor.

Gain and Shunts

Press calibration means adjusting the monitor gain until each display displays the correct tonnage. After this is done a reference voltage is displayed and this value is called the "calibration" or "test" number. Gain can therefore be re-established via the "test" number.

The reference voltage is obtained by paralleling a portion of the sensor with a precision resistor ("shunt"). This is done by pushing the "push-to-read" calibration switch shown in figure No. 5. The shunt resistors are shown on figure No. 4. It causes the sensor to produce a constant reference voltage. The value displayed depends upon the sensor gain. When the gain is correct the value is called the "TEST" number. The TEST number can be used to reestablish the correct gain. Also called calibration numbers.

To adjust the gain the front panel must be removed. Check capacity. Put monitor in TEST mode. Adjust the balance to zero (the pot is marked "B"). Push the calibration switch and while holding it in adjust the gain pot (has "G" on it) to the "test" number.

The TEST number = shunted value - no-load value.

Example: no-load value = -5
 shunt value = 198

difference = 198 - (-5) = 203 = test number.

The method of checking system calibration is as follows:

1. Stop the press in an unloaded condition.
2. Check capacity by depressing the RESET button.
3. Put in TEST mode.
4. Either balance each sensor to zero or record the values seen.
5. While holding the "Sensor Selection Switch" in the desired position (left or right), push the appropriate "Push-to-Read" shunt switch (left or right --- See figure No. 5. This can be done with one hand.

If the TEST number is wrong the front panel must be removed and the gain pot adjusted (while holding the 2 above switches) until the proper TEST number is displayed. The gain pots have a "G" on them.

(The gain pots should have been sealed after initial calibration --- paint on pot stem.)

The basic monitor is in a high gain condition because the signals obtained from most rigid presses are low. If the signal is large, greater resolution in the gain pot setting can be obtained by reducing the gain range. This can be done by cutting the high gain jumper (this reduces the gain by a factor of 5). See figure No. 4 for the jumper position. Only one cut is needed ---- separate the wires.

The N404 is shipped with 768,000 ohm shunt resistors in the circuit board. These resistors should cover almost all applications. The resistors are inserted into small sockets to make it easy to change the shunt value if necessary. If the test number is equal to or greater than 200 (20.0 or 2.00) the gain can be reset to an accuracy of 99.5% of capacity or better. If greater accuracy is required a smaller shunt value may be needed (255,000 ohms).

N402/N404 Gain Ranges

Below is a section of the N402/N404 P.C. board parts layout showing schematic part numbers.

The standard N402 and N404 amplifier gain range is for press capacity inputs of 0.028 mv/v to 0.73 mv/v. This satisfies most stamping presses. If the capacity signal is between 0.122 mv/v and 0.73 mv/v, greater pot resolution can be obtained by cutting jumpers 7 and 8 for the N402, and jumpers 7, 8, 9 and 10 for the N404.

If the capacity signal is greater than 0.73 mv/v the gain range must be reduced. By removing resistors R79 and R80 the gain is halved, thus allowing capacity signal values up to 1.46 mv/v.

Do not remove R40 and R41.

(The resistors can be removed by cutting one resistor lead and lifting that end of the resistor away from the board.)

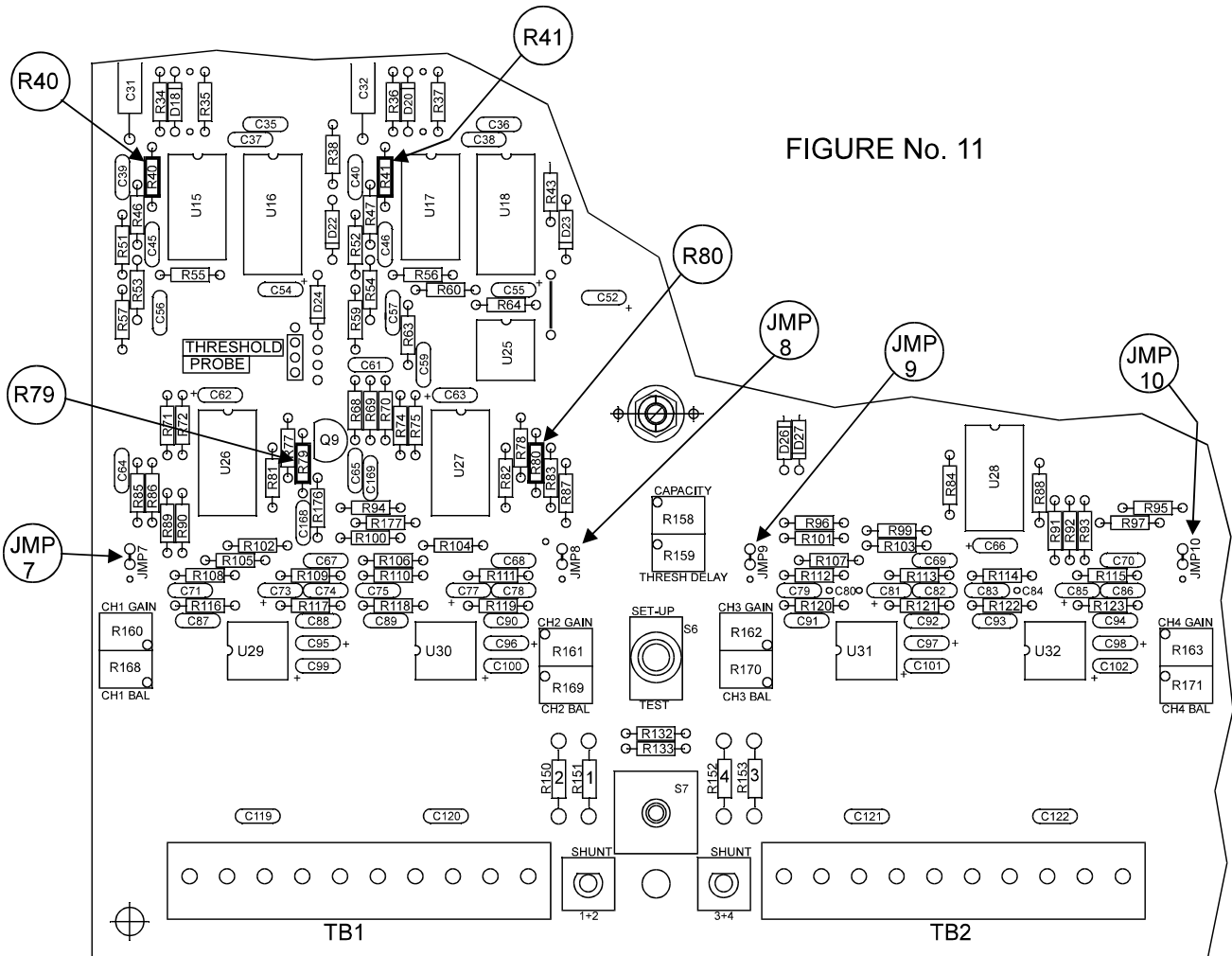


FIGURE No. 11

2.8. LOW and HIGH Set-Points.

Each side, LEFT and RIGHT, has a LOW and a HIGH set-point control.

The 4 digit display (0 to 9999) and the high signal resolution (of up to 2048 parts) allow the setting of precise LOW and HIGH set-points, thus providing excellent control over the in-tolerance or "quality" window.

The set-points are determined by pushing the TOTAL-HIGH-LOW switch until the desire (LOW or HIGH) indicator light comes on and holding it while adjusting the proper (LOW or HIGH) set-point pot to the desired value as indicated by the display.

Within 0.001 second after a valid signal exceeds the high set-point the relay will be told to open. The relay will then take between 0.010 and 0.015 seconds to open. Therefore the relay should be wired in series with the press top-stop circuit.

If the signal doesn't exceed the low set-point the monitor tells the relay to open after the signal drops below the threshold and the delay time(s) have run out.

However, if the low set-point is set to 0, (below .7% of capacity), the monitor will not alarm due to that low set-point under any condition.

In each case the displays are updated after the signal drops below the threshold and the delay time(s) have run out.

2.9 Triggering the Monitor

The N404 can be "triggered" or activated to monitor the load signal by one of three ways:

- 1) On the basis of a threshold or minimum value (6% of capacity). When the load signal is above this value the instrument measures it. When it is below the value the instrument ignores it. The threshold - probe switch must be in the threshold position. (See figure No. 4)

6% Threshold

The standard 6% threshold requires a 499 ohm resistor. (See section 2.2.)

Other values, if needed, are:

<u>Threshold</u> % of capacity	<u>Resistance</u> ohms
6%	499 ohms
8	665
10	825
12	1000
14.5	1210

Facts concerning the threshold:

- A) A signal crossing the threshold resets the peak hold circuits.
 - B) A signal is considered valid only if it stays above threshold longer than 0.001 seconds. (This is why the standard minimum monitoring tonnage is about 7% of capacity.)
 - C) Delay time starts after the signal recrosses the threshold.
 - D) The tonnage is displayed only after the signal recrosses the threshold and the delay time(s) are completed.
 - E) The auto-zero time constant is 10 seconds.
- 2) On the closing of an external contact. The N404 only measures the load signal during the time this contact is closed. P4 pins 3 and 4 are the input for this external contact. The threshold-probe switch must be in the probe position. (See figure 4 and 7).
- 3) On the operation of a normally open DC PNP proximity switch. The N404 only measures the load signal when the proximity switch is on. P4 pins 1, 3 and 4 are the input for the proximity device. The threshold-probe switch must be in the probe position. (See figure 4 and figure 7).

2.10. (Threshold) Delay Time

The (threshold) delay time is adjusted by pushing and holding in the RESET switch and turning the delay pot (See figure No. 5). The lowest time is 5 milliseconds (0.005 seconds) and the maximum time is 1250 milliseconds (1.250 seconds). The time is displayed in the LEFT display. The time increments in 5 millisecond steps.

2.11. Bypass

The Bypass switch (figure No. 3) must only be used to electrically disconnect the monitor from the press in case the monitor malfunctions.

To have the monitor and press function independently of each other use the SET-UP mode.

2.12 Reverse Load Option

Reverse Load is the “snap through” or damaging negative forces occurring in the machine. Typically, the snap through rating is 10% of the capacity of the press rating. If your tonnage is over 10 %, press damage may occur.
(Example: A 400 ton press should not exceed -40 tons in reverse load.)

To use the Reverse Load option, press the SHOW COUNT button once and hold it in. This button is located on the front of the monitor. Cycle the press. The value displayed is the Reverse Load.

(Note: When using the Reverse Load option HIGH and LOW limits are not active.)

(Reverse Load is a custom option. If you only receive count readings when attempting to use this option, then you need your N400 series monitor updated. Your reverse loading update will require new parts and a new ROM program. You can call us at Toledo Transducers for the details of this modification.)

3. Installation

3.1. Sensors

If Toledo Transducers has not determined the location of the sensors on the press and there is uncertainty please call Toledo Transducers for assistance.

It is assumed that the method of attaching, weld or drill and tap, has been determined and that the proper hardware has been delivered. Please follow the assembly instructions received with the sensors.

Run all sensor cables in steel conduit. The conduit should not contain any other wires.

Do not run sensor wires through control cabinets containing any AC wires. Sensor cables must be at least 10 inches from all parallel high power AC wires.

If the sensor goes into compression when the press operates, reverse the white and red wires at the monitor terminals.

If for some reason only one sensor is used, short cut the vacant signal terminals (red, white) to the shield terminal with short jumpers. Do not jumper the power terminals -- green, black. (See figure No. 4.)

3.2. Monitor

It is recommended that the monitor be mounted to a surface that does not experience vibration or shock loads. Use the shock absorbers provided, especially if the monitor is mounted on the press.

The fuse is used as a switch. Remove it until the system is ready to operate.

See figure No. 3 for power information.

The relay contacts close with power "on". In the NORMAL mode of operation they open when an out-of-tolerance load occurs. The RESET then closes them.

If the conduit doesn't ground the monitor enclosure, a ground cable should be installed. Remove the paint for a good electrical joint.

4. System Calibration

The capacity and the decimal point position must be determined. Remove the front panel. Cut the required decimal point jumpers.

Insert the fuse. The monitor should light up.

Adjust the capacity pot. See section 2.5. Seal the pot stem.

Balance the sensors in TEST mode.

Put in SET-UP mode.

Place the Auto-Cells in the press.

The SSS switch (Side Selector Switch) must be hand held in position to see the signal of two sensors. This means that separate press strokes are required to calibrate four sensors.

Strike the cells by single stroking the press. Between strokes lower the press ram and/or shim the cells so as to gradually increase the load equally on all cells to between 95% and 105% of press capacity. Adjust each gain pot until each sensor displays twice the tonnage that the load cells indicate each should have. If the gain is too large read page 23. "N402/N404 Gain Ranges".

Put the monitor in TEST mode. Rebalance each sensor.

Read and record each test number (calibration number).

Put in either NORMAL or SET-UP mode.

Put front panel back on. Remove cells.

System is now ready to operate.

If the "TEST" numbers are too small (under 200, 20.0 or 2.00), too large (over 150% of capacity) the shunt resistors need to be changed.

This "twice the tonnage" indication can be somewhat complicated. Once understood though, it can be a helpful tool in finding the tonnage on each corner. If you hold the SSS switch to one side and cycle the press, the true tonnage is half the value seen.

Example: Hold the switch to the left and cycle the press. The monitor then reads 50 on the left and 75 on the right for channels one and two. The true tonnage for corner one will be 25 for channel one and 37.5 for channel two. If you flip the switch to the right, then cycle the press and it read 50 on the left and 40 on the right for channel three and four. The true tonnage for channel three will be 25 and 20 for channel four.

Knowing this doubling effect can help you understand the process of the monitor.

5. Spare Parts

The only spare part recommended for stocking is the fuse:

1 amp.--- "Buss" --- AGCI

N400 Trouble Shooting

1.) 8888 on Display:

- a. Wait approximately 1 minute, if it continues check zero balance.
- b. To check zero balance, place mode switch in Test.

If N402, turn appropriate balance pot until 000 is achieved on both displays.

If N404, hold selector switch to left, then balance channels one and two. Hold selector switch to right and balance channel three and four.
- c. To check calibration numbers while in Test mode, depress black button(s) near selector switch for appropriate channels.
- d. Return mode switch back to Normal.

2.) Tonnage does not seem correct:

- a. Use steps above to check zero balance and calibration numbers.
- b. Calibration numbers, (or gain numbers) should be written on door panel. Each channel will have different calibration numbers.
- c. If calibration numbers are not correct, adjust each channel using the appropriate gain pot.

3.) Monitor does not update:

- a. Push reset (if no change) continue (next step).
- b. Check zero balance and gain numbers as in item 1. above, (b thru d.)
- c. If no change, turn high set-point pot down slowly (while press is running). If monitor alarms, it will show the value that triggered the alarm. That value should be your tonnage.

If that value is less than 6% of press capacity, the monitor will not display it.
- d. If monitor does not alarm, check for loose wires on terminal or damaged sensor wires. Check resistance of sensor.
- e. Your delay time may be too long (see item 6.b. - adjust threshold delay).

4.) When checking zero balance, (if you cannot balance sensor).

- a. Check for damaged sensor or cable.
- b. Check for short on terminal board, or loose wires.
- c. If all HHHH, turn pots counter-clockwise, if LLLL, turn clockwise (Bal.Pots).

5.) Monitor keeps alarming (High or Low)

- a. Check your set-points to make sure they are correct.
- b. Is your tonnage exceeding 100% of press capacity? If so, put selector switch in set-up and determine why you are running such high tonnages.

6.) Tonnage values erratic

- a. Check stock variation (thickness, etc.)
- b. Adjust threshold delay time:
 - b.1. To do this, hold in reset button. Delay time will appear on left display, capacity on right.

To adjust delay time use DELAY POT seen on front panel.

- b.2. If your press is running slow, Example - 10-12 spm, your delay time could be: Example - 500-1000 ms. The higher the speed of your press the less delay time.
 - b.2.1. Adjust delay time until tonnage values even out and become consistent. If the delay time is too long the monitor will not update. If this happens, turn back pot until updating begins again.
- c. Make sure selector switch is in NORMAL mode.

7.) Monitor does not shut down press after overload.

- a. Check monitor bypass switch, in the upper right hand corner. (It should be in the OFF position).
- b. Check monitor selector switch. (It should be in the NORMAL position).
- c. Check installation for proper hookup to relay contacts.

8.) Monitor does not update after balancing.

- a. Flip the SET-UP/NORMAL/TEST switch to the TEST position. Wait two minutes. Flip the switch back to normal and cycle the press.