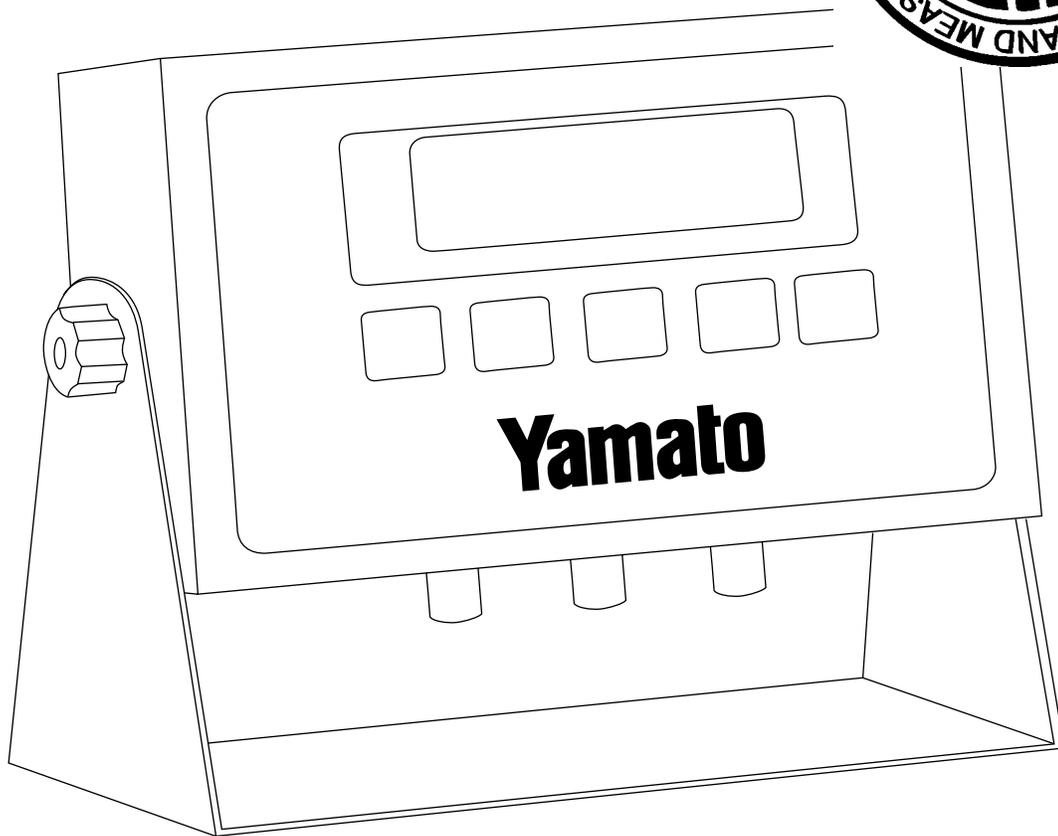


## OPERATING AND SETUP INSTRUCTIONS



# Yamato

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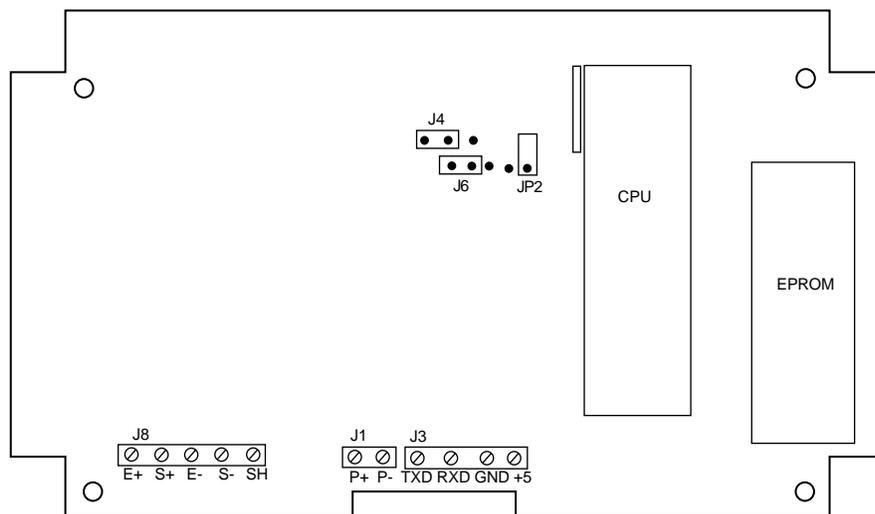
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The DPI-500 is a multipurpose indicator, which is NTEP approved at 5000 divisions. This indicator is housed in stainless steel and meets all NEMA 4X standards. The large 0.75" display is easy to see from a distance and is capable of showing up to 50,000 divisions. The DPI-500 also supplies enough current to drive eight 350Ω load cells.

All system and user keyword parameters can be changed through the front panel, including calibration.

The DPI-500 has two RS-232C communication modes: full duplex and Gross/Net/Tare. Place the indicator in full duplex mode for communicating with a computer or a remote display. The unit can transmit on demand or continuously. Place the indicator in Gross/Net/Tare mode for connecting directly to a printer.

## Installation and Wiring

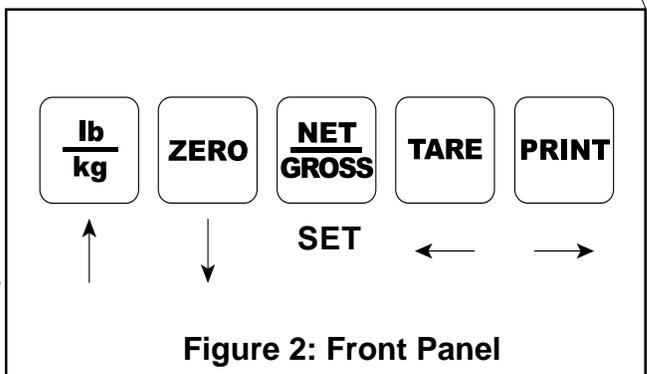


**Figure 1: CPU Board Layout**

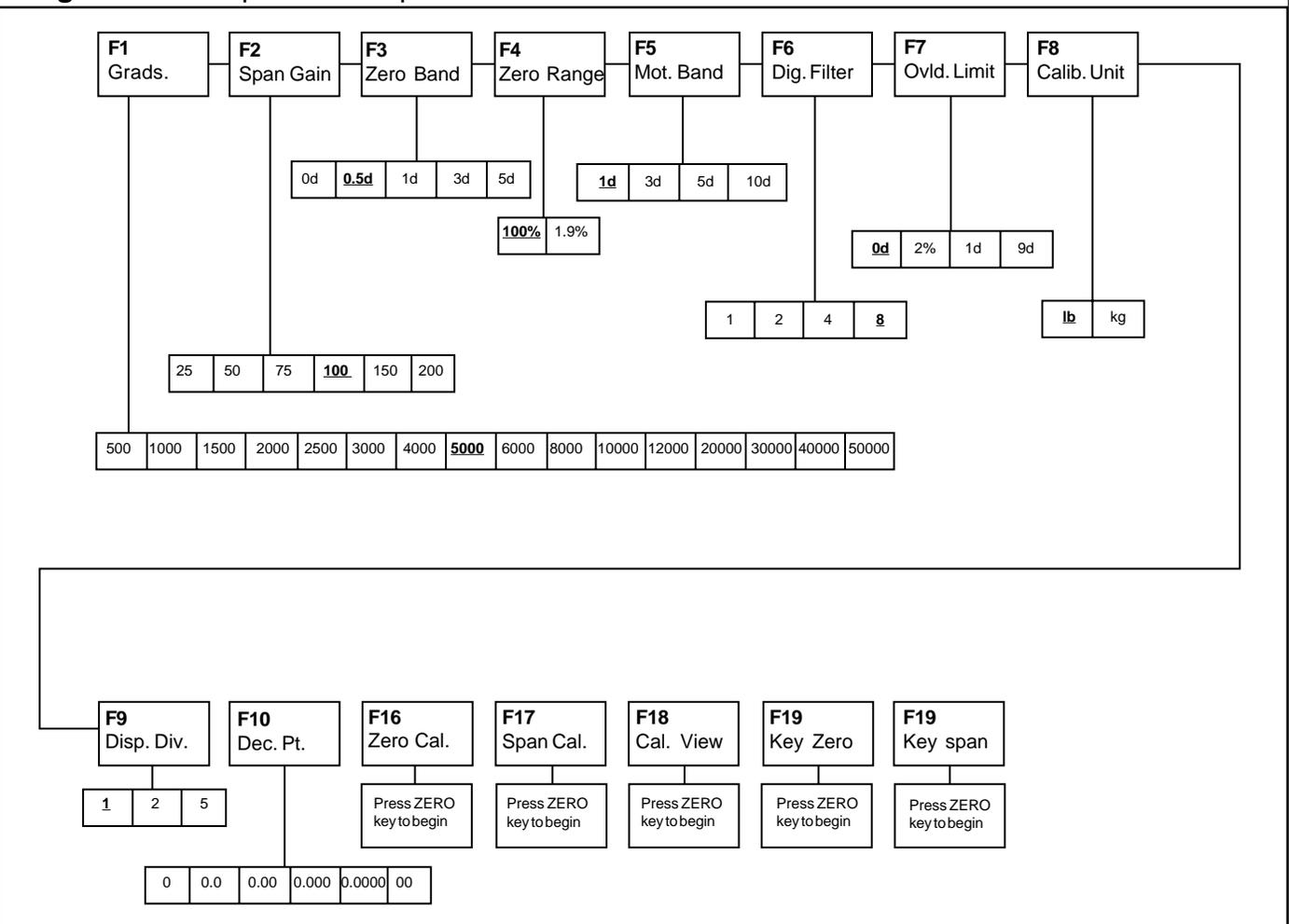
A crude layout of the DPI-500 circuit board is shown in **Figure 1**. This layout shows the major components, as well as the input and output terminal blocks. The inputs and outputs consist of a load cell terminal (J8), DC power supply terminal (J1), and a serial communications terminal (J3).

## To Place the Indicator in System Keyword Setup Mode

- 1) Remove the back cover from the indicator.
- 2) Place the shunt block across both pins of JP2.
- 3) Apply power to the indicator. The display will show keyword "F 1" which indicates that the unit is in the System Keyword Setup Mode. **Figure 2** shows the functions for each of the front panel keys in this mode.



**Figure 3** is a map of the setup menu.



**Figure 3: System Keyword Setup Mode Menu**

## To Place the Indicator in User Keyword Setup Mode

- 1) Turn the unit off. (Do not place the shunt block across both pins of JP2)
- 2) While holding down the lb/kg key, turn the power back on.

- 3) The display will show "A 1" to indicate that the unit is in User Keyword Setup Mode. The front panel keys work exactly as in the System Keyword Setup Mode. See **Figure 4** for a map of this setup menu.
- 3) The display will momentarily show "CAL 0" followed by a value. This value is the *zero calibration value* and should be recorded. Press any key to continue.
- 4) The display will momentarily show "CAL 1" followed by a value. This value is the *span calibration value*. Press any key to return to keyword F18.

### To Key-in the Zero Calibration Value

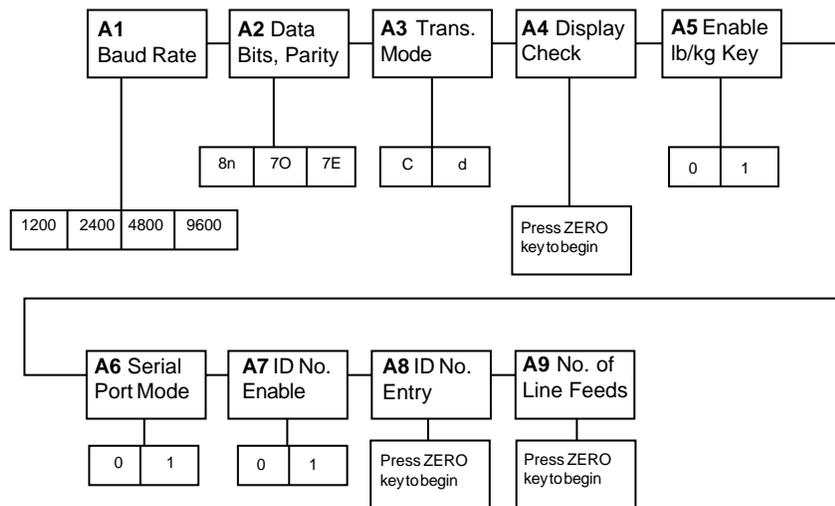
Please note that this procedure is intended for emergency use, only in the case of nonvolatile memory loss. A proper zero value, obtained from a successful zero calibration procedure, must be used.

- 1) While in the *System Keyword Setup Mode* scroll to keyword F19.
- 2) At keyword F19, scroll down once using the **ZERO** key.
- 3) The display will momentarily show "CAL 0", followed by a flashing zero. Use the front keypad directional keys, as shown in **Figure 2** on page 4, to change the displayed value to the proper zero calibration value.
- 4) After setting the value, press the **NET/GROSS** key to save the value.
- 5) The display will momentarily show "E CAL 0" and then return to keyword F19.

### To Key-in the Span Calibration Value

Please note that this procedure is intended for emergency use, only in the case of nonvolatile memory loss. A proper span value, obtained from a successful span calibration procedure, must be used.

- 1) While in the *System Keyword Setup Mode*, scroll to keyword F20.
- 2) At keyword F19, scroll down once using the **ZERO** key.
- 3) The display will momentarily show "CAL 1", followed by a flashing zero. Use the front keypad directional keys, as shown in **Figure 2** on page 4, to change the displayed value to the proper span calibration value.
- 4) After setting the value, press the **NET/GROSS** key to save the value.
- 5) If the entered value is greater than zero, the display will momentarily show "E CAL 1" and then return to keyword F19. If a zero value is entered, then the display will momentarily show "Err 5" and then revert to the display in step 3 of this procedure.



**Figure 4: User Keyword Setup Mode Menu**

### To Return to Weighing Mode

- 1) Turn the indicator off. If the unit was in the System Keyword Setup Mode, remove the shunt from both pins of JP2.
- 2) Turn the indicator on.

## Calibration

The DPI-500 is calibrated through *System Keywords* F16 and F17. Each keyword will save a value into the nonvolatile memory of the indicator. F16 sets the zero (dead load) value and F17 sets the span (full scale) value. After the two keywords are set successfully, the user needs to record both calibration values, which can be viewed at keyword F18.

In the rare event that the calibration values are lost, the user can input these calibration values at keywords F19 and F20. This eliminates the use of using test weights to recalibrate the weighing system.

### To Set the Zero Point:

- 1) If the DPI-500 is not in the *System Keyword Setup Mode*, enter it following the procedure on the top of page 4.
- 2) Once in this mode, scroll to keyword F16 (please refer to **Figure 3** on page 4).
- 3) At F16, scroll down once, using the **ZERO** key. The display will momentarily show "C 0" followed by a value. This value is the internal A/D count.

- 4) Make sure that there is no load on the platform and then press the **ZERO** key to zero the value.
- 5) Press the **NET/GROSS** key to save the zero point value into memory.
- 6) The display will show "EndC0" momentarily, then return to "F 16". Now scroll to keyword F17 to complete the span calibration.

### To Calibrate the Span

- 1) While in the *System Keyword Setup Mode*, scroll to keyword F17.
- 2) At keyword F17, scroll down once, using the **ZERO** key. The display will momentarily show "C 1" followed by a value with one flashing digit. This value will be zero with the decimal point set to the value set in keyword F10. Place test weights on the platform equalling full scale capacity.
- 3) Use the keypad (see **Figure 2** on page 4) to adjust the displayed value to the test weight value. Increase the flashing digit by pressing the **lb/kg** key. Decrease the flashing digit by pressing the **ZERO** key. The position of the flashing digit is changed by either the **PRINT** key or the **TARE** key.
- 4) After the value is set, press the **NET/GROSS** key to save the value.
- 5) If the procedure was a success, the display will show "EndC1" momentarily, and then revert to "F 17". Please record the calibration value at this time for future use.
- 6) If the calibration was not successful, an error message will appear on the display. Take the shown action to correct the error and then recalibrate the system.

"Err0"- The calibration test weight or the adjusted keyed-in weight is larger than the full capacity of the scale. Change the 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 test weight or 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.

### To Record the Calibration Values through the F18 Keyword

Please note that the values displayed from this keyword are only valid after a successful calibration has been performed.

- 1) While in the *System Keyword Setup Mode*, scroll to keyword F18.
- 2) At keyword F18, scroll down once, using the **ZERO** key to enter the View Calibration menu.

## Determining Proper Span Gain

The span gain parameter, accessed from keyword F2 in the *System Keyword Setup Mode*, is directly related to the analog to digital integration time. Therefore, the lower the span gain number, the higher the measurements per second. Disregarding the digital filter length, a span gain of 25 produces about 25 to 30 measurements per second, while a span gain of 200 produces only 3 or 4 measurements per second.

There are two steps for determining the span gain value to use in the Setup Menu for F2. The first involves looking up a value in the table below, saving that value, and then calibrating the system.

If the first step does not yield a successful calibration, then the second step allows the technician to view the internal counts to determine the proper span gain value and to check for linearity.

### To Determine the Initial Span Gain Value

- 1) Determine the number of desired external graduations and choose the corresponding value under the number closest to your full scale input range in mV.
- 2) Enter the *System Keyword Setup Mode*, and save this number at keyword F2.
- 3) Perform the calibration procedure. If the calibration is unsuccessful, or you wish to view the internal counts, complete the next procedure.

### To View the Internal Counts

- 1) Enter keyword F16 and perform the first three steps of the zero calibration shown on page 5. **DO NOT SAVE THE ZERO POINT VALUE!**
- 2) After pressing zero to zero any offset, place the test weight on the platform.
- 3) The displayed count is the internal count. At full scale capacity, the internal count should be a minimum of 2 times the desired external graduations. For maximum stability, a ratio of 5:1 or greater is recommended.
- 4) If the internal count is high enough, remove the test weight, re-zero the indicator, and continue on with calibration. If the internal count is not high enough, increase the span gain to the next highest choice and recalibrate.

**Table 1: Span Gain Table 5:1**

# of External Graduations	Full Scale Input Range (mV/V)							
	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00
500	25	25	25	25	25	25	25	25
1000	50	25	25	25	25	25	25	25
1500	50	25	25	25	25	25	25	25
2000	75	50	25	25	25	25	25	25
2500	100	50	50	25	25	25	25	25
3000	100	50	50	25	25	25	25	25
4000	150	75	50	50	25	25	25	25
5000	200	100	75	50	50	50	25	25
6000	200	100	75	50	50	50	50	25
8000	-	150	100	75	50	50	50	50
10000	-	200	150	100	75	75	50	50
12000	-	200	150	100	75	75	75	50
20000	-	-	-	200	150	150	100	100
30000	-	-	-	-	200	200	150	150

## RS-232 Communications

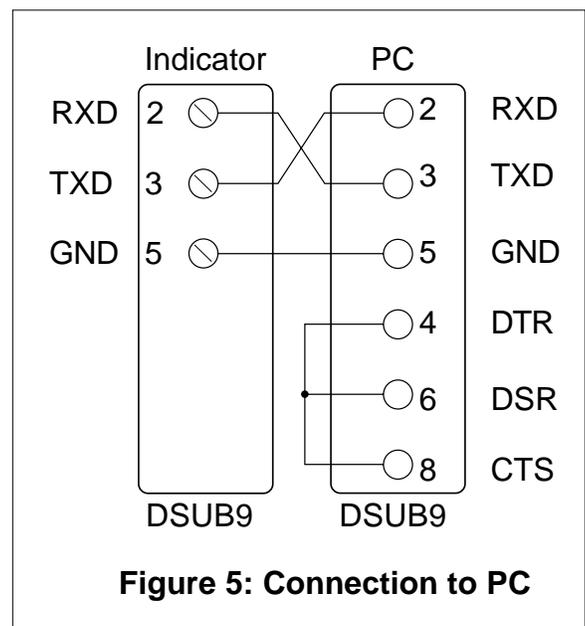
The DPI-500 can communicate with a printer, computer, or remote display via a full duplex, ACSII compatible RS-232 terminal. There are two modes of operation, which can be changed via user keyword A6: Full Duplex Mode and Gross/Net/Tare Print Mode.

### Full Duplex Mode

The Full Duplex Mode provides both Continuous and Demand serial transmission. The Continuous Mode is used to interface computers, scoreboards, and other remote devices requiring constant data updates. Transmission occurs at the end of each display update.

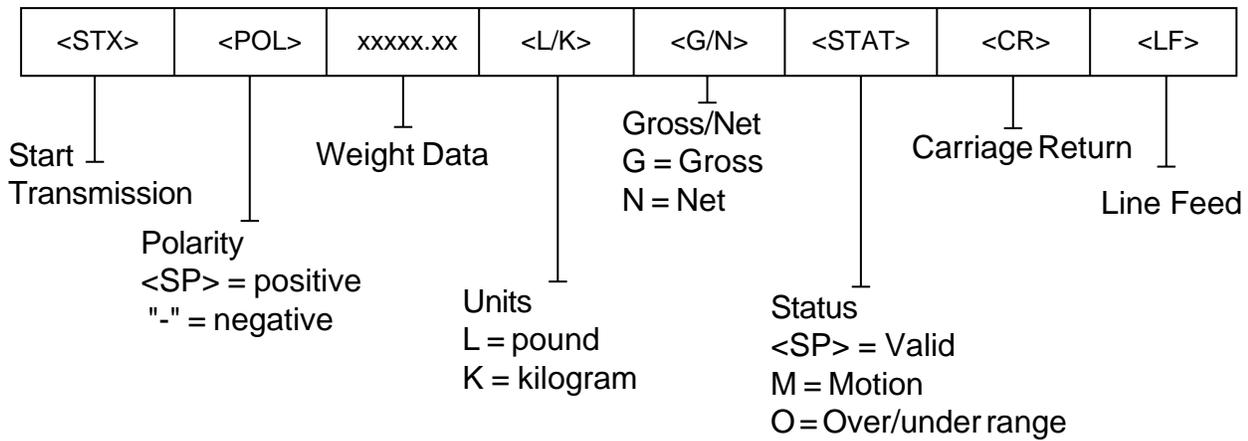
The Demand Mode allows control from a host device, usually a PC, and can be activated by pressing the **PRINT** key on the front face.

**Figure 5** shows the suggested cable diagram for interface to a PC. **Figure 6** shows the serial data format for Continuous Mode while **Figure 7** shows the serial data format for the Demand Mode.

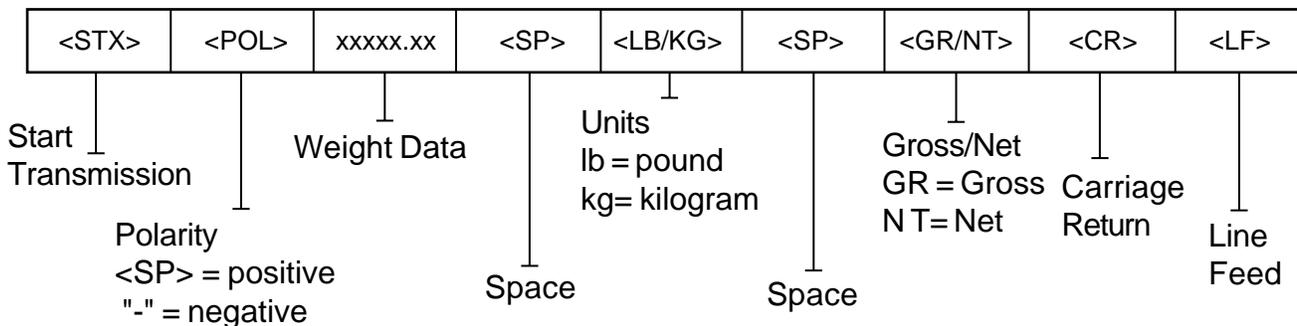


**Figure 5: Connection to PC**

## RS-232 Communications (cont.)



**Figure 6: Serial Data Format for Continuous Mode**



**Figure 7: Serial Data Format for Demand Mode**

1) Recognized host commands:

- "P" = Print
- "Z" = Zero the scale
- "T" = Tare the scale
- "G" = Change to Gross Mode
- "N" = Change to Net Mode
- "C" = Change displayed units

## RS-232 Communications (cont.)

### 2) Restrictions for transmission:

"P" - Will not respond if a) scale is in motion; b) positive overload; c) negative overload; d) negative gross weight; or e) scale is in "Display Check Mode".

"Z" - Will not respond if a) scale is in motion; b) scale is not in gross mode; or c) scale is not within zero capture range.

"T" and "G"- Will not respond if a) scale is in motion; or b) scale is not in net mode.

"N" - Will not respond if a) scale is in motion; or b) scale is not in gross mode.  
Will send the "Invalid" format when a) scale is in motion; b) under zero; or c) over capacity.

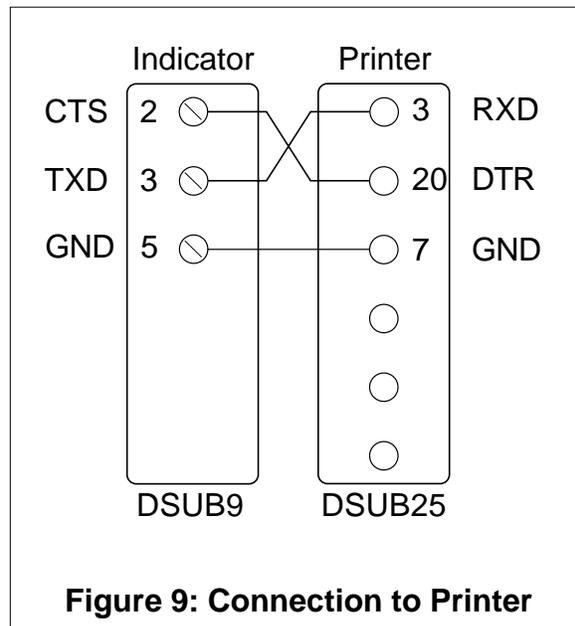
### Gross/Net/Tare Print Mode

The Gross/Net/Tare Print Mode is designed for use with a printer. **Figure 8** shows the fixed format of the print ticket. For printers with limited buffers, this mode supports the DTR pin handshaking which can be wired to the indicator's RXD pin which then functions as a CTS pin. This mode allows the printout of a 6-digit ID number which can be entered via the User Menu. **Figure 9** shows a suggested cable diagram for interfacing to a serial printer which supports the DTR pin (refer to the printer's manual).

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

**Figure 8: Print Ticket**

\*Please note that the TARE and NET fields are blank when a tare has not been established in the system.\*



## RS-232 Communications (cont.)

**To Enter a New ID Number**

- 1) While in the *User Keyword Setup Mode*, scroll to keyword A8.
- 2) At keyword A8, scroll down once by pressing the **ZERO** key.
- 3) The display will momentarily show "ID NO", followed by the current value with one flashing digit.
- 4) Use the front keypad to change the value.
- 5) Press the **NET/GROSS** key to save the value.
- 6) If the ID number entry was a success, the display will show "SET" and then return to keyword A8.

**To Enter Line Feeds**

- 1) While in the *User Keyword Setup Mode*, scroll to keyword A9.
- 2) At keyword A9, scroll down once by pressing the **ZERO** key.
- 3) The display will momentarily show "LF", followed by the current value with one flashing digit.
- 4) Use the front keypad to change the value.
- 5) Press the **NET/GROSS** key to save the value.
- 6) If the line feed number entry was a success, the display will show "SET" and then return to keyword A9.

## Appendix A: System and User Keyword Descriptions

### System Keyword Descriptions:

Keyword	Description	Value	
F1 Graduations	Specifies the number of full scale graduations. Value should be consistent with legal requirements and environmental limits.	500 1,500 2,500 4,000 6,000 10,000 20,000 40,000	1,000 2,000 3,000 <b>5,000</b> 8,000 12,000 30,000 50,000
F2 Span Gain	Span gain is related to A/D integration time. The larger the span gain, the higher the internal resolution, but a slower update speed.	25 75 150	<b>50</b> 100 200
F3 Zero Track Band	Selects the range within which the scale will automatically zero. Note that the scale must be stable to automatically zero. Values are shown in display divisions.	0d 1d 5d	<b>0.5d</b> 3d
F4 Zero Range	Selects the range within which the scale may be rezeroed. The scale must be stable for zeroing to take place.	<b>100%</b>	1.9%
F5 Motion Band	Sets the level at which motion is detected by comparing the current display update with the previous one. If motion is not detected for two seconds or more, scale is stable and can process a PRINT or ZERO command. Max. value varies depending on regulations.	1d 5d	<b>3d</b> 10d
F6 Digital Filter	Averages weight readings to increase accuracy. The larger the filter value, the greater the accuracy, but a slower response time. Choose 4 or 8 unless speed is on the essence.	1 4	2 <b>8</b>
F7 Overload Limit	Selects the desired overload limit. All selections are based on the unit chosen in keyword F8.	FS FS + 1d	<b>FS + 2%</b> FS + 9d
F8 Calibration Unit	Selects the units in which the scale is to be calibrated. The selected unit is also the default unit in normal weighing operation. "1" = lb; "2" = kg	1	2
F9 Display Divisions	Determines the desired weight increments.	1 5	2
F10 Decimal Point	Determines the decimal point position.	<b>0</b> 0.00 0.0000	0.0 0.000 00
F16 Zero Calibration	Places indicator into zero calibration. Scroll down by pressing the <b>ZERO</b> key to start calibration.	Press ZERO key to begin sequence	
F17 Span Calibration	Places the indicator into span calibration. Scrolling down with the <b>ZERO</b> key one level begins the procedure.	Press ZERO key to begin sequence	
F18 View Calibration	Actuates the function which allows user to view both zero and span calibration value. Values are valid only after calibration is successfully completed in F16 and F17.	Press ZERO key to begin sequence	
F19 Key-in Zero	Allows user to key-in known zero calibration value in case of memory loss in the field.	Press ZERO key to begin sequence	
F20 Key-in Span	Allows user to key-in known span calibration value in case of memory loss in field.	Press ZERO key to begin sequence	

Please note that factory settings are shown in bold face.

## User Keyword Descriptions:

Keyword	Description	Value	
<b>A1</b> Baud Rate	Select the baud rate for transmission through the serial port.	1200 4800	<b>2400</b> 9600
<b>A2</b> Data Bits and Parity	Selects number of data bits and parity for serial port transmission.	<b>8n</b> 7E	7O
<b>A3</b> Serial Transmission Mode	Selects the type of serial mode transmission. "C" = Continuous mode; Send data continuously. "d" = Demand mode; Send data on PRINT command from computer, printer, indicator.	<b>C</b>	d
<b>A4</b> Display Check	Actuates the function which checks all display digits.	Press ZERO key to begin sequence	
<b>A5</b> Disable the lb/kg Key	Allows user to disable the lb/kg key. "0" = disable "1" = enable	0	<b>1</b>
<b>A6</b> Serial Port Mode	Selects the mode of the RS-232C serial port. "0" = full duplex mode "1" = Gross/Net/Tare print mode	<b>0</b>	1
<b>A7</b> ID No. Enable	Allows the ID No. to be disabled in the Gross/Net/Tare printout. Valid only when <b>A6</b> is set to "1". "0" = disable "1" = enable	0	<b>1</b>
<b>A8</b> ID No. Entry	Actuates the function which allows the 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 once starts the sequence.	<b>0</b> - 199999	
<b>A9</b> No. of Line Feeds	Actuates the function which allows entry of the desired number of line feeds to be printed after the Gross/Net/Tare printout. Valid only when <b>A6</b> is set to "1". Pressing the <b>ZERO</b> key to scroll down once starts the sequence.	<b>0</b> - 99	

## Appendix B: Error Codes

Error	Where it Occurs	Meaning
□□□□□□	Normal Weighing Mode	Gross overload.
Err 0	Span Calibration Mode (F17)	Keyed-in weight value in Calibration Procedure is less than 1% of full scale capacity.
Err 1	Span Calibration Mode (F17)	Keyed-in weight value in Calibration Procedure is larger than full scale capacity.
Err 2	Span Calibration Mode (F17)	Internal resolution is not high enough to process keyed-in weight value in Calibration Procedure.
Err 3	All Modes	Diagnostics check error - EEPROM Read
Err 4	All Modes	Diagnostics check error - EEPROM Write
Err 5	Key-in Span Calibration Mode (F20)	Attempted to key-in zero for C1.
Err 7	Initialization	No reading from analog to digital converter.
Err 9	Normal Weighing Mode	Span calibration lost.

## Appendix C: Specifications

### Analog Specifications

Full Scale Input Signal	30 mV, including dead load
Minimum Sensitivity	0.4 V / grad
Input Impedance	30 MΩ, typical
Internal Resolution	260,000 counts
Display Resolution	30,000 dd
Measurement Rate	10 Meas / sec, nominal
System Linearity	Within 0.02% of FS
Calibration Method	Software Calibration
Excitation Voltage	+10 VDC, 8 x 350Ω load cells

### Digital Specifications

Microcomputer	Intel 80C32
Program Memory	32K x 8
EEPROM	64 x 16
Digital Filtering	selectable from software

### Serial Communications

Serial Port	Full Duplex, 1200, 2400, 4800, 9600 Baud 8 data bits, no parity 7 data bits, even parity 7 data bits, odd parity
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### User Interface

Display	0.56" (14 mm) 7-segment, LED, 6 digit
Additional Markings	Net, Gross, Stable, Tare, lb, kg, Zero
Keyboard	5-key flat membrane panel

### Power

AC Adaptor	12 VDC @ 650 mA
Power Consumption	200 mA + 30 mA per LC

### Environmental

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

### Mechanical

Dimensions	5.5" x 8.9" x 2.8" (140mm x 225mm x 72mm)
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