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TRANSCCELL TECHNOLOGY, INC.

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# ***TI-500 Series***

## *Digital Indicator*

### Setup / Operation Manual

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### **NOTE**

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

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## **CHAPTER 1: INTRODUCTION TO THE TI-500 SERIES DIGITAL INDICATORS**

The TI-500 Series Digital Indicator is a general purpose, industrial grade weight indicator. Six models are currently available, distinguishable by display type, enclosure type and power supply. Table 1-1 shows the TI-500 Series product matrix.

All models operate identically, can readout up to 50,000 display divisions and can supply enough current for up to 4-350 $\Omega$  load cells. All setup parameters may be entered via the front panel keys, including calibration.

For certain models, an internal 6V rechargeable battery is available as the primary power source. The external power supply with these units functions as a charger for the rechargeable battery. The power supply may also be used as the main power supply.

If your Model TI-500 Series Digital Indicator is part of a complete floor scale or has been installed for you, you may skip to Chapter 7 for operating instructions. Prior to using the indicator, please read this chapter carefully and completely. Store the manual in a safe and convenient place so it will be available if you have questions concerning the operation of the scale.

If you are an installer, the indicator's installation and wiring instructions are found in Chapter 2. The indicator contains two main setup menus: The Setup ("F") menu, which configures the indicator to your weigh platform and the User ("A") menu, which configures the serial communication port and enables some user options. Chapter 3 gives an overview and explains how to use the five front panel keys to maneuver and save settings in both menus. Chapters 4 and 5 explain the Setup and User Menu options, respectively. Chapter 6 covers system calibration. Prior to installing the indicator, please read this manual carefully and completely. Store the manual in a safe and convenient place so it will be available if you have questions concerning the setup and operation of the scale.

| MODEL                          | DISPLAY TYPE <sup>1</sup> | ENCLOSURE TYPE <sup>2</sup> | POWER SOURCE                                                 |
|--------------------------------|---------------------------|-----------------------------|--------------------------------------------------------------|
| TI-500                         | LCD                       | ABS                         | AC adapter - 12 VDC, 500 mA                                  |
| TI-500E <sup>3</sup>           | LED                       | ABS                         | AC adapter - 12 VDC, 500 mA                                  |
| TI-500E-SS <sup>3</sup>        | LED                       | Stainless Steel             | 110/220 VAC, 50/60 Hz <sup>4</sup>                           |
| TI-500E-SS (4-20) <sup>5</sup> | LED                       | Stainless Steel             | 110/220 VAC, 50/60 Hz                                        |
| TI-500-BW                      | LCD                       | ABS                         | 6 x "C" (UM-2) batteries or internal 6V battery <sup>6</sup> |
| TI-500-SSB                     | LCD                       | Stainless Steel             | Internal 6V battery                                          |
| TI-500-SL                      | LCD                       | Stainless Steel             | Internal 6V battery                                          |

TABLE 1-1: TI-500 Series Product Matrix

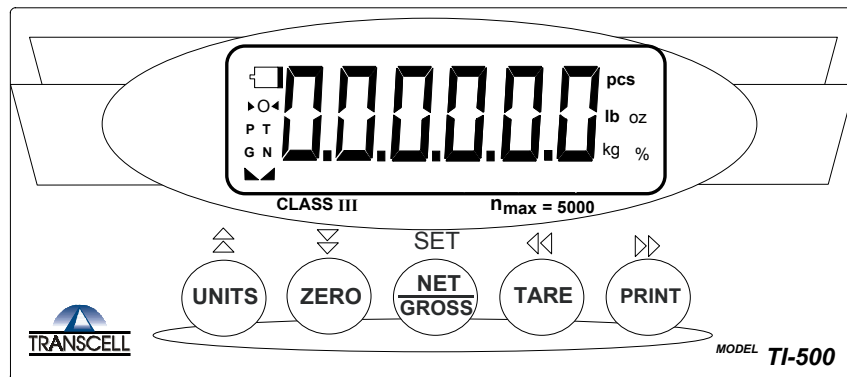


FIGURE 1-1: TI-500 Front Panel

<sup>1</sup> LCD stands for Liquid Crystal Display. LED stands for Light Emitting Diode.

<sup>2</sup> All ABS enclosures are NEMA 12 rated. All stainless steel enclosures are NEMA 4X rated.

<sup>3</sup> An analog 4-20 mA output is no longer an option for this indicator.

<sup>4</sup> Earlier models shipped with a 12 VDC, 500 mA AC adapter.

<sup>5</sup> An analog 4-20 mA output and RS-485 serial port is standard for this indicator

<sup>6</sup> Internal 6V battery is optional for this model.

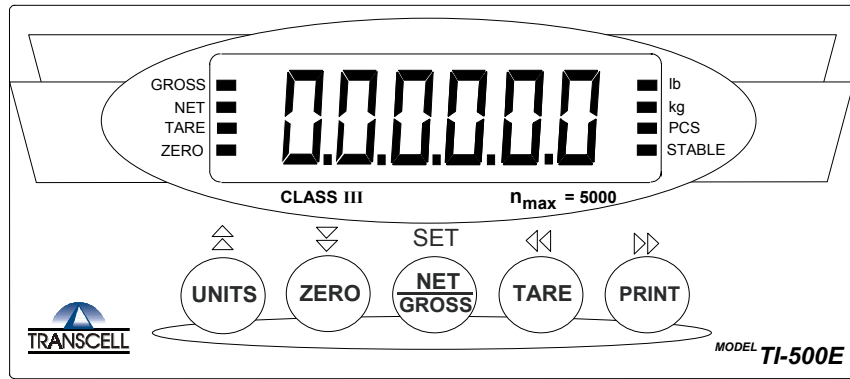


FIGURE 1-2: TI-500E Front Panel

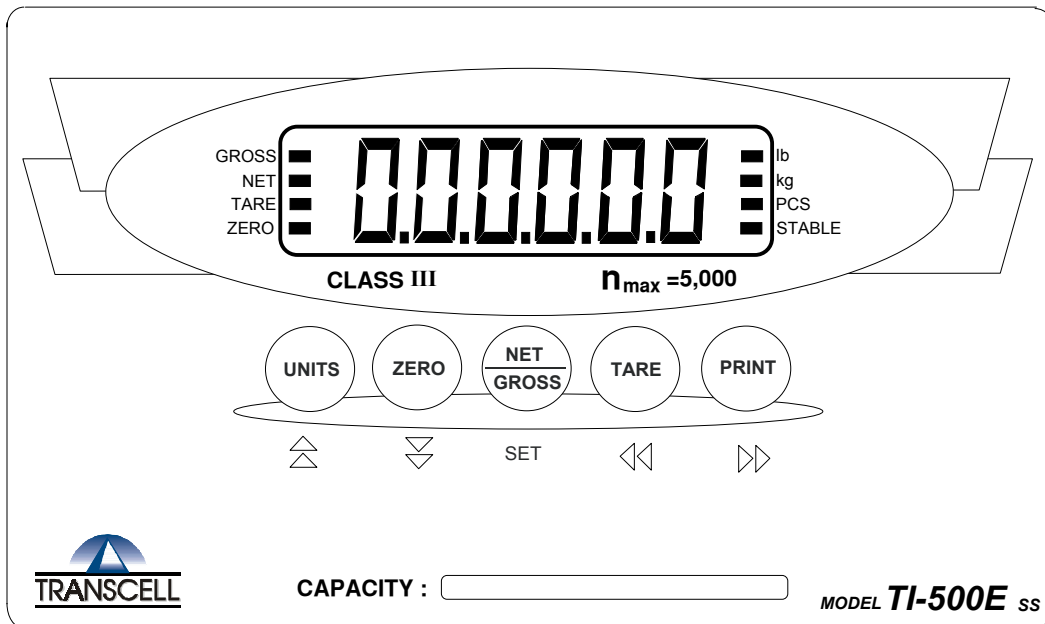


FIGURE 1-3: TI-500E-SS<sup>7</sup> Front Panel

<sup>7</sup> Includes (4-20) model.



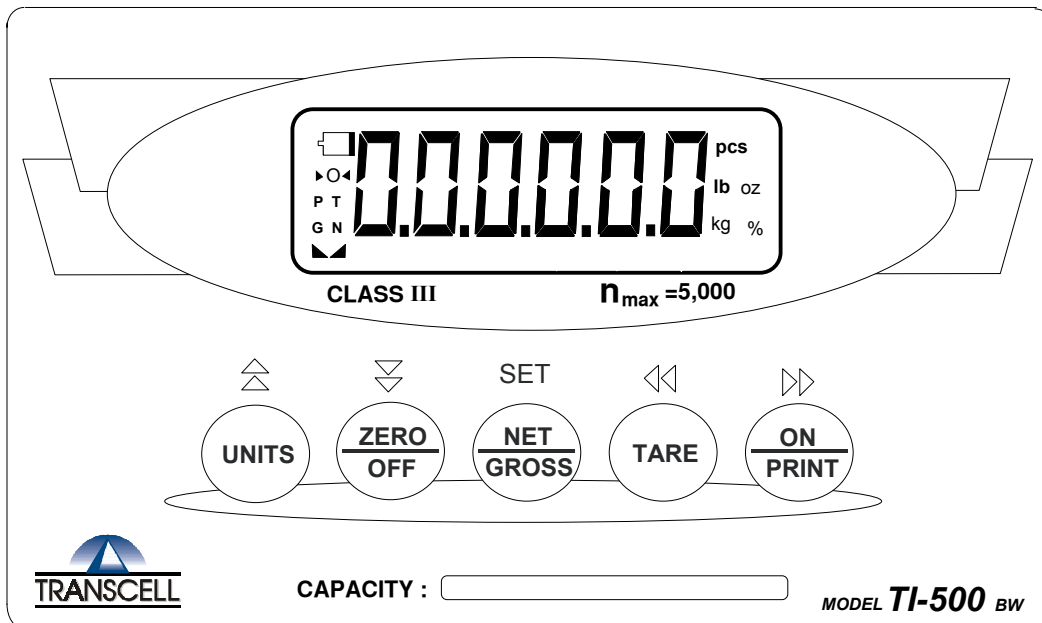


FIGURE 1-4: TI-500-BW Front Panel

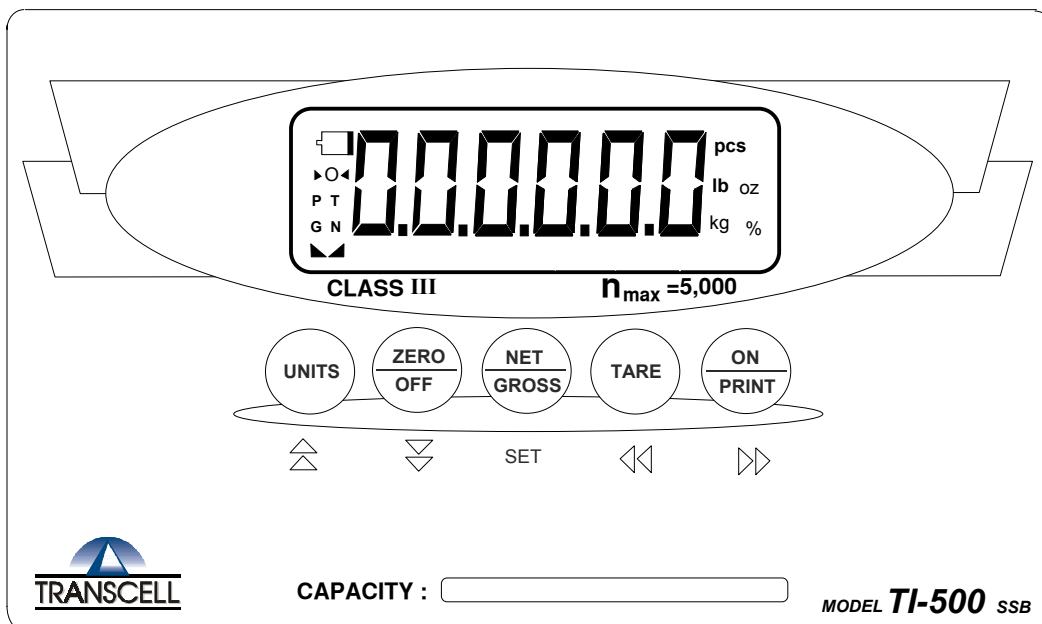


FIGURE 1-5: TI-500-SSB Front Panel

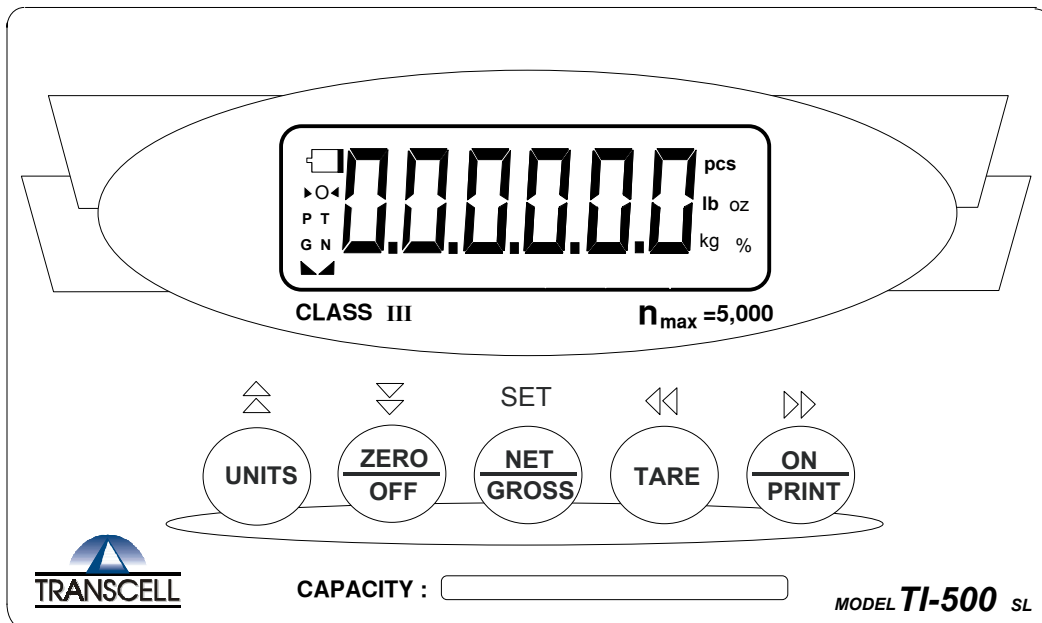
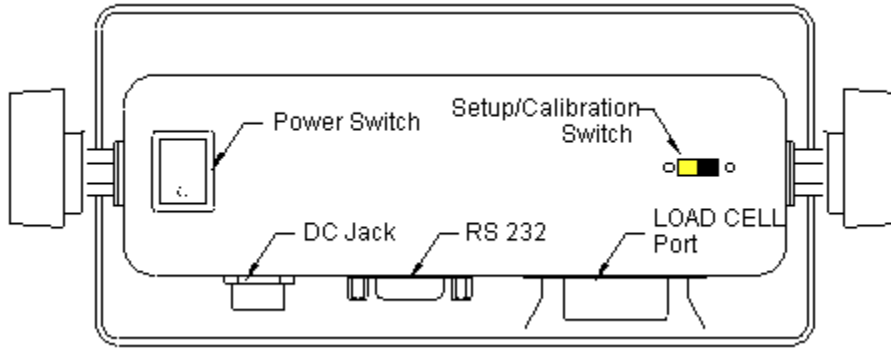


FIGURE 1-6: TI-500-SL Front Panel

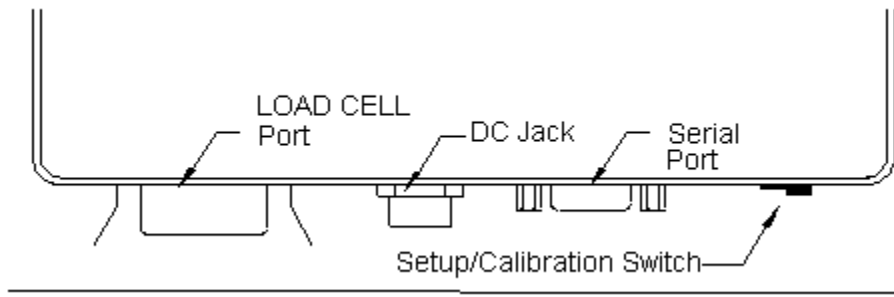
## CHAPTER 2: INSTALLATION

### 2.1 ABS ENCLOSURE

For indicators contained in the standard ABS enclosure, the rear panel contains all connectors necessary to make the appropriate connections to the weigh platform, printer, remote display and power supply.



**Figure 2-1: TI-500/TI-500E ABS Enclosure Rear Panel**



**Figure 2-1a: TI-500-BW ABS Enclosure Rear Panel**

### 2.1.1 CONNECTING THE WEIGH PLATFORM

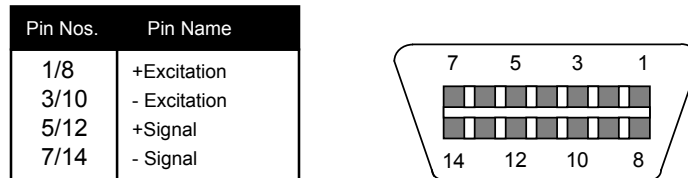
The indicators mounted in an ABS enclosure ship with a 15 ft shielded load cell cable for connection to weigh platform's load cell(s) or junction box.

1. Plug the cable's 14-pin Centronics-type connector into the load cell port on the rear panel of the indicator.
2. Wire the bare wires and shield to the weigh platform's load cell(s) or junction box using the color codes shown in Figure 2-2.

| Color | Wire Name    |
|-------|--------------|
| RED   | +Excitation  |
| BLK   | - Excitation |
| GRN   | +Signal      |
| WHT   | - Signal     |

**Figure 2-2: Color Codes for Shielded Load Cell Cable**

3. If you do not wish to use the shielded load cell cable, you may use own, following the pin assignments shown in Figure 2-3. (A 14-pin Male Centronics-type connector is required).



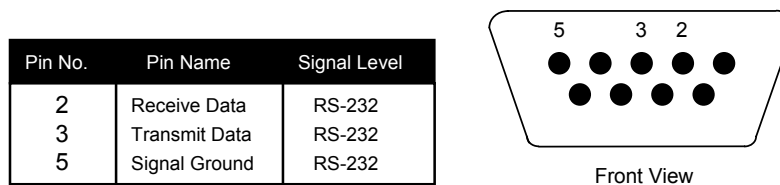
**Figure 2-3: Pin assignments for the Load Cell Port**

### 2.1.2 CONNECTING THE SERIAL PRINTER, REMOTE DISPLAY OR COMPUTER

The TI-500 Series indicator comes standard with one full duplex RS-232 serial port, designed for connection to either a PC or a serial printer. The same port may be also used as a simplex, RS-232 port designed for connection to a remote display.

Figure 2-4 shows the serial port pinout. Refer to Appendix B for some suggested cable diagrams. (A 9-pin Male D-type connector is required).

1. Plug the serial printer, remote display or computer communication cable (not included) directly into the D-SUB9 serial port connector.



**Figure 2-4: Pin assignments for the D-SUB9 serial port connector**

### 2.1.3 CONNECTING THE POWER SUPPLY

The TI-500 and TI-500E indicators ship standard with an external AC adapter.

1. Simply plug the AC adapter into the indicator's DC Power Jack first, and then plug into a standard wall outlet. **Make sure that the AC voltage appearing at the wall outlet matches the input voltage marked on the AC adapter.**

The TI-500-BW alkaline battery indicator ships as a "batteries not included" unit.

1. Obtain six (6) alkaline "C" (UM-2) batteries and install them in the battery compartment located at the rear of the unit. **Be sure to observe the polarity indicated inside the battery holder.**

The TI-500-BW rechargeable battery indicator ships with the battery pre-installed. The external power supply (included) can also be used to power the indicator. The adapter for the rechargeable battery unit acts as the battery charger.

1. Simply plug the AC adapter into the indicator's DC Power Jack first, and then plug into a standard wall outlet. **Make sure that the AC voltage appearing at the wall outlet matches the input voltage marked on the AC adapter.**

## 2.2 STAINLESS STEEL ENCLOSURE

For indicators contained in a stainless steel enclosure, the rear cover must first be removed to make the appropriate connections to the weigh platform, printer, remote display and power supply. To remove the rear cover, simply remove the screws that secure it to the enclosure and set aside.

**NOTE:** On earlier units, the rear cover must remain off to access the Setup Menu and calibration procedures.

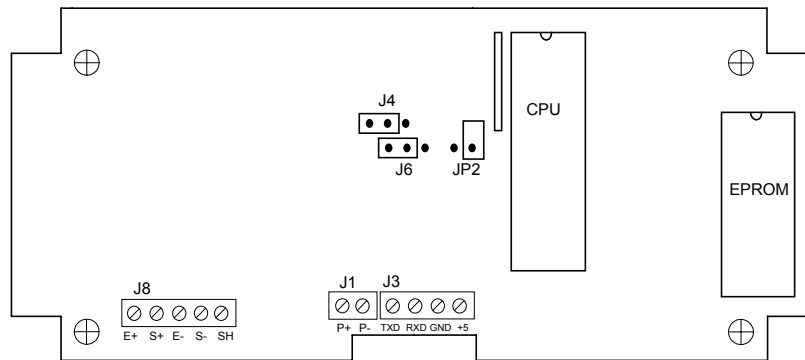


Figure 2-5: TI-500E-SS Main Circuit Board Overview

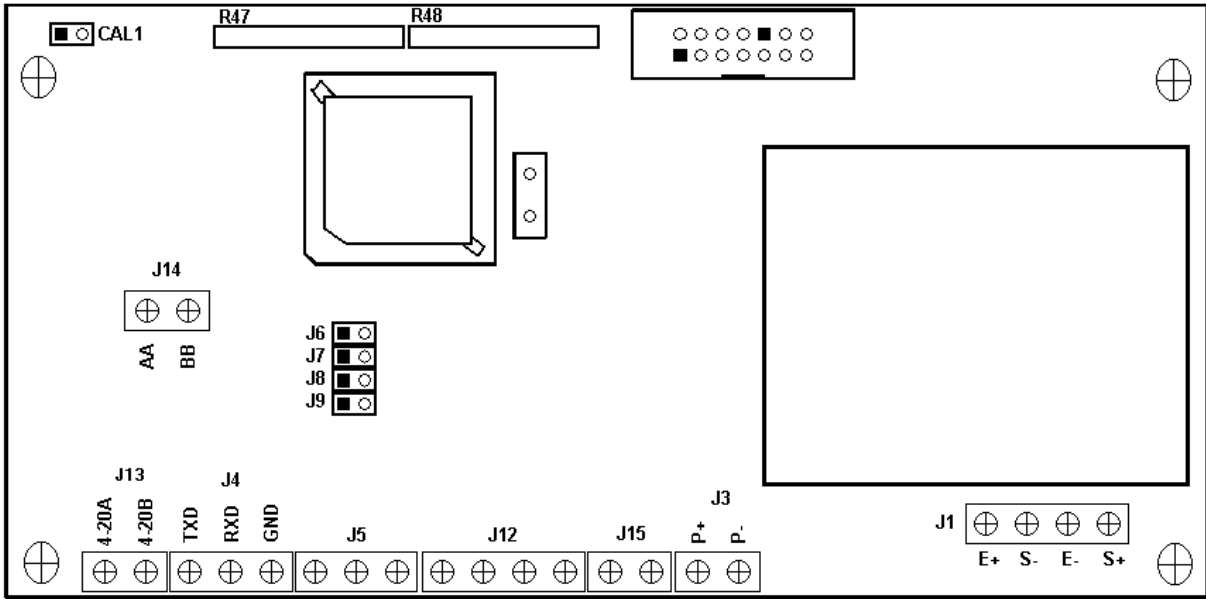


Figure 2-5a: TI-500E-SS Main Circuit Board Overview –4-20 version

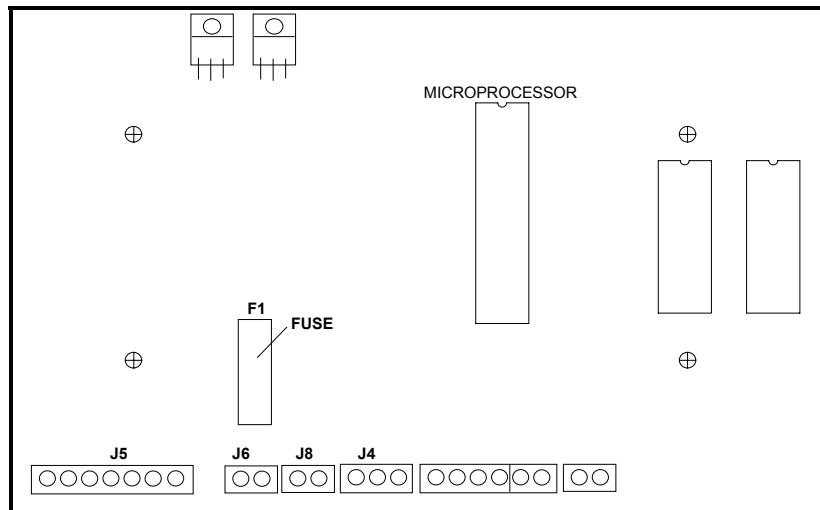
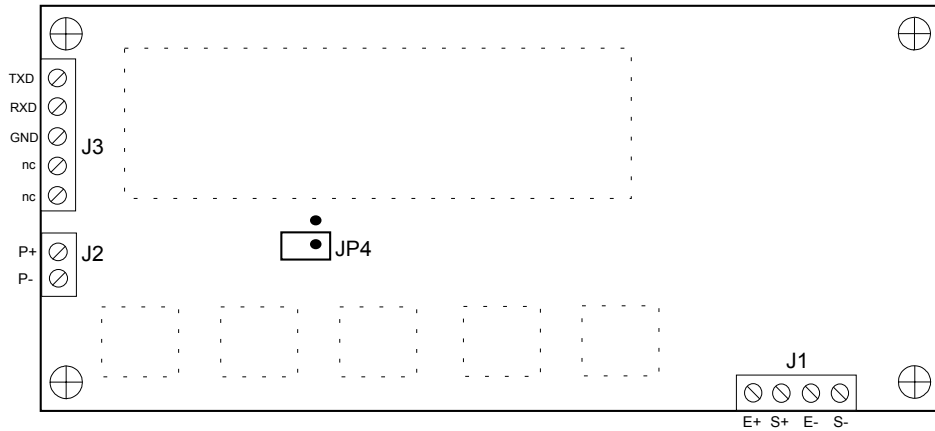


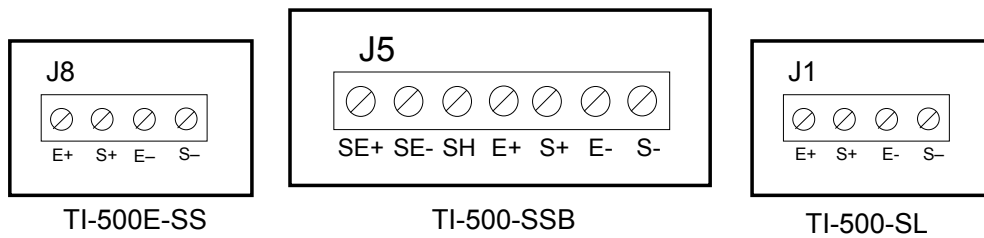
Figure 2-5b: TI-500-SSB Main Circuit Board Overview



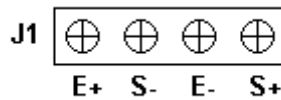
**Figure 2-5c: TI-500-SL Main Circuit Board Overview**

### 2.2.1 CONNECTING THE WEIGH PLATFORM

1. Connect your shielded load cell cable (not included) to the appropriate terminal on the main board. Connection assignments for the Load Cell Terminals are shown in Figure 2-6.



**Figure 2-6: Connection assignments for the Load Cell Terminal**



**Figure 2-6a: Connection assignments for the Load Cell Terminal – TI-500E-SS 4-20**

## 2.2.2 CONNECTING THE SERIAL PRINTER, REMOTE DISPLAY OR COMPUTER

The TI-500 Series indicator comes standard with one full duplex RS-232 serial port, designed for connection to either a PC or a serial printer. The same port may be also used as a simplex, RS-232 port designed for connection to a remote display.

Connection assignments for all serial communication terminals are shown in Figure 2-7.

**NOTE:** Do not connect any RS-232 equipment to the “+5V” terminal (not shown).

1. Connect your serial printer, remote display or computer communication cable (not included) to the appropriate terminal on the main board.

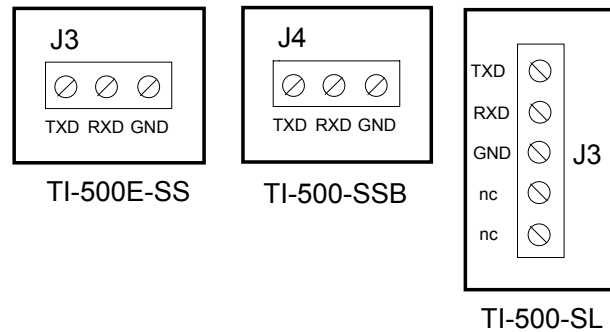


Figure 2-7: Connection assignments for the serial communication terminal

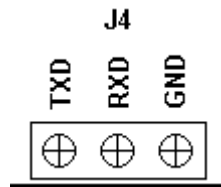


Figure 2-7a: Connection assignments for the serial communication terminal – TI-500E-SS 4-20

## 2.2.3 CONNECTING THE POWER SUPPLY

The TI-500E-SS indicator ships with an AC line cord attached to the indicator. Simply plug the unit into a standard wall outlet.

The TI-500-SSB and TI-500-SL indicators ship with the rechargeable battery pre-installed. The external power supply (included) can also be used to power the indicator. The adapter acts as the battery charger. Because of this, the rechargeable indicator must use a 12 VDC, 800 mA adapter.

1. Simply plug the AC adapter into the indicator's DC Power Jack first, and then plug into a standard wall outlet. **Make sure that the AC voltage appearing at the wall outlet matches the input voltage marked on the AC adapter.**



## 2.2.4 CONNECTING THE 4-20 mA ANALOG OUTPUT (TI-500E-SS 4-20 ONLY<sup>1</sup>)

The digital indicator provides a passive analog 4-20 mA output on two wires designated "4-20A" and "4-20B". A 12-bit DAC is used along with a current loop transmitter. Since the output is passive, you will need an external 24 VDC power supply.

The output tracks the weight displayed on the indicator, so you must first have the indicator configured and calibrated correctly in order for it to work properly. Please see Appendix E on application notes for this feature.

1. Connect your device cable (not included) to the appropriate terminal on the main board.

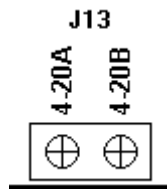


Figure 2-8: Analog Output Terminal – TI-500E-SS 4-20

## 2.2.5 CONNECTING THE RS-485 OUTPUT (TI-500E-SS 4-20 ONLY)

The TI-500E-SS 4-20 indicator comes standard with one full duplex RS-485 serial port, designed for connection to either a PC or a serial printer through an RS-485 to RS-232 converter. The same port may be also used as a simplex, RS-485 port designed for connection to a remote display.

NOTE: The product does not currently support multi-drop connectivity. Use Appendix B as a guide to data transfer and commands.

1. Connect your device cable (not included) to the appropriate terminal on the main board.

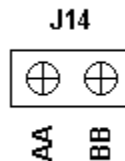


Figure 2-9: RS-485 Output Terminal – TI-500E-SS 4-20

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<sup>1</sup> The 4-20 mA analog output was an option on the standard TI-500E and TI-500E-SS indicator. For the TI-500E-SS indicator, the connections are labeled "AA" and "BB". For the TI-500E indicator, the two connections are wired to pins 2 and 3 of the D-SUB9 serial port connector. For these indicators, all serial port communication functions were removed to accommodate the 4-20 mA analog output. Appendix B is no longer applicable. In addition, almost the entire "A" menu is excluded.

## CHAPTER 3: CONFIGURATION

### 3.1 CONFIGURATION OVERVIEW

The indicator contains two main setup menus: The Setup ("F") menu, which configures the indicator to your weigh platform and the User ("A") menu, which configures the serial communication port and enables some user options. The Setup and User menus consist of several menu selections, each with its own sub-menu of choices.

To set up the indicator, you must first enter the appropriate menu mode. Once there, four of the front panel keys become directional navigators to move around in the menus, and one key is used to save or SET the selections.

### 3.2 SETUP ("F") MENU

#### 3.2.1 ENTERING THE SETUP MENU – ABS ENCLOSURE

1. Power off the indicator.
2. On the rear panel move the Setup/Calibration Switch to the opposite position. See Chapter 2 for location of the Setup/Calibration Switch.
3. Power on the indicator. The indicator shows " F 1" to indicate that you are in Setup Menu mode.

**Note:** Access to the Setup/Calibration Switch is inhibited if the indicator has been sealed for commercial use. For more information, please refer to Chapter 8.

#### 3.2.2 ENTERING THE SETUP MENU – STAINLESS STEEL ENCLOSURE

1. Power off the indicator.
2. Locate the slide switch on the rear cover and move it to the right.

**NOTE:** A metal plate held on by two drilled-head screws may conceal the slide switch.


3. Power on the indicator. The indicator shows " F 1" to indicate that you are in Setup Menu mode.

**Note 1:** Access to the back cover is inhibited if the indicator has been sealed for commercial use. For more information, please refer to Chapter 8.

**Note 2:** If your indicator is an older model and does not have the slide switch on the rear cover, follow these instructions instead:

#### TI-500-ESS (without slide switch)

1. Remove the rear cover and locate jumper JP2.

2. Position the shunt block as shown at right.  JP2

**Note:** On certain units, the shunt block position will be exactly the opposite.

3. Power on the indicator. The indicator shows " F 1" to indicate that you are in Setup Menu mode.

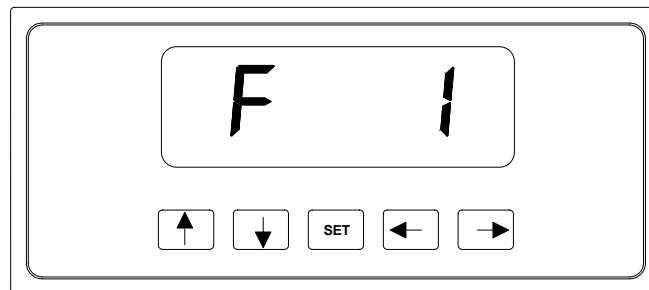
### **TI-500-SSB (without slide switch)**

1. Remove the rear cover and locate the two-position dipswitch.
2. Place switch #1 to the OFF position.  
**Note:** On certain units, the dipswitch position will be exactly the opposite.
3. Power on the indicator. The indicator shows " F 1" to indicate that you are in Setup Menu mode.

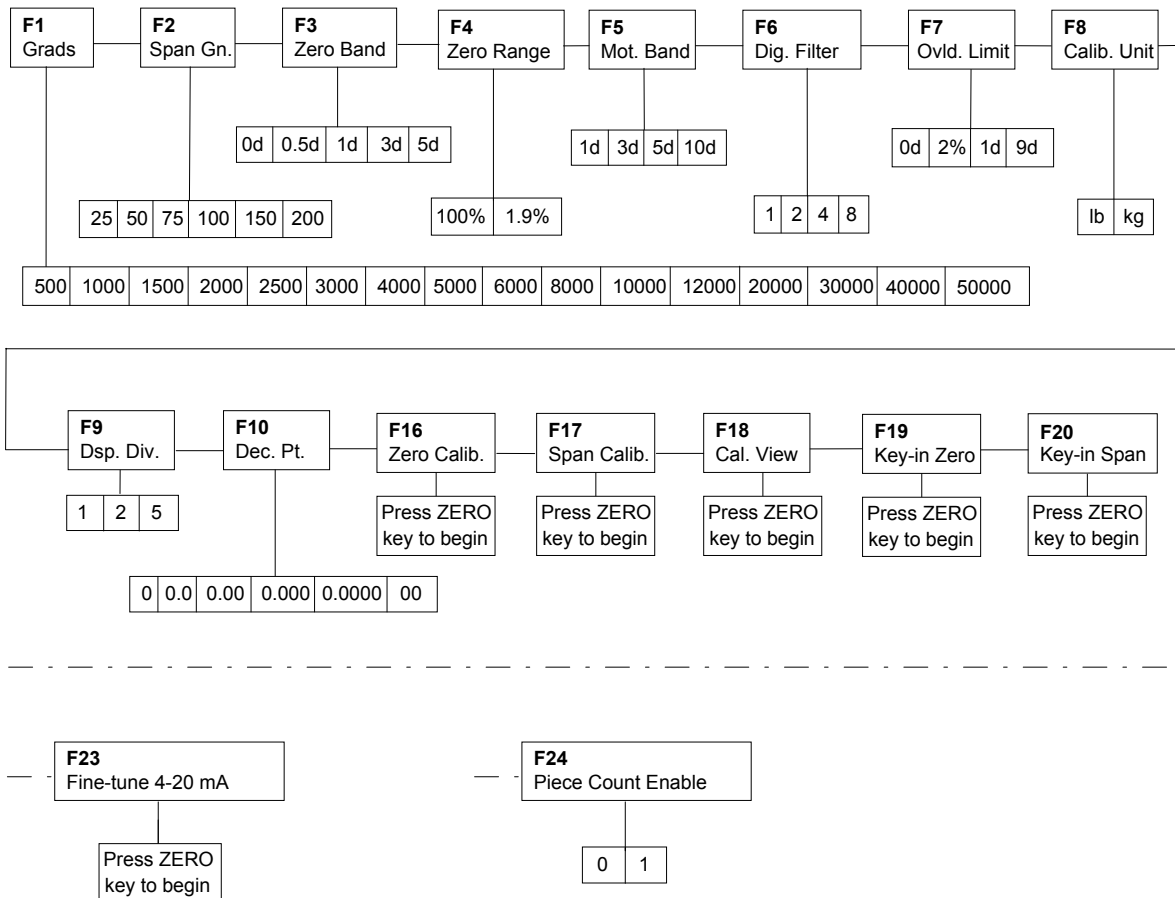
### **3.2.3 NAVIGATING IN THE SETUP MENU**

Use the directional keys shown in Figure 3-1 to move around in the Setup Menu Chart shown in Figure 3-2 on the following page.

1. To move to a new "F" heading, use the TARE (left) or PRINT (right) key to move right or left in the Setup Menu Chart.
2. To move to the selection level, press the ZERO (down) key once. The current saved selection is shown.
3. To view the available selections for the current "F" heading, use the TARE (left) or PRINT (right) key to move through the selection field.
4. To save a new selection, press the NET/GROSS (Set) key .To exit without saving, press the UNITS (up) key to return to the current "F" heading.
5. Repeat Steps 1 through 4 until the Setup Menu is programmed.



**Figure 3-1: Setup Menu Key Assignments**



Only pertains to the following models:

- \* TI-500E-SS (4-20 mA)
- \* TI-500E w/4-20 mA option
- \* TI-500E-SS w/4-20 mA option

Only pertains to the following models:

- \* TI-500E
- \* TI-500E-SS
- \* TI-500E-SS (4-20 mA)

**Figure 3-2: Setup Menu Chart**

### 3.2.4 NOTES ON THE SETUP MENU

1. There is an **F21** sub-menu present that is for FACTORY USE ONLY!
2. Detailed descriptions of the setup menu parameters can be found in Chapter 4 of this manual.
3. The User (“A”) menu sub-menus appear when scrolling left or right from the “F” menu.
4. Some selections shown are not available on all models in the series. Likewise, additional selections may be available on other models in the series. See Chapter 4 for more information.

### 3.2.5 EXITING THE SETUP MENU – ABS ENCLOSURE


1. Power off the indicator.
2. On the rear panel, move the Setup/Calibration Switch back to its original position.
3. Power on the indicator. The display will go through a digit check, then settle into Normal Operating mode. All front panel keys will now return to their normal mode of operation.

### 3.2.6 EXITING THE SETUP MENU – STAINLESS STEEL ENCLOSURE

1. Power off the indicator.
2. Move the slide switch on the rear cover back to the left.
3. Power on the indicator. The display will go through a digit check, then settle into Normal Operating mode. All front panel keys will now return to their normal mode of operation.

**Note:** If your indicator is an older model and does not have the slide switch on the rear cover, follow these instructions instead:

#### **TI-500-ESS (without slide switch)**

1. Remove the rear cover and locate jumper JP2.
2. Position the shunt block as shown at right.  JP2
3. Power on the indicator. The display will go through a digit check, then settle into Normal Operating mode. All front panel keys will now return to their normal mode of operation.

**Note:** On certain units, the shunt block position will be exactly the opposite.

#### **TI-500-SSB (without slide switch)**

1. Remove the rear cover and locate the two-position dipswitch.
2. Place switch #1 to the ON position.
3. Power on the indicator. The display will go through a digit check, then settle into Normal Operating mode. All front panel keys will now return to their normal mode of operation.

**Note:** On certain units, the dipswitch position will be exactly the opposite.

## 3.3 USER (“A”) MENU

### 3.3.1 ENTERING THE USER MENU

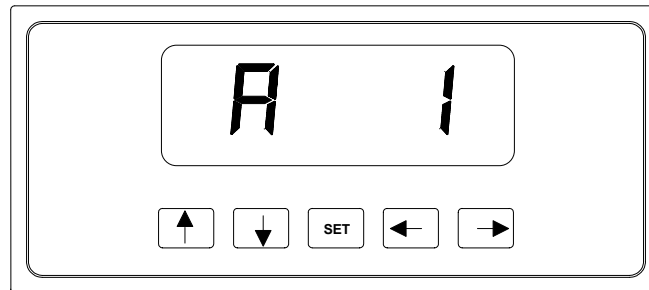
1. Enter the Setup (“F”) menu by following the directions in Section 3.2.1 or 3.2.2.
2. Use the right or left directional keys shown in Figure 3-3 to move right or left in the Setup (“F”) menu until the indicator shows “A 1”.

**Note:** On certain older units, the User (“A”) Menu is independent from the Setup (“F”) Menu. To enter the User Menu on these units, first exit the Setup Menu Mode. Turn the unit off, then press and hold the LB/KG key while powering the unit back on. When the screen shows “A 1” you may release the LB/KG key.

### 3.3.2 NAVIGATING IN THE USER MENU

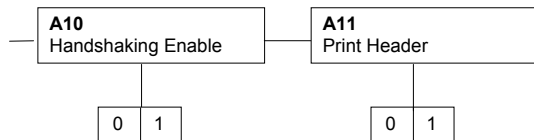
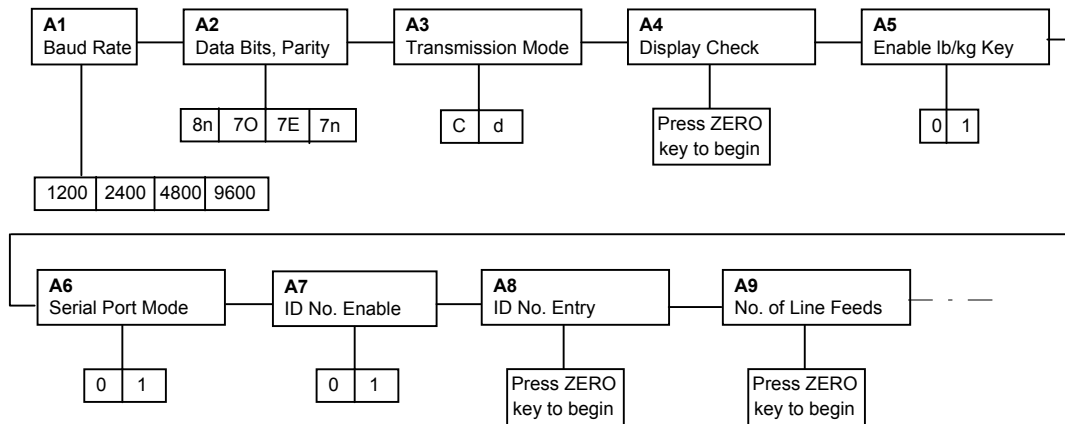
Use the directional keys shown in Figure 3-3 to move around in the User Menu Chart shown in Figure 3-4 on the following page.

1. To move to a new "A" heading, use the TARE (left) or PRINT (right) key to move right or left in the User Menu Chart.
2. To move to the selection level, press the ZERO (down) key once. The current saved selection is shown.
3. To view the available selections for the current "A" heading, use the TARE (left) or PRINT (right) key to move through the selection field.
4. To save a new selection, press the NET/GROSS (Set) key .To exit without saving, press the UNITS (up) key to return to the current "A" heading.
5. Repeat Steps 2 through 5 until the User Menu is programmed.

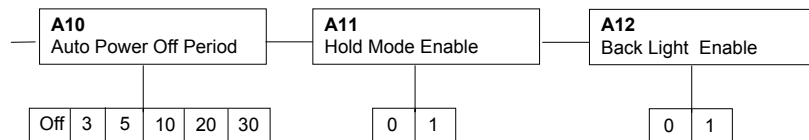


**Figure 3-3: User Menu Key Assignments**

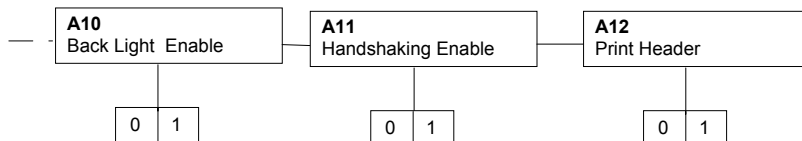
**Continued =>**



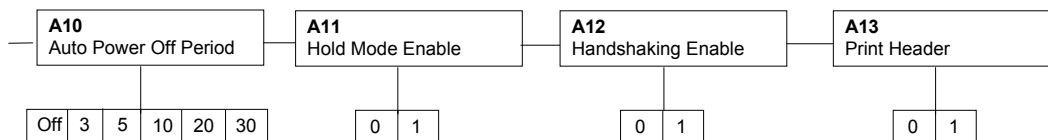
TI-500E, TI-500E-SS and TI-500E-SS (4-20) only



TI-500-BW and TI-500-SSB only



TI-500 only



TI-500-SL only

**Figure 3-4: User Menu Chart**

### **3.3.3 NOTES ON THE USER MENU**

1. Detailed descriptions of the user menu parameters can be found in Chapter 5 of this manual.
2. Some selections shown are not available on all models in the series. Likewise, additional selections may be available on other models in the series. See Chapter 5 for more information.

### **3.3.4 EXITING THE USER MENU**

1. Exit the User ("A") menu by following the directions in Section 3.2.5 or 3.2.6. The display will go through a digit check, then settle into Normal Operating mode. All front panel keys will now return to their normal mode of operation.



## CHAPTER 4: SETUP MENU DESCRIPTIONS AND PROCEDURES

### 4.1 SETUP MENU DESCRIPTIONS

This section provides more detailed descriptions of the selections found in the Setup Menu Chart. Factory-set defaults are shown in bold with a checkmark (✓).

Table 4-1 shows the selections that are not allowed for “Legal-for-Trade” applications:

| NAME/CODE                    | DESCRIPTION                                                                                                                                                                                                                                                                       | CODE/VALUE                                                                                                                           |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| <b>F1</b><br>Graduations     | Specifies number of full-scale graduations. Value should be consistent with legal requirements and environmental limits on the useful system resolution.                                                                                                                          | 500 1,000<br>1,500 2,000<br>2,500 3,000<br>4,000 <b>5,000</b> ✓<br>6,000 8,000<br>10,000 12,000<br>20,000 30,000<br>40,000 50,000    |
| <b>F2</b><br>Span Gain       | Span Gain is related to A/D integration time. The larger the span gain, the higher the internal resolution, but the slower the update speed. Note that the scale must be re-calibrated whenever this parameter is altered. See Appendix C for more information.                   | 25 50<br><b>75</b> ✓ 100<br>150 200                                                                                                  |
| <b>F3</b><br>Zero Track Band | Selects the range within which the scale will automatically zero. Note that the scale must be in standstill to automatically zero. Selections are in Display Divisions.                                                                                                           | 0d<br><b>0.5d</b> ✓<br>1d<br>3d<br>5d                                                                                                |
| <b>F4</b><br>Zero Range      | Selects the range within which the scale may be zeroed. Note that the indicator must be in standstill to zero the scale.                                                                                                                                                          | <b>100%</b> ✓<br>1.9%<br><br><u>SL only</u><br>2%<br>20%                                                                             |
| <b>F5</b><br>Motion Band     | Sets the level at which motion is detected by comparing the present display update with the previous one. If motion is not detected for two seconds or more, scale is in standstill and can process a Print or Zero command. Maximum value varies depending on local regulations. | 0.25d (SL)<br><b>1d</b> ✓<br>3d<br>5d<br>10d<br><br><u>BW, SSB and SL</u> <sup>1</sup><br><u>only:</u><br>15 d 20d<br>30d 40d<br>50d |
| <b>F6</b><br>Digital Filter  | Averages weight readings to produce higher stability. The higher the filter setting, the greater the stability but the slower the indicator's response time. Choose 8 unless a very fast response is needed.                                                                      | 1 2<br>4 <b>8</b> ✓<br><br><u>BW, SSB and SL</u> <sup>1</sup><br><u>only:</u><br>16 32<br>64 128                                     |

<sup>1</sup> These menu selections will not appear on older TI-500-SL units.

|                                |                                                                                                                                                                                                                                                                                     |                                                                                        |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| <b>F7</b><br>Overload Limit    | Selects the desired formula which determines the point at which the indicator shows overload. All selections are based on the primary unit selected in F8.<br><br>"FS" = Full scale in primary units.                                                                               | FS<br><b>FS + 2%</b> √<br>FS + 1d<br>FS + 9d                                           |
| <b>F8</b><br>Calib. Unit       | Selects the primary base unit to be used in the calibration process. Also the default unit for normal operation.<br>"1" = primary unit is lb.                      "2" = primary unit is in kg.                                                                                     | 1√<br>2                                                                                |
| <b>F9</b><br>Display Divisions | Determines the desired weight increments. Value should be consistent with legal requirements.                                                                                                                                                                                       | 1√<br>2<br>5                                                                           |
| <b>F10</b><br>Decimal Pt.      | Determines location of the decimal point.                                                                                                                                                                                                                                           | 0√                      0.0<br>0.00                  0.000<br>0.0000                00 |
| <b>F16</b><br>Zero Calibration | Places indicator into the zero calibration routine. Scrolling down with the <b>ZERO</b> key one level begins the procedure.                                                                                                                                                         | Press <b>ZERO</b> key to begin sequence                                                |
| <b>F17</b><br>Span Calibration | Places indicator into the span calibration routine. Scrolling down with the <b>ZERO</b> key one level begins the procedure.                                                                                                                                                         | Press <b>ZERO</b> key to begin sequence                                                |
| <b>F18</b><br>View Calibration | Actuates the function that allows you to view both the zero and span calibration value. The values displayed in this function are valid only after Calibration (F16 & F17) has been successfully completed. Scrolling down with the <b>ZERO</b> key one level begins the procedure. | Press <b>ZERO</b> key to begin sequence                                                |
| <b>F19</b><br>Key-in Zero      | Allows you to key-in known zero calibration value in case of memory loss in the field. Scrolling down with the <b>ZERO</b> key one level begins the procedure.                                                                                                                      | Press <b>ZERO</b> key to begin sequence                                                |
| <b>F20</b><br>Key-in Span      | Allows you to key-in a known span calibration value in case of memory loss in the field. Scrolling down with the <b>ZERO</b> key one level begins the procedure.                                                                                                                    | Press <b>ZERO</b> key to begin sequence                                                |
| <b>F21</b><br>Factory Reset    | This sub-menu will reset all parameters in the "F" and "A" menu to the default settings. USE WITH CAUTION!                                                                                                                                                                          | Press the <b>ZERO</b> key twice to execute.                                            |

**TI-500E-SS (4-20) only<sup>2</sup>**

| NAME/CODE                          | DESCRIPTION                                                                                                                                              | CODE/VALUE                |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>F23</b><br>Fine Tune<br>4-20 mA | Actuates the function that allows you to fine-tune the 4-20 mA analog output. Pressing the <b>ZERO</b> key to scroll down one level begins the sequence. | Press the <b>ZERO</b> key |

<sup>2</sup> Also appears on newer TI-500E and TI-500E-SS indicators as well as older units with optional 4-20 mA analog output.

**TI-500E and TI-500E-SS only<sup>3</sup>**

| NAME/CODE                           | DESCRIPTION                                                                                                                                                                              | CODE/VALUE |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>F24</b><br>Piece Count<br>Enable | Used to enable or disable the piece count feature. This feature must be disabled for commercial applications.<br>"0" = Disable piece count                      "1" = Enable piece count | 0√<br>1    |

| SUB-MENU | TITLE                         | SELECTIONS                                                              |
|----------|-------------------------------|-------------------------------------------------------------------------|
| F1       | Graduations                   | 6,000    8,000<br>10,000   12,000<br>20,000   30,000<br>40,000   50,000 |
| F3       | Zero Tracking<br>Band (SAZSM) | 0d<br>5d                                                                |
| F5       | Motion Band                   | 3d        5d<br>10d      15 d<br>20d      30d<br>40d      50d           |
| F6       | Digital Filter                | 1<br>2    4                                                             |
| F24      | Piece Count                   | 1                                                                       |

**Table 4-1: Invalid Setup Menu selections for commercial applications**

**4.2 SETUP MENU PROCEDURES**

This section provides instructions for all of the Setup Menu procedures except F16 through F20. These can be found in Chapter 6.

**4.2.1 Fine-tune 4-20 mA output (F23)**

1. While in the Setup Menu mode, scroll to "F 23", then scroll down once using the ZERO key to enter Fine-tune menu. The indicator outputs 4 mA and displays a number.
2. While monitoring the voltage across  $R_L$  (see Appendix E), use the right (PRINT) or left (TARE) keys to change the displayed value until the measured voltage is exactly 1 VDC.
3. Press the SET (Net/Gross) key to save. The indicator outputs 20 mA and displays another number.
4. While monitoring the voltage across  $R_L$ , use the right (PRINT) or left (TARE) keys to change the displayed value until the measured voltage is exactly 5 VDC.
5. Press the SET (Net/Gross) key to save and revert back to F23.

<sup>3</sup> Won't appear on older units.

## CHAPTER 5: USER MENU DESCRIPTIONS AND PROCEDURES

### 5.1 USER MENU DESCRIPTIONS

This section provides more detailed descriptions of the selections found in the User Menu Chart. Factory-set defaults are shown in bold with a checkmark (✓).

| NAME/CODE                                | DESCRIPTION                                                                                                                                                                                                                                                                                                    | CODE/VALUE                                                            |
|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| <b>A1</b><br>Baud Rate                   | Selects the baud rate for data transmission through the serial port.                                                                                                                                                                                                                                           | 1200    2400<br>4800 <b>9600</b> ✓ <sup>1</sup><br>19200 <sup>2</sup> |
| <b>A2</b><br>Data Bits and Parity        | Selects the number of data bits and parity of serial transmission.<br>"8n" = 8 data bits with no parity bit and one stop bit<br>"7O" = 7 data bits with odd parity bit and one stop bit<br>"7E" = 7 data bits with even parity bit and one stop bit<br>"7n" = 7 data bits with no parity bit and two stop bits | <b>8n</b> ✓<br>7O<br>7E<br>7n                                         |
| <b>A3</b><br>Mode of Serial Transmission | Selects when data will be sent out of the serial port to a printer or computer:<br>"C" = Continuous mode; send data continuously<br>"d" = Demand mode; send data when a PRINT command is issued from the printer, computer, or indicator.                                                                      | C<br><b>d</b> ✓                                                       |
| <b>A4</b><br>Display Check               | Actuates the function that illuminates all digit segments, decimal points, and LCD annunciators in a test sequence. Pressing the <b>ZERO</b> key to scroll down one level begins the test sequence.                                                                                                            | Press <b>ZERO</b> key to begin sequence                               |
| <b>A5</b><br>Disable the lb/kg Key       | Allows the lb/kg key to be disabled so that an operator cannot accidentally press the key and change the displayed units.<br>"0" = Disable the lb/kg key    "1" = Enable the lb/kg key                                                                                                                         | 0<br><b>1</b> ✓                                                       |
| <b>A6</b><br>Serial Port Mode            | Selects the mode of the RS-232 serial port: Refer to Appendix B for more information.<br>"0" = Full Duplex Mode<br>"1" = Print Ticket Mode                                                                                                                                                                     | 0<br><b>1</b> ✓ <sup>3</sup>                                          |
| <b>A7</b><br>ID No. Enable               | Allows the ID number to be disabled in the Print Ticket mode. Valid only when <b>A6</b> is set to "1".<br>"0" = Disable the ID No.    "1" = Enable the ID No.                                                                                                                                                  | <b>0</b> ✓<br>1                                                       |
| <b>A8</b><br>ID No. Entry                | Actuates the function that allows entry of a new ID No. Valid only when <b>A6</b> is set to "1". Pressing the <b>ZERO</b> key to scroll down one level begins the sequence.                                                                                                                                    | 0 – 999999 <sup>4</sup><br><b>123456</b> ✓                            |
| <b>A9</b><br>No. of Line Feeds           | Actuates the function that allows entry of the desired number of line feeds to be printed in Print Ticket Mode. Valid only when <b>A6</b> is set to "1". Pressing the <b>ZERO</b> key to scroll down one level begins the sequence.                                                                            | 0 - 99<br><b>8</b> ✓ <sup>5</sup>                                     |

<sup>1</sup> Newer units only. All others default to 2400.

<sup>2</sup> All newer models except TI-500-BW and TI-500-SSB.

<sup>3</sup> Newer units only. All others default to 0.

<sup>4</sup> Except TI-500 – max 19999.

<sup>5</sup> Newer units only. All others default to 5.

**TI-500 only**<sup>6</sup>

| NAME/CODE                           | DESCRIPTION                                                                                                                                        | CODE/VALUE             |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| <b>A10</b><br>Backlight<br>Enable   | Allows you to permanently disable the backlight feature for outdoor use. Factory default setting is "1" (Enabled).<br>"0" = Disabled "1" = Enabled | <b>0</b> <b>1</b> ✓    |
| <b>A11</b><br>Handshaking<br>Enable | Enables hardware handshaking for Print Ticket Mode. Valid only when <b>A6</b> is set to "1".<br>"0" = Disable Handshaking "1" = Enable Handshaking | <b>0</b> ✓<br><b>1</b> |
| <b>A12</b><br>Print Header          | Tells MP-20 printer to print the header information. Valid only when <b>A6</b> is set to "1".<br>"0" = Do NOT Print Header "1" = Print Header      | <b>0</b> ✓<br><b>1</b> |

**TI-500E and TI-500E-SS only**<sup>6</sup>

| NAME/CODE                           | DESCRIPTION                                                                                                                                        | CODE/VALUE             |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| <b>A10</b><br>Handshaking<br>Enable | Enables hardware handshaking for Print Ticket Mode. Valid only when <b>A6</b> is set to "1".<br>"0" = Disable Handshaking "1" = Enable Handshaking | <b>0</b> ✓<br><b>1</b> |
| <b>A11</b><br>Print Header          | Tells MP-20 printer to print the header information. Valid only when <b>A6</b> is set to "1".<br>"0" = Do NOT Print Header "1" = Print Header      | <b>0</b> ✓<br><b>1</b> |

**TI-500-BW and TI-500-SSB only**

| NAME/CODE                                      | DESCRIPTION                                                                                                                                                                                                                                                                                                             | CODE/VALUE                                                            |
|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| <b>A10</b><br>Auto Power Off<br>Period         | Selects the auto off time period in minutes:<br>"Off" = Disabled (Always ON)                                                                                                                                                                                                                                            | <b>Off</b> ✓<br><b>3</b> <b>5</b><br><b>10</b> <b>20</b><br><b>30</b> |
| <b>A11</b><br>Hold Model<br>Enable             | Activates the "Hold" mode where weight of the object on the platform is frozen on the display until the applied weight is decreased to one-half of the memorized weight. This is used in conjunction with the Motion Band setting (F5) to capture an unstable load, such as livestock.<br>"0" = Disabled, "1" = Enabled | <b>0</b> ✓ <b>1</b>                                                   |
| <b>A12</b> <sup>6</sup><br>Backlight<br>Enable | Allows you to permanently disable the backlight feature for outdoor use. Factory default setting is "1" (Enabled).<br>"0" = Disabled "1" = Enabled                                                                                                                                                                      | <b>0</b> <b>1</b> ✓                                                   |

<sup>6</sup> Some or all menus will not appear on older units.

**TI-500-SL only<sup>6</sup>**

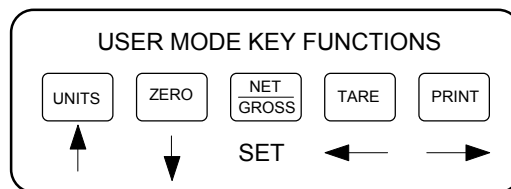
| NAME/CODE                              | DESCRIPTION                                                                                                                                                                                                                                                                                                             | CODE/VALUE                               |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| <b>A10</b><br>Auto Power Off<br>Period | Selects the auto off time period in minutes:<br>"Off" = Disabled (Always ON)                                                                                                                                                                                                                                            | Off<br>1, 2, 3, 5√, 8,<br>10, 15, 20, 30 |
| <b>A11</b><br>Hold Model<br>Enable     | Activates the "Hold" mode where weight of the object on the platform is frozen on the display until the applied weight is decreased to one-half of the memorized weight. This is used in conjunction with the Motion Band setting (F5) to capture an unstable load, such as livestock.<br>"0" = Disabled, "1" = Enabled | 0√ 1                                     |
| <b>A12</b><br>Handshaking<br>Enable    | Enables hardware handshaking for Print Ticket Mode. Valid only when <b>A6</b> is set to "1".<br>"0" = Disable Handshaking "1" = Enable Handshaking                                                                                                                                                                      | 0√<br>1                                  |
| <b>A13</b><br>Print Header             | Tells MP-20 printer to print the header information. Valid only when <b>A6</b> is set to "1".<br>"0" = Do NOT Print Header "1" = Print Header                                                                                                                                                                           | 0√<br>1                                  |

**5.2 USER MENU PROCEDURES**

This section provides instructions for all of the User Menu procedures.

**5.2.1 ID Number Entry (A8)**

1. While in the User Menu mode, scroll to "**A 8**", then scroll down once using the ZERO key to enter the ID Number menu.
2. The display will momentarily show "**ID NO**", followed by a value with one flashing digit. This value will be the current ID number value.
3. Use the four directional keys (shown in Figure 5-1 below) to adjust the displayed value to the actual ID Number value. Increase the flashing digit by pressing the UNITS key. Decrease the flashing digit by pressing the ZERO key. Pressing the PRINT key or the TARE key will change the position of the flashing digit.



**Figure 5-1: User Menu Key Assignments**

4. After setting the exact value, press the NET/GROSS key to save the ID Number value. The display will show "**SET**" momentarily, then revert back up to A8.

### 5.2.2 LF (Line Feeds) Number Entry (A9)

1. While in the User Menu mode, scroll to "**A 9**", then scroll down once using the ZERO key to enter the Line Feeds menu.
2. The display will momentarily show "**LF**", followed by the current line feeds value.
3. Use the four directional keys (shown in Figure 5-1 above) to adjust the displayed value to the actual line feeds value. Increase the flashing digit by pressing the UNITS key. Decrease the flashing digit by pressing the ZERO key. Pressing the PRINT key or the TARE key will change the position of the flashing digit.
4. After setting the exact value, press the NET/GROSS key to save the line feeds value. The display will show "**SET**" momentarily, then revert back up to A9.

## CHAPTER 6: CALIBRATION

### 6.1 CALIBRATION OVERVIEW

The indicator is calibrated by following the procedures embedded in F16 (Zero) and F17 (Span) of the Setup Menu. Each procedure enters a value into the indicator's non-volatile memory - F16 the zero value (deadweight) and F17 the span value (test weight). The minimum test weight that can be used is 1% of full-scale capacity. After the two calibration procedures are executed successfully, you should record both calibration values in Table 6-1 using the F18 View procedure.

In the unlikely event that either value is lost while in the field, the setup menu makes provisions for re-entering these values via F19 and F20, thus eliminating the need for re-calibration with test weights.

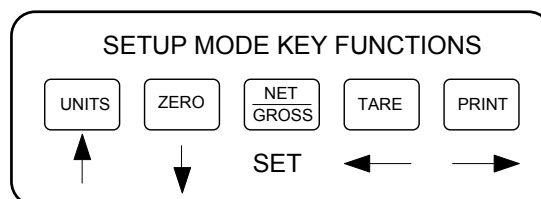
**NOTE:** This chapter assumes that the indicator is in Setup ("F") Menu mode. If the indicator is not in Setup Menu mode, refer to Chapter 3 for instructions.

### 6.2 ZERO CALIBRATION (F16)

1. While in the Setup mode, scroll to "**F 16**", then scroll down once using the ZERO key to enter zero calibration menu. The display will momentarily show "**C 0**" followed by a value. This value is the internal A/D count and can prove useful when trying to troubleshoot setup problems.
2. After making sure that there are no test weights on the platform, press the ZERO key again to zero out the displayed value.
3. Press the NET/GROSS key to save the zero point value. The display will show "**EndC0**" momentarily, then revert back up to F16. At this time, proceed to the F17 span calibration to complete indicator calibration.

### 6.3 SPAN CALIBRATION (F17)

1. While in the Setup mode, scroll to "**F 17**", then scroll down once using the ZERO key to enter span calibration menu.
2. The display will momentarily show "**C 1**" for the span calibration, followed by a value with one flashing digit. This value will be zero with the Decimal Point parameter selected in F10. Place the test weight on the weighing mechanism.
3. Use the four directional keys (shown in Figure 6-1 below) to adjust the displayed value to the actual test weight value. Increase the flashing digit by pressing the UNITS key. Decrease the flashing digit by pressing the ZERO key. Pressing the PRINT key or the TARE key will change the position of the flashing digit.



**Figure 6-1: Setup Menu Key Assignments**



4. After setting the exact value, press the NET/GROSS key to save the value.
5. If the calibration was successful, the display will show "EndC1" momentarily, then revert back up to F17. At this time it is suggested that the calibration values be recorded for future use (see Section 6.4).
6. If the calibration was *not* successful, one of the error messages below will appear. Take the indicated action to correct the problem, then perform a new calibration.
  - "Err0" - The calibration test weight or the adjusted keyed-in weight is larger than the full capacity of the scale. Change the calibration test weight or check the input data.
  - "Err1" - The calibration test weight or the adjusted keyed-in weight is smaller than 1% of the full capacity of the scale. Change the calibration test weight or check the input data.
  - "Err2" - The internal resolution of the scale is not high enough to accept the calibration value. Select a larger parameter for the Span Gain (F2). SEE APPENDIX C FOR MORE INFORMATION.

#### 6.4 VIEW CALIBRATION VALUES (F18)

**Note:** The values displayed in this procedure are valid only after a successful calibration has been performed using F16 and F17.

1. While in the Setup mode, scroll to "F 18", then scroll down once using the ZERO key to enter View calibration menu.
2. The display will momentarily show "CAL 0" followed by a value. This value is the **zero calibration value** and should be recorded in the table below. Press any key to continue.
3. The display will momentarily show "CAL 1" followed by another value. This value is the **span calibration value** and should also be recorded in the table below. Press any key to return to upper level (F18).

| INDICATOR | ZERO CALIBRATION VALUE | SPAN CALIBRATION VALUE |
|-----------|------------------------|------------------------|
| S/N:      |                        |                        |

**Table 6-1: Calibration Value Table**

#### 6.5 KEY-IN ZERO CALIBRATION VALUE (F19)

**Note:** This procedure is intended for emergency use only in the case of non-volatile memory loss. A valid zero calibration value, obtained from a successful F16 calibration procedure, must be used.

1. While in the Setup mode, scroll to "F 19", then scroll down once using the ZERO key.
2. The display will momentarily show "CAL 0", followed by a flashing zero. Use the four directional keys (shown in Figure 6-1) to adjust the displayed value to the zero calibration value.
3. After setting the exact value, press the NET/GROSS key to save the value.
4. The display will show "E CAL 0" momentarily, then revert back up to F19.

## 6.6 KEY-IN SPAN CALIBRATION VALUE (F20)

**Note:** This procedure is intended for emergency use only in the case of non-volatile memory loss. A valid span calibration value, obtained from a successful F17 calibration procedure, must be used.

1. While in the Setup mode, scroll to "**F 20**", then scroll down once using the ZERO key.
2. The display will momentarily show "**CAL 1**", followed by a flashing zero. Use the four directional keys (shown in Figure 6-1) to adjust the displayed value to the span calibration value.
3. After setting the exact value, press the NET/GROSS key to save the value.
4. If the entered value is greater than zero, the display will show "**E CAL 1**" momentarily, then revert back up to F20. If a value of zero is entered, the indicator will briefly show "**Err 5**", then revert back to the screen described above in Step # 2.

## CHAPTER 7: OPERATION

### 7.1 DISPLAY

As mentioned in Chapter 1, some models utilize a 6 digit LCD (Liquid Crystal Display) while others utilize a 6-digit LED (Light Emitting Diode) display. Typically, LCD's are used for outdoor applications while LED's are used indoors where brightness is needed. Table 7-1 summarizes both types of display annunciators.

#### 7.1.1 LIQUID CRYSTAL DISPLAY (LCD)

Figure 7-1 shows the display detail of the LCD indicators.

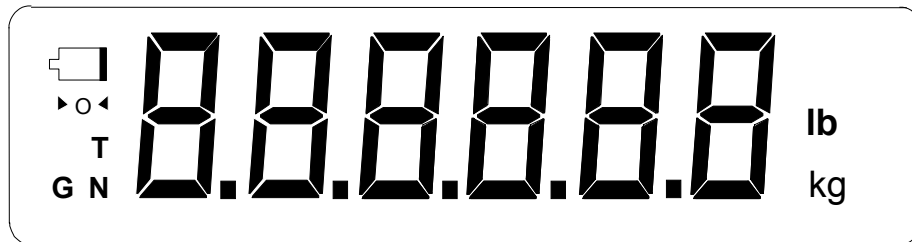


FIGURE 7-1: TI-500 Series LCD Detail

#### 7.1.2 LIGHT EMITTING DIODE (LED) DISPLAY

Figure 7-2 shows the display detail of the LED display indicators.

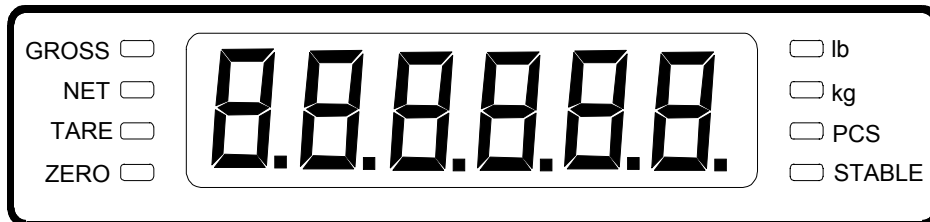



FIGURE 7-2: TI-500 Series LED Display Detail

**NOTE:** On earlier units, the PCS annunciator is not present. This may mean your unit does not support piece counting.

| LCD Annunciator                                                                   | LED Annunciator | MEANING                                                                                                                                           |
|-----------------------------------------------------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| →0←                                                                               | ZERO            | Better known as the “Center of Zero” annunciator, this light is active whenever the displayed weight is within $\pm 0.25$ divisions of true zero. |
| N                                                                                 | NET             | Indicates that the indicator is displaying net weight.                                                                                            |
| G                                                                                 | GROSS           | Indicates that the indicator is displaying gross weight.                                                                                          |
| T                                                                                 | TARE            | Indicates that a tare weight has been established in the system.                                                                                  |
| lb, kg                                                                            | lb, kg, PCS     | Indicates the unit of the displayed weight. PCS stands for “pieces”.                                                                              |
|  | STABLE          | This light is on whenever the scale is stable.                                                                                                    |

**TABLE 7-1: TI-500 Series Annunciator Definitions**

## 7.2 KEYBOARD

The keyboard is composed of five function keys. Refer to Figures 7-3 and 7-3a for the overall layout and key locations.



**FIGURE 7-3: Function Keys Layout – non-battery powered units**



**FIGURE 7-3a: Function Keys Layout – battery powered units**

**NOTE:** On earlier units, the UNITS key is labeled as LB/KG.

### 7.2.1 FUNCTION KEYS

**Units** – This key toggles the indicator among the available weight units if enabled in the User (“A”) menu. Available weight units include lb, kg and pieces<sup>1</sup>. See Chapter 5 for more information.

<sup>1</sup> Newer units only.

**Zero** - This key sets the indicator to display zero provided the following conditions are met:

1. The indicator is displaying Gross weight.
2. The displayed weight is within the zero reset range that is programmed in F4 of the Setup ("F") Menu.
3. The scale is not in motion.
4. The scale is not in overload (see Appendix D for error codes).

**Zero/Off** – Same as ZERO key except when held for five seconds, shuts the unit off (battery powered indicators only).

**Net/Gross** - This key toggles the indicator between Gross weight and Net weight only if a Tare has been established.

**Tare** - This key is used to establish a Tare provided the following conditions are met:

1. The indicator is not at or below Gross zero.
2. The scale is not in motion.
3. The scale is not in overload (see Appendix D for error codes).

**Print** - This key is used to send weight information out to the serial port provided the following conditions are met:

1. The scale is not in motion.
2. The scale is not in overload (see Appendix D for error codes).

**ON/Print** – Same as PRINT key except when the unit is off, turns the unit on (battery powered indicators only).

## 7.3 GENERAL SCALE OPERATION

### 7.3.1 WEIGHING AN ITEM

1. Select the desired weighing unit by pressing the lb/kg key until that unit is indicated on the display.
2. If necessary, press the ZERO key to obtain a weight reading of zero.
3. Place the object to be weighed on the scale's platter and allow the weight indication to stabilize. If the item weight exceeds the scale's weight capacity, it displays "□□□□□□".
4. Read the weight shown on the display.

### 7.3.2 TARING AN ITEM

To weigh an item in a container, the weight of that container must first be subtracted from the overall weight to obtain an accurate weight reading. This is known as taring.

1. Select the desired weighing unit by pressing the lb/kg key until that unit is indicated on the display.
2. If necessary, press the ZERO key to obtain a weight reading of zero.
3. Place the empty container on the scale's platter and allow the weight indication to stabilize.
4. Press the TARE key. The display shows zero weight and turns the NET annunciator on.
5. Place the material to be weighed in the container and allow the weight indication to stabilize.
6. Read the weight shown on the display.
7. You may toggle between the gross weight and the net weight by pressing the NET/GROSS key.

### 7.3.3 PIECE COUNTING<sup>2</sup>

**IMPORTANT NOTE:** The piece counting function cannot be used in commercial (NTEP) applications.

This mode is used to indicate the number of pieces of an item you have placed on the scale's platform and is accessed by pressing the UNITS key. To ensure accuracy, the parts you are counting must be consistent in weight.

The indicator uses the sampling method to determine the average piece weight (APW) of the items you wish to count. When sampling items, always count the parts in your hand and place them on the platform all at once. If the APW of the items is too light or the total weight of the sample is too light, accuracy cannot be guaranteed. You will get an error message, but piece counting will still be allowed.

1. If the items you will be counting require a container, you must first tare the container off by pressing the TARE key.

**NOTE:** The TARE key is inoperative when in sampling mode.

2. Press the UNITS key until "5 0" is indicated on the display. If the screen does not show "5 0", press the ZERO key once. The indicator is prompting you to place five identical items on the platform.

**NOTE:** If you wish to change the sample number, simply press the UNITS key repeatedly until the desired sample number appears. Available choices are 5, 10, 20, 50 and 100. If you continue to push the UNITS key, the indicator will resort back to weighing mode and you must start again from Step 2.

3. Place the sample items on the platform all at once and allow the weight indication to stabilize. Once this is done, the zero indicated after the sample number will change to a "–". For example, "5 –".
4. Press the NET/GROSS key to take the sample. If the sample size is large enough, the indicator now displays the number of pieces on the platform and the "PCS" annunciator is lit. If not, the indicator briefly displays "Lo" and automatically increments the sample size. Repeat Step #4 with the new sample size.

**NOTE:** If the indicator continues to display "Lo" even after sampling 100 pieces, the unit weight of the items you wish to count is too light for your scale to process accurately.

5. To exit the piece count mode, press the UNITS key.

**NOTE:** The APW will NOT remain in scale memory when you exit piece counting mode.

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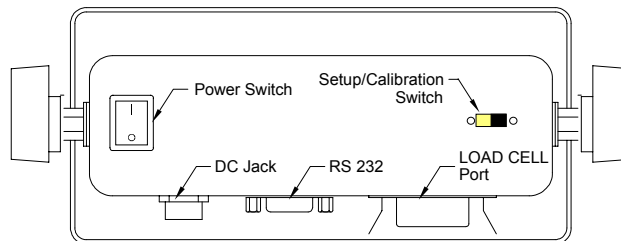
<sup>2</sup> Available only on newer TI-500E and TI-500E-SS indicators at this time.

## CHAPTER 8: LEGAL FOR TRADE SEALING

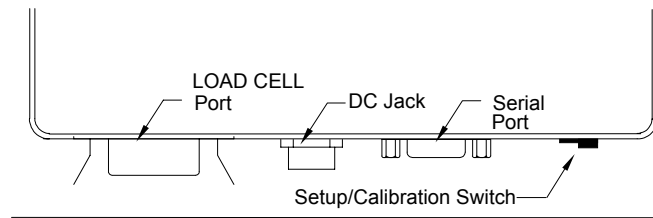
### 8.1 ABS ENCLOSURE

Indicators in the ABS enclosure can be sealed for commercial (Legal for Trade) applications as follows.

1. Power off the indicator.
2. On the back of the indicator, locate the setup/calibration switch cover (see illustrations below).
3. Thread a wire security seal through both drilled head screws securing the calibration switch cover as well as the single drilled head screw holding on the rear panel.



**Figure 8-1: TI-500 and TI-500E ABS Rear Panel**



**Figure 8-1a: TI-500-BW ABS Rear Panel**

### 8.2 STAINLESS STEEL ENCLOSURE

Indicators in the stainless steel enclosure can be sealed for commercial (Legal for Trade) applications as follows.

1. Power off the indicator.
2. On the rear cover of the indicator, locate the calibration switch cover.
3. Thread a wire security seal through both drilled head screws securing the calibration switch cover as well as the two drilled head screws holding on the rear panel.

#### **Older units**

1. Power off the indicator.
2. Locate the two adjacent drilled head screws securing the rear cover.
3. Thread a wire security seal through two drilled head screws securing the rear cover.

## APPENDIX A: SPECIFICATIONS

### ANALOG SPECIFICATIONS

|                                                          |                                                        |
|----------------------------------------------------------|--------------------------------------------------------|
| Full Scale Input Signal                                  | 30mV, including dead load                              |
| Minimum Sensitivity - Non H-44                           | 0.4 $\mu$ V / grad                                     |
| Minimum Sensitivity - H-44                               | 1.0 $\mu$ V / grad                                     |
| Input Impedance                                          | 30M $\Omega$ , typical                                 |
| Internal Resolution - TI-500,<br>TI-500E, TI-500E-SS     | Approximately 260,000 to 325,000 counts                |
| Internal Resolution – TI-500-SL                          | Approximately 150,000 counts                           |
| Internal Resolution – TI-500-BW,<br>TI-500-SSB           | Approximately 130,000 counts                           |
| Display Resolution                                       | 50,000 display division max                            |
| Measurement Rate                                         | 10 Meas/sec, nominal                                   |
| System Linearity                                         | Within 0.02% of FS                                     |
| Calibration Method                                       | Software Calibration, with long term storage in EEPROM |
| Excitation Voltage – TI-500,<br>TI-500E, TI-500E-SS      | +10 VDC, 4 x 350 $\Omega$ load cells                   |
| Excitation Voltage – TI-500-BW,<br>TI-500-SSB, TI-500-SL | +5 VDC, 4 x 350 $\Omega$ load cells                    |

### DIGITAL SPECIFICATIONS

|                   |                                                                                                                                                                                            |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Microcontrollers  | <ul style="list-style-type: none"><li>• Intel 80C32</li><li>• Winbond W78E58</li><li>• Winbond W78E516</li></ul>                                                                           |
| Program Memory    | <ul style="list-style-type: none"><li>• 64K x 8, external to <math>\mu</math>C</li><li>• 32K x 8, internal to <math>\mu</math>C</li></ul>                                                  |
| SRAM:             | <ul style="list-style-type: none"><li>• 256 x 8, internal to <math>\mu</math>C</li><li>• 64K x 8, external to <math>\mu</math>C</li><li>• 256 x 8, internal to <math>\mu</math>C</li></ul> |
| EEPROM:           | 64 x 16, external to $\mu$ C                                                                                                                                                               |
| Digital Filtering | Software selectable                                                                                                                                                                        |

### SERIAL COMMUNICATIONS

|             |                                                                                                                                                                                                             |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Serial Port | Full Duplex, 1200, 2400, 4800, 9600, 19200 Baud<br>8 data bits, no parity, 1 stop bit<br>7 data bits, odd parity, 1 stop bit<br>7 data bits, even parity, 1 stop bit<br>7 data bits, no parity, 2 stop bits |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### OPERATOR INTERFACE

|                          |                                                 |
|--------------------------|-------------------------------------------------|
| Display – LED Indicators | 0.56" (14 mm) 7-segment, LED, 6 Digit           |
| Display – LCD Indicators | 0.8" (20 mm) 7-segment, Liquid Crystal, 6 Digit |
| Additional Symbols       | Net, Gross, Stable, Tare, lb, kg, Zero, PCS     |
| Keyboard                 | 5-key flat membrane panel                       |

### POWER

|                                                         |                                     |
|---------------------------------------------------------|-------------------------------------|
| Alkaline Batteries                                      | 6 x "C" Size (UM-2) Cells           |
| Rechargeable Battery                                    | 6 VDC, 3.0 Ah lead acid             |
| AC Adapter – TI-500, TI-500E                            | 12 VDC, 500mA Female                |
| AC Adapter – TI-500-BW, TI-500-SSB                      | 12 VDC, 800mA Female                |
| DC Power Consumption - TI-500                           | 80mA + 30mA/350 $\Omega$ Load Cell  |
| DC Power Consumption - TI-500-BW, TI-500-SSB            | 80mA + 15mA/350 $\Omega$ Load Cell  |
| DC Power Consumption - TI-500E, TI-500E-SS <sup>1</sup> | 200mA + 30mA/350 $\Omega$ Load Cell |
| DC Power Consumption - TI-500-SL                        | 55mA + 15mA/350 $\Omega$ Load Cell  |

<sup>1</sup> Includes TI-500E-SS (4-20) indicator.



**ENVIRONMENTAL**

Operating Temperature -10° to +40° C  
Storage Temperature -25° to +70° C

**MECHANICAL**

Overall Dimensions (L x W x H) – TI-500, TI-500E 8.5" x 3.0" x 4.6" (215mm x 75mm x 117mm)  
Overall Dimensions (L x W x H) – TI-500E-SS and TI-500E-SS (4-20) 10.4" x 3.1" x 7.7" (265mm x 80mm x 195mm)  
Overall Dimensions (L x W x H) – TI-500-BW 12.2" x 3.9" x 8.1" (310mm x 100mm x 205mm)  
Overall Dimensions (L x W x H) – TI-500-SSB 10.4" x 3.1" x 7.7" (265mm x 80mm x 195mm)  
Overall Dimensions (L x W x H) – TI-500-SL 10.4" x 3.1" x 7.7" (265mm x 80mm x 195mm)

**APPROVALS**

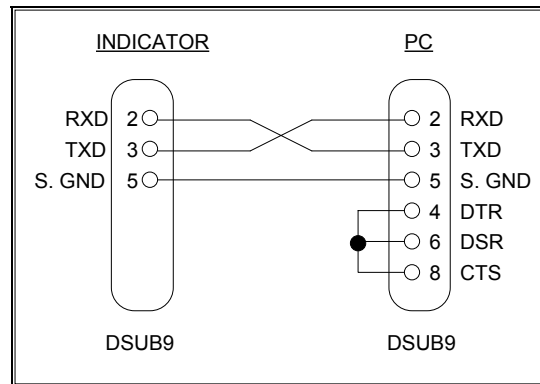
NTEP COC # 94-080A2

## APPENDIX B: SERIAL PORT INFORMATION

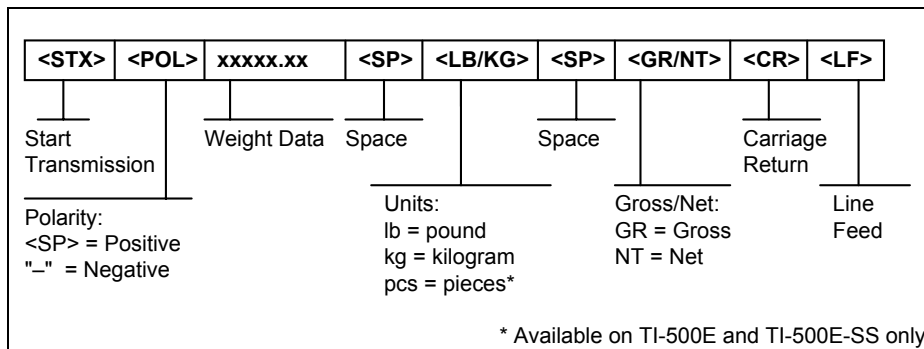
### B.1 SERIAL PORT MODES

#### B.1.1 FULL DUPLEX MODE

The Full Duplex Mode provides a Demand serial transmission mode and is selected by setting A3 to "d" and A6 to "0". The Demand mode allows control from a host device, usually a PC, and can be activated by pressing the PRINT key on the indicator's front panel. Figure B-1 shows a suggested cable diagram for interface to a PC. Figure B-2 shows the serial data format for the Demand Mode.



**FIGURE B-1. Cable Diagram for Indicator to IBM PC**



**FIGURE B-2. Consolidated Controls Demand Mode**

### B.1.1.1 RECOGNIZED HOST COMMANDS

- “**P**” - This command is sent to the indicator to print the indicated display. The indicator will not respond if the scale is in motion, positive overload or negative overload.
- “**Z**” - This command is sent to the indicator to zero the scale. The indicator will not respond if the scale is in motion, positive overload or negative overload. The indicator will also not respond if it is not in gross mode or within the zero range specified in F4 of the Setup Menu.
- “**T**” - This command is sent to the indicator to tare the scale. The indicator will not respond if the scale is in motion, positive overload or negative overload. The indicator will also not respond if it is displaying a negative gross value.
- “**G**” - This command is sent to the indicator to revert to gross mode. The indicator will not respond if the scale is in motion, positive overload or negative overload. The indicator will also not respond if it is not in net mode.
- “**N**” - This command is sent to the indicator to revert to net. The indicator will not respond if the scale is in motion, positive overload or negative overload. The indicator will also not respond if it is not in gross mode or a tare has yet to be established.
- “**C**” - This command is sent to the indicator to toggle among the configured units.

### B.1.2 PRINT TICKET MODE

The Print Ticket Mode is designed specifically for a serial printer and is selected by setting A6 to “1”. Figure B-3 shows the fixed format of the print ticket.

For printers with limited buffers, this mode supports DTR pin handshaking. The DTR pin from the serial printer is wired to the indicator’s RXD pin which then functions as a CTS pin. Figure B-4 shows a suggested cable diagram for interfacing to a serial printer. Refer to the printer’s user manual to confirm which pin is the DTR pin.

#### NOTES:

1. The TARE and NET fields are not printed unless a tare has been established in the system.
2. The ID number field is not printed if it is disabled in A7 of the User Menu.

|         |          |
|---------|----------|
| ID. NO. | 123456   |
| GROSS   | 25.00 LB |
| TARE    | 1.48 LB  |
| NET     | 23.52 LB |

FIGURE B-3. Print Ticket

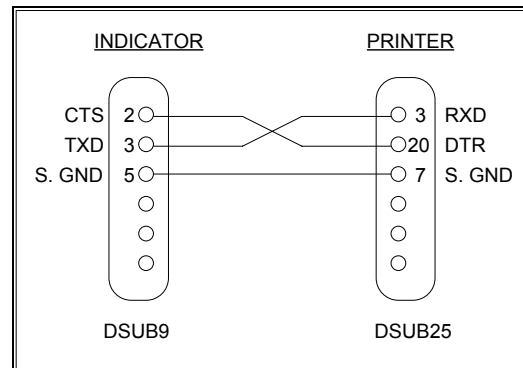
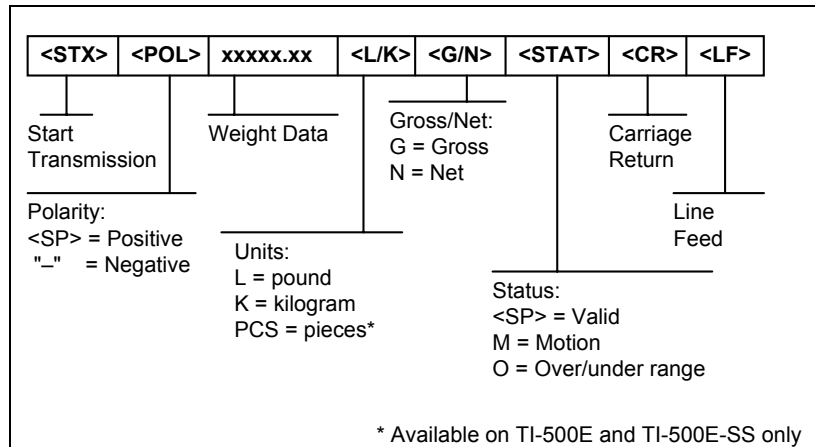


FIGURE B-4. Cable Diagram for Indicator to Printer

### B.1.3 SIMPLEX MODE

The Simplex Mode provides a continuous serial transmission mode and is selected by setting A3 to "C" and A6 to "0". The Continuous mode is used to interface to computers, scoreboards, and other remote devices requiring constant data updating. The transmission occurs at the end of each display update. Figure B-5 shows the serial data format for Continuous Mode.



**FIGURE B-5. Consolidated Controls Continuous Mode**

## APPENDIX C: DETERMINING PROPER SPAN GAIN (F2)

### C.1 SPAN GAIN OVERVIEW

The Span Gain parameter found in F2 of the Setup Menu is directly related to the ADC (Analog to Digital Converter) integration time. This means that the lower the setting, the higher the number of measurements per second. A span gain setting of **25** produces about 25 to 30 measurements per second, while a span gain of **200** produces only about 3 or 4 measurements per second.

There is really no wrong setting for span gain – except in two cases. Using a low setting for a high resolution, low output system could yield instability. Using a high setting in a high output system could yield non-linearity.

### C.2 SETTING THE INITIAL VALUE FOR SPAN GAIN

1. Determine the number of desired external graduations and choose the corresponding value listed in Table C-1 or Table C-1a under the number closest to your full-scale input range in millivolts.
2. Enter the Setup Menu and save this number for the Span Gain parameter in F2.
3. Perform a system calibration. If the calibration proves unsuccessful, or you wish to view the internal counts, proceed to the next set of instructions.

### C.3 VIEWING THE INTERNAL COUNTS

1. Enter the zero calibration menu (F16) and follow steps 1 to 3, **but do not save the zero point**.
2. After pressing **ZERO** to zero the offset, place the test weight(s) on the platform. The displayed count is the internal count. If the count remains on zero, check your load cell connections.
3. At full scale, the displayed count should be a minimum of 2 times the desired external graduations. However, for maximum stability, a ratio of 6:1 or higher is recommended.
4. If the displayed count is large enough, remove the test weight(s), re-zero the indicator if necessary, and proceed with the calibration. If the displayed number is *not* large enough, increase the Span Gain to the next highest choice in the Setup Menu and re-calibrate.

**TI-500, TI-500E, TI-500E-SS**

| # of External<br>Grads | Full Scale Input Range (mV/V) |            |            |           |           |           |           |           |           |           |           |           |           |           |           |
|------------------------|-------------------------------|------------|------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                        | 0.2                           | 0.4        | 0.6        | 0.8       | 1.0       | 1.2       | 1.4       | 1.6       | 1.8       | 2.0       | 2.2       | 2.4       | 2.6       | 2.8       | 3.0       |
| 500                    | 25                            | 25         | 25         | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        |
| 1,000                  | 50                            | 25         | 25         | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        |
| 1,500                  | 75                            | 50         | 25         | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        |
| 2,000                  | 100                           | 50         | 50         | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        |
| 2,500                  | 150                           | 75         | 50         | 50        | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        |
| 3,000                  | 150                           | 75         | 50         | 50        | 50        | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        |
| 4,000                  | 200                           | 100        | 75         | 50        | 50        | 50        | 50        | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        |
| <b>5,000</b>           | –                             | <b>150</b> | <b>100</b> | <b>75</b> | <b>50</b> | <b>50</b> | <b>50</b> | <b>50</b> | <b>50</b> | <b>25</b> | <b>25</b> | <b>25</b> | <b>25</b> | <b>25</b> | <b>25</b> |
| 6,000                  | –                             | 150        | 100        | 75        | 75        | 50        | 50        | 50        | 50        | 50        | 25        | 25        | 25        | 25        | 25        |
| 8,000                  | –                             | 200        | 150        | 100       | 75        | 75        | 75        | 50        | 50        | 50        | 50        | 50        | 50        | 50        | 25        |
| 10,000                 | –                             | –          | 200        | 150       | 100       | 100       | 75        | 75        | 75        | 50        | 50        | 50        | 50        | 50        | 50        |
| 12,000                 | –                             | –          | 200        | 150       | 150       | 100       | 100       | 75        | 75        | 75        | 50        | 50        | 50        | 50        | 50        |
| 15,000                 | –                             | –          | –          | 200       | 150       | 150       | 100       | 100       | 100       | 75        | 75        | 75        | 75        | 50        | 50        |
| 20,000                 | –                             | –          | –          | –         | 200       | 200       | 150       | 150       | 150       | 100       | 100       | 100       | 75        | 75        | 75        |
| 30,000                 | –                             | –          | –          | –         | –         | –         | 200       | 200       | 200       | 150       | 150       | 150       | 150       | 100       | 100       |
| 40,000                 | –                             | –          | –          | –         | –         | –         | –         | –         | –         | 200       | –         | –         | 150       | 150       | –         |



**Table C-1: Minimum Recommended (6:1) Span Gain Table**

**TI-500-BW, TI-500-SSB, TI-500-SL**

| # of External Grads | Full Scale Input Range (mV/V) |     |            |            |            |            |            |           |           |           |           |           |           |           |           |
|---------------------|-------------------------------|-----|------------|------------|------------|------------|------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                     | 0.2                           | 0.4 | 0.6        | 0.8        | 1.0        | 1.2        | 1.4        | 1.6       | 1.8       | 2.0       | 2.2       | 2.4       | 2.6       | 2.8       | 3.0       |
| 500                 | 75                            | 50  | 25         | 25         | 25         | 25         | 25         | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        |
| 1,000               | 150                           | 75  | 50         | 50         | 25         | 25         | 25         | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        |
| 1,500               | 200                           | 100 | 75         | 50         | 50         | 50         | 25         | 25        | 25        | 25        | 25        | 25        | 25        | 25        | 25        |
| 2,000               | –                             | 150 | 75         | 75         | 50         | 50         | 50         | 50        | 25        | 25        | 25        | 25        | 25        | 25        | 25        |
| 2,500               | –                             | 200 | 100        | 75         | 75         | 50         | 50         | 50        | 50        | 50        | 50        | 25        | 25        | 25        | 25        |
| 3,000               | –                             | 200 | 150        | 100        | 75         | 75         | 50         | 50        | 50        | 50        | 50        | 50        | 50        | 25        | 25        |
| 4,000               | –                             | –   | 150        | 150        | 100        | 75         | 75         | 75        | 50        | 50        | 50        | 50        | 50        | 50        | 50        |
| <b>5,000</b>        | –                             | –   | <b>200</b> | <b>150</b> | <b>150</b> | <b>100</b> | <b>100</b> | <b>75</b> | <b>75</b> | <b>75</b> | <b>75</b> | <b>50</b> | <b>50</b> | <b>50</b> | <b>50</b> |
| 6,000               | –                             | –   | –          | 200        | 150        | 150        | 100        | 100       | 75        | 75        | 75        | 75        | 75        | 50        | 50        |
| 8,000               | –                             | –   | –          | –          | 200        | 150        | 150        | 150       | 100       | 100       | 100       | 75        | 75        | 75        | 75        |
| 10,000              | –                             | –   | –          | –          | –          | 200        | 200        | 150       | 150       | 150       | 150       | 100       | 100       | 100       | 75        |
| 12,000              | –                             | –   | –          | –          | –          | –          | 200        | 200       | 150       | 150       | 150       | 150       | 150       | 100       | 100       |
| 15,000              | –                             | –   | –          | –          | –          | –          | –          | –         | 200       | 200       | 200       | 150       | 150       | 150       | 150       |
| 20,000              | –                             | –   | –          | –          | –          | –          | –          | –         | –         | –         | –         | 200       | 200       | 200       | 150       |
| 30,000              | –                             | –   | –          | –          | –          | –          | –          | –         | –         | –         | –         | –         | –         | –         | –         |
| 40,000              | –                             | –   | –          | –          | –          | –          | –          | –         | –         | –         | –         | –         | –         | –         | –         |

**Table C-1a: Minimum Recommended (6:1) Span Gain Table**

## APPENDIX D: DISPLAYED ERROR CODES

| CODE                                                                                | MODE                               | MEANING / POSSIBLE SOLUTION                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | Normal Operating Mode              | Gross Overload. A weight greater than the rated capacity has been applied to the scale. Remove the weight from the platter or try re-calibrating the scale. Otherwise, check for a bad load cell connection or possible load cell damage due to overloading. |
| Err 0                                                                               | Span Calibration Mode (F17)        | Keyed-in weight value is larger than full-scale capacity. Use a smaller test weight or check keyed-in value.                                                                                                                                                 |
| Err 1                                                                               | Span Calibration Mode (F17)        | Keyed-in weight value is less than 1% of full-scale capacity. Use a larger test weight or check keyed-in value.                                                                                                                                              |
| Err 2                                                                               | Span Calibration Mode (F17)        | There is not enough load cell signal to produce the internal counts necessary to properly calibrate the scale. First check all load connections. Use F16 mode to view internal counts. See Appendix C for more information.                                  |
| Err 3                                                                               | All Modes                          | Non-volatile memory read error. One or more setup parameters have been lost.                                                                                                                                                                                 |
| Err 4                                                                               | All Modes                          | Non-volatile memory write error. Indicator needs service.                                                                                                                                                                                                    |
| Err 5                                                                               | Key-in Span Calibration Mode (F20) | You have attempted to enter a zero value for C1. Enter a known calibration value greater than zero.                                                                                                                                                          |
| Err 7                                                                               | Initialization                     | No reading from the ADC. Make sure there is a load cell(s) connected to the indicator at start-up.                                                                                                                                                           |
| Err 9                                                                               | Normal Operating Mode              | Span calibration value has been lost. Re-calibrate the scale.                                                                                                                                                                                                |
|  | Normal Operating Mode              | Indicates that the battery voltage is too low for normal operation. For alkaline battery units, replace the batteries. For rechargeable battery units, re-charge the battery.                                                                                |
| Flashes "bAtt"                                                                      | Normal Operating Mode              | Indicates that the battery voltage is too low for normal operation. For alkaline battery units, replace the batteries. For rechargeable battery units, re-charge the battery.                                                                                |



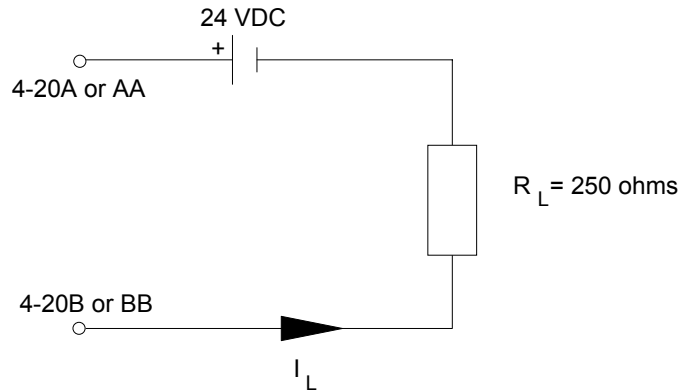
## APPENDIX E: INFORMATION ON 4-20 MA ANALOG OUTPUT

### GENERAL INFORMATION

Some models provide a passive analog 4-20 mA output on two terminals. These terminals are covered in Chapter 2 (see Section 2.2.5).

The output tracks the weight displayed on the indicator, so you must first have the indicator configured and calibrated correctly in order for it to work properly.

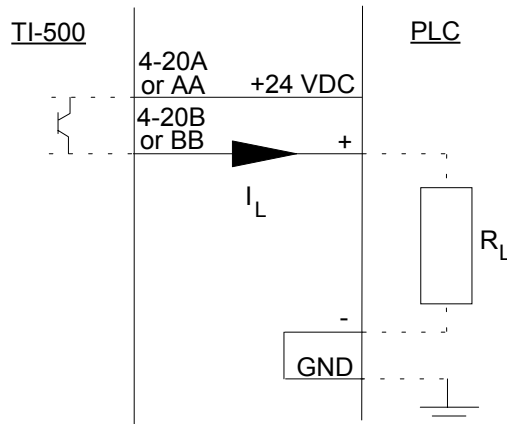
Here is a working connection diagram used at the factory to test:



**NOTE 1:** In your application, substitute the actual input device for  $R_L$ . If your input device is polarized, connect the common lead to the negative lead of the 24 VDC power supply and the positive lead to the BB wire.

**NOTE 2:** The 4-20A (AA) and 4-20B (BB) wires are not polarized. You may connect them in any manner you wish.

Here is a suggested connection diagram for a PLC:



**NOTE 1:** Do NOT connect the indicator ground to the PLC ground.

Here is how to test to see if it is working correctly:

1. Configure and calibrate the indicator to your load device. Ensure the weighing function is working properly.
2. Connect the AA and BB output wires to an external 24 VDC power supply and 250  $\Omega$  resistor as shown in the above test diagram.
3. When the indicator is displaying zero, the output should be 4 mA. Since  $V=IR$ , you should measure 1 VDC across  $R_L$ .
4. When the indicator is displaying the full-scale load, the output should be 20 mA. Again, since  $V=IR$ , you should measure 5 VDC across  $R_L$ .

Here is how you fine-tune the output using F23:

1. Enter the Setup Menu and scroll to F23. For directions on entering the Setup Menu, see Chapter 3 of the manual.
2. Push the down (ZERO) key once. The indicator outputs 4 mA and displays a number.
3. While monitoring the voltage across  $R_L$ , use the right (PRINT) or left (TARE) keys to change the displayed value until the measured voltage is exactly 1 VDC.
4. Press the SET (Net/Gross) key to save. The indicator outputs 20 mA and displays another number.
5. While monitoring the voltage across  $R_L$ , use the right (PRINT) or left (TARE) keys to change the displayed value until the measured voltage is exactly 5 VDC.
6. Press the SET (Net/Gross) key to save and revert back to F23.