8140

Technical Manual

INTRODUCTION

This publication is provided solely as a guide for individuals who have received METTLER TOLEDO Technical Training in servicing the METTLER TOLEDO product.

Information regarding METTLER TOLEDO Technical Training may be obtained by writing to:

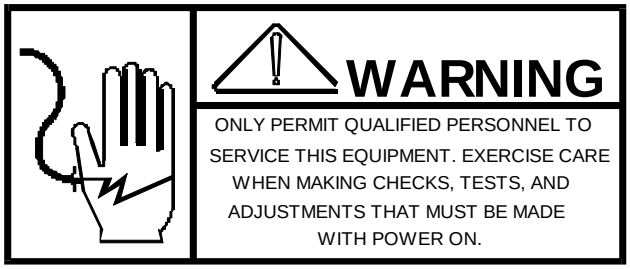
METTLER TOLEDO
Training Center
P.O. Box 1705
Columbus, Ohio 43216
(614) 438-4400

PRECAUTIONS

- **READ this manual before operating or servicing this equipment.**

- **ALWAYS REMOVE POWER and wait at least 30 seconds BEFORE connecting or disconnecting any internal harnesses. Failure to observe these precautions may result in damage to, or destruction of the equipment.**

- **ALWAYS take proper precautions when handling static sensitive devices.**



- **DO NOT connect or disconnect a load cell scale base to the equipment with power connected or damage will result.**

- **SAVE this manual for future reference.**

- **DO NOT allow untrained personnel to operate, clean, inspect, maintain, service, or tamper with this equipment.**

- **ALWAYS DISCONNECT this equipment from the power source before servicing.**

- **CALL METTLER TOLEDO for parts, information, and service.**

CONTENTS

TABLE 1

Factory Number	Enclosure	Main PCB Part No.	Main PCB Revision	Load Cell Excitation
8140-0001	Desk	12275100A	ALL	15vDC
8140-0002	Desk	12563200A	ALL	15vDC
8140-0004	Desk*	12563500A	ALL	15vDC
8140-0005	Desk*	12275200A	ALL	15vDC
8140-0008	Desk*	12709500A	ALL	15vDC
8140-0011	Wall	12275100A	ALL	15vDC
8140-0012	Wall	12563200A	ALL	15vDC
8140-0014	Wall*	12563500A	ALL	15vDC
8140-0015	Wall*	12275200A	ALL	15vDC
8140-0017	Wall	12709500A	ALL	15vDC

TABLE 2

Factory Number	Enclosure	Main PCB Part NO.	Main PCB Revision	Load Cell Excita-tion
8140-1101	Desk	12665900A	O, A, B	12.5vDC
8140-1002	Desk	12666000A	O, A. B	12.5vDC
8140-1004	Desk*	12665900A	O, A, B	12.5vDC
8140-1006	Desk	12666200A	O, A	5.0vDC
8140-1009	Desk	12665900A	O, A, B	12.5vDC
8140-1011	Wall	12665900A	O, A, B	12.5vDC
8140-1012	Wall	12666000A	O, A, B	12.5vDC
8140-1014	Wall*	12665900A	O, A, B	12.5vDC
8140-1016	Wall	12666200A	O, A	5.0vDC
8140-1019	Wall	12665900A	O, A. B	12.5vDC

TABLE 3

Factory Number	Enclosure	Main PCB Part No.	Main PCB Revision	Load Cell Excitation
8140-1001	Desk	12665900A	C and later	12.5vDC
8140-1002	Desk	12666000A	C and later	12.5vDC
8140-1004	Desk*	12665900A	C and later	12.5vDC
8140-1006	Desk	12666200A	B and later	5.0vDC
8140-1009	Desk	12665900A	C and later	12.5vDC
8140-1011	Wall	12665900A	C and later	12.5vDC
8140-1012	Wall	12666000A	C and later	12.5vDC
8140-1014	Wall*	12665900A	C and later	12.5vDC
8140-1016	Wall	12666200A	B and later	5.0vDC
8140-1019	Wall	12665900A	C and later	12.5vDC

*** These versions are designed to reduce RFI susceptibility.**

I. GENERAL DESCRIPTION

The Model 8140 electronic digital indicator is intended for use with strain gauge load cell scales. The 8140 provides display of gross or net scales. The 8140 provides display of gross or net weights up to six digits. The unit is available in either a plastic or stainless steel enclosure which can be mounted to a desk, wall or column. A data output option provides the ability to transmit weight information to a printer or compatible accessory device in bit serial ASCII code, even parity, 20 mA current loop or EIA RS-232-C. The baud rate is selectable at 300, 1200, 2400, 4800 or 9600 baud on demand or 2400, 4800 or 9600 baud continuous output.

FEATURES

- **Selectable Increments from 1000, 2000, 2500, 3000, 4000, 5000, 6000, 8000, and 10,000.**
- **Keyboard Calibration and Functional Setup.**
- **Displays Gross or Net Weighty in either pounds (lb) or kilograms (kg).**
- **Pushbutton lb/kg switching.**
- **Six character 0.5" high vacuum fluorescent type display, green-blue in color.**
- **Available in a dust resistant case which may be placed on a desk or mounted to a wall.**
- **A NEMA 4x stainless steel wall mount enclosure is an option which can be post mounted or desk mounted.**
- **Automatic Zero Maintenance for weight variations less than 0.1 increment per second, (up to plus or minus 2% of scale capacity from zero).**
- **Pushbutton Zeroing.**
- **Digital Filtering to help compensate for vibration or motion on the scale.**
- **Analog Verification tests the integration circuitry.**
- **Under Zero Display Blanking with a minus sign showing.**
- **Over Capacity Blanking at 5 increments over selected full scale capacity.**

II. SYSTEM DESCRIPTION

The 8140 consists of three (3) major blocks. These are:

1. **Transformer - Steps down voltage from an AC source to smaller magnitude voltages to be sent to the Control PCB.**

2. **Control PCB - Contains power supplies, scale logic, program selection switches, load cell connections and fluorescent display.**

3. **Keyboard - Allows operator interface for functions such as Tare, Clear, Zero, LB/KG Selection, Print, and Test.**

There is an optional data output K.O.P. or Pod which allows a 20 ma current loop or EIA RS 232-C output.

Excitation current is provided for up to a 4-320 ohm load cells or for a load as low as 87 ohm total. The maximum load cell cable distance is 1000 feet using 16 gauge load cell cable. Toledo Scale load cell cable is recommended to eliminate cross talk that my cause an unstable display.

The excitation voltage, provided for the load cells, will vary depending upon the Factory Number and which Main PCB is used. Reference tables 1,2, and 3 on page 1 for further information. The initial range is adjustable from 0 to 20 mV on all 8140's. The span range is adjustable from 5mv to 35 mV on units found in Table 1 and from 7.5 to 45mv on units in Tables 2 and 3.

III. SPECIFICATIONS

A. ELECTRICAL AND PHYSICAL SPECIFICATIONS

1. ENVIRONMENT

The 8140 operates from -10 C (14 F) to + 40 C (104 F) at 95 % relative humidity, non-condensing. Zero Temperature Coefficient is 0.25 µV/ C maximum. The span temperature coefficient is 12 PPM / C maximum.

2. POWER REQUIREMENTS

The model 8140 can operate (by selection) at 120V, 220V or 240V AC (+ 10%, -15%) at a line frequency form 49 to 61 Hz. Power consumption is 15 watts maximum.

The line voltage must be within these specifications and voltage measured between neutral and ground at the power outlet should be less than 0.1 VAC. the power line for the 8140 should not be shared with equipment that generates line noise (Such as motors, relays, heaters, etc.) If adverse power conditions exist, a power line conditioner may be required.

CAUTION: ALL UNITS ARE SHIPPED FOR 120V A-C OPERATION. REFER TO SECTION 4 FOR ALTERNATE VOLTAGE OPERATION.

3. UL AND C.S.A. STANDARDS

Materials, components, and electrical design comply with UL and C.S.A. standards and requirements including grounding of all metal parts, fusing, etc.

4. FCC REGULATIONS

The 8140 meets or exceeds the FCC conducted and radiated emissions requirements.

5. RFI SPECIFICATIONS

In environments where high RFI radiation exists, special versions of the 8140 should be used. These models have been designed to greatly reduce susceptibility to Radio Frequency Interface. The plastic enclosure has been internally coated with a conductive layer and has an RFI filtered load cell connector and a conductive display lens added. The stainless steel enclosure has a conductive gasket and an RFI filtered load cell connector and a conductive display lens added. These versions do not fluctuate more than one increment given the following conditions:

Field Strength	Frequencies
3 volts per meter	27, 169 and 460 MHz
4 watts at 2 meters	27 and 460 MHz

All RFI protected versions are noted with an asterisk in Tables 1, 2 & 3 on p.1 of this Technical Manual.

6. APPEARANCE AND DIMENSIONS

The color of the Model 8140 is charcoal black with green-blue display and gray display lens. The two piece plastic case used is 7.1' tall (18 cm) x 11.8 wide (30 cm) x 3" deep (7.7 cm), and can be desk mounted or wall mounted by the use of a reversible bracket. The stainless steel NEMA 4 enclosure is 11.25" high (28.58 cm) x 13.88" wide (35.26 cm) x 5.5" deep (14 cm) and can be wall mounted or column mounted. The desk and wall model weigh approximately 4.6 lb. (2.1 kg) and 18.2 lb. (8.3) kg respectively.

B. INTERNAL FUNCTIONS

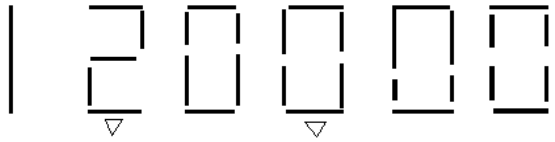
The 8140 contains the necessary electronics, except the load cell(s), to calculate and display weight. The instrument receives the microvolt signal from the cell(s), amplifies it then filters and converts it to a digital signal in the integrator.

C. DISPLAY FORMAT

The display is a green-blue, vacuum fluorescent, six character (6 digits or 5 digits and a minus sign) with lighted decimal point. There are lighted descriptors above the Zero, LB, KG, Gross, Net and Print legends.

> **NOTE: The 8140 cannot display a negative six digit net weight with a minus sign since it only has six display digits. If a negative six digit net weight occurs, the display will blank with the net cursor lit. The proper data will be printed.**

Sample display:



Zero LB KG Gross Net Print

D. DATA INTERFACE

The 8140 is capable of transmitting TTL logic level data at 300 to 9600 baud selectable through the keyboard. An optional data output interface PCB may be connected to allow conversion to a 20 mA current loop or EIA RS-232-C output.

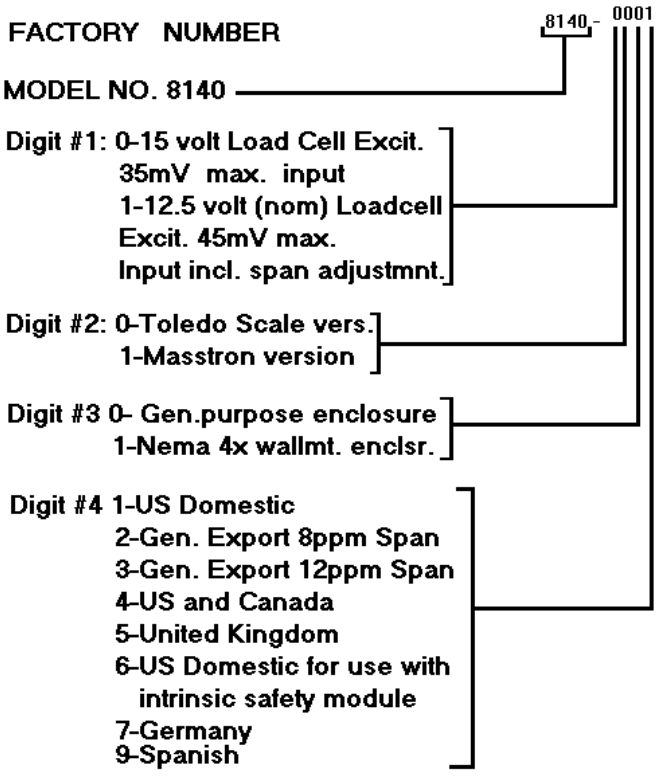
1. DEMAND OPERATION - 300 TO 9600 BAUD

When a print command is received, either from the Print key or an external "Print Demand" signal, the 8140 will output a message formatted by setup selections through the keyboard. (See output tables, Section 7) Transmission of a checksum character is selectable as is expanded print format. Scale motion, expanded display mode, under zero or over capacity operation will disable a print command.

2. CONTINUOUS OPERATION - 2400 TO 9600 BAUD

The data is transmitted every display update, approximately eight times each second. See output tables, Section 7 for format. A checksum character is always transmitted.

E. FACTORY NUMBER GUIDE



*** These versions are designed to reduce RFI susceptibility.**

IV. INSTALLATION INSTRUCTIONS

A. PRELIMINARY INSPECTION

1. **Inspect the outer case for loose or damaged parts. If any damage is found, immediately notify the freight carrier.**

2. **Open the instrument and continue the inspection, noting that all interconnecting harnesses are securely fastened.**

a. The plastic enclosure is opened by inserting a flat bladed screwdriver into the two notches in their rear cover and lifting until the catches are released. Pull the top of the front cover out until the bottom tabs clear the rear cover. Be careful not to damage the keyboard harness.

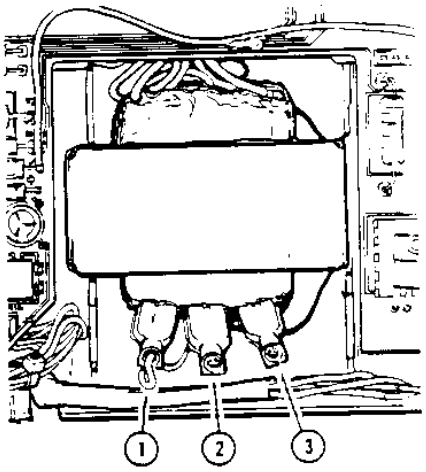
b. The NEMA 4x enclosure is opened by flipping the wing-type handle on the fastener out and twisting counter clockwise 180 . Loosen the six fasteners on the left side. The two fasteners at the left are used as hinges and should be loosened last and at the same time.

NOTE: Certain versions of the 8140 NEMA 4x enclosures have an 11/16" hex head retainer in the lower left position instead of a wing-type handle.

3. **Check the power connection to the transformer to insure the proper voltage has been selected for use in your area.**

Be sure to reinstall spade connection covers after changing the voltage selection.

WARNING: DISCONNECT POWER BEFORE MAKING ANY ADJUSTMENTS TO THE TRANSFORMER FOR VOLTAGE CHANGES.



a. **Connect the wire here for 120 VAC operation.**
b. **Connect the wire here for 220 VAC operation.**
c. **Connect the wire here for 240 VAC operation.**

CAUTION: CHECK TO BE SURE FUSE HAS BEEN REPLACED WITH FUSE OF CORRECT RATING. THE PROPER SLO-BLO FUSE VALUES ARE.

OPERATION	RATING	PART NUMBER
120V	0.2A	12483400A
220V	1\8A	09591900A

4. If a printer interface is to be installed, do so at this time. See Section 7.

5. Connect the 8140 to the base or loadcell it will be used with. Reference Section 7 for details on connections.

6. Preliminary Calculations

Before connecting the 8140 to an understructure it should be determined if the load cell(s) are of a size that will work correctly with the instrument and platform. If it is a standard build, proceed with the installation of the scale. However, if it is a special build or if it is a conversion of an existing mechanical scale, the microvolt per increment should be calculated. Calculate the microvolts per increment, then check with the chart to make sure the proposed load cell (s) are the correct size.

a. To find the microvolt per increment build, you must first find:

- **i. Scale capacity***
- **ii. Increment size***
- **iii. Number of load cells or total lever ratio.**
- **iv. Capacity of load cell(s)***
- **v. Cell output rating in mV/V - (millivolts per volt of excitation)**

****In Lb or Kg depending on how the scale is to be calibrated and used.***

b. Find the total load cell output in millivolts by multiplying the cell output rating* by the 8140 excitation voltage, 15 volts, 12.5 volts or 5 volts.

*** NOTE: Toledo load cells are 2m V/V. Other types may be 1mV?, 1.75mV/V or 3mV/V.**

PCB NUMBER	EXCITATION
*122751 00A	15V
*122752 00A	15V
*125632 00A	15V
*125635 00A	15V
*127095 00A	15V
*126659 00A	12.5V
*126660 00A	12.5V
*126661 00A	12.5V
*126662 00A	5.0V
*126738 00A	12.5V
* PCB may have revision letter.	

c. Use the formula shown to calculate the microvolt per increment ration.

$$\frac{\text{Increment Size} \times \text{Total Load Cell Output (mV)} \times 1000}{\text{Load Cell Capacity} \times \text{Number of Cells (or lever Ratio)}}$$

d. Divide scale capacity by increment size to determine number of increments to be programmed.

e. Locate the proper Microvolt per Increment Chart depending upon the application and check to see if the build is satisfactory.

Microvolt Per Increment Chart for PCB's without jumper W5. (Units in Table 1 on page 1.)		
NUMBER OF INCREMENTS	**MINIMUM µV/INC**	**MAXIMUM µV/INC**
1000	5.0	35
2000	2.5	17.5
2500	2.0	14
3000	1.67	11.7
4000	1.25	8.8
5000		
6000	1.0	7
	0.83	5.8
8000		
10000	0.63	4.4
	0.5	3.5

Microvolt Per Increment Chart for PCB's with jumper W5 set between pins 1 and 2. (From Table 2 or 3)		
NUMBER OF INCREMENTS	**MINIMUM µV/INC**	**MAXIMUM µV/INC**
1000	5.0	26
2000	2.5	13
2500	2.0	10.4
3000	1.67	8.7
4000	1.25	6.5
5000	1.0	5.2
6000	0.83	4.4
8000	0.63	3.3
10000	0.5	2.6

Microvolt Per Increment Chart for PCB's with jumper W5 set between pins 2 and 3. (From Table 2 or 3).		
NUMBER OF INCREMENTS	**MINIMUM µV/INC**	**MAXIMUM µV/INC**
1000	7.5	38
2000	3.75	19
2500	3.0	15.2
3000	2.5	12.7
4000	1.88	9.5
5000	1.5	7.6
6000	1.25	6.4
8000	0.94	4.8
10000	0.75	3.8

f. Example on finding UV/Inc.

	MODEL 2155
Scale Capacity	5000 LB
Increment Size	1 LB
Number of Cells	4
Capacity of Cell	2000 LB
Cell Output Rating	2 mV/V

Step 1) **Find total load cell output (mV)**
2mV/V x 15 V = 30 mV

Step 2) **Use the formula for finding µV/Inc.**

$$\frac{1\ LB \times 30mV \times 1000}{2000\ LB \times 4} = 3.75\ \mu V/Inc.$$

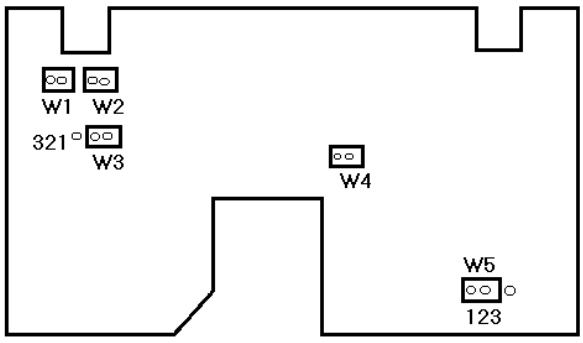
Step 3) **Divide scale capacity by increment size to determine number of increments to be programmed.**

$$\frac{5000\ LB}{1\ LB} = 5000\ Increments$$

Step 4) **Check the Microvolt Per Increment Chart to see if this build fits into the 5000 increment range. It does, so this will be a satisfactory build.**

B. SET UP

1. JUMPER DESCRIPTIONS
All jumpers are in the correct position for standard operation when the unit is shipped. Check the jumper positioning to be certain they are correct for this unit's application.



W1- **External Memory**
This jumper must be in place shorting the two pins for correct operation.

W2- **Calibrate Enable**
IN- **When this jumper is shorting the two pins, the set-up mode is accessible via the keyboard.**

OUT- **When this jumper is not connecting the two pins, the set-up mode cannot be accessed.**

W3- EPROM Selection
This jumper must be between pin 1 and pin 2 to select the proper EPROM that is used at this time.

NOTE: This jumper is not present on 8140's described in Table 1 on page 1 of this manual.

W4- Comma Enable

IN- When the jumper is in place shorting the pins, a comma will be displayed instead of a decimal point.

OUT- When the jumper is not shorting the pins, a decimal point will be displayed if the 8140 is programmed for one.

W5 Load Cell Output Selection

NOTE: This jumper is not present on 8140's described in Table 1 on page 1 of this manual.

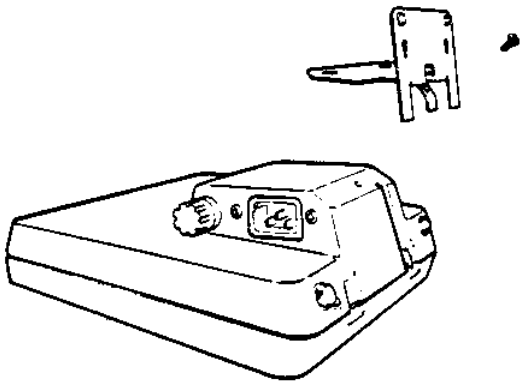
2mV/V- For use with 2mV/V load cells, this jumper should be between pin 1 and pin 2.

3mV/V- For use with 3mV/V load cells, this jumper should be between pin 3 and pin 3.

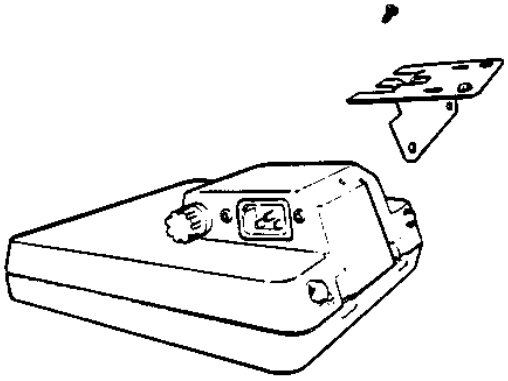
2. REVERSIBLE BRACKET FOR PLASTIC ENCLOSURE

NOTE: Be sure load cell cable is in hollow channel located on bottom of rear cover. The bracket is used as a strain relief on the load cell cable so it should be a snug fit.

a. Bracket being installed for desk top mounting.



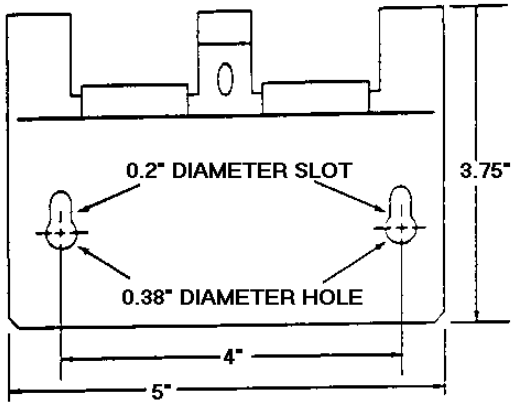
b. Bracket being installed for wall mounting.



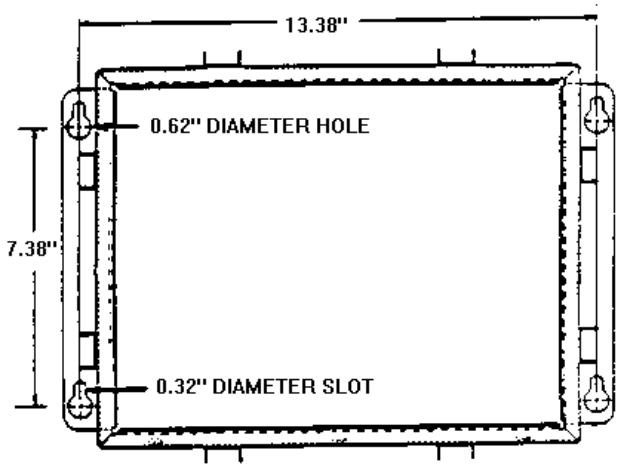
NOTE: Some Legal for Trade applications may require the removal of the Data Plate from the rear of the plastic enclosure and re--installation on the front. It should be installed on the lower left facing with non-conductive (plastic) fasteners.

3. WALL MOUNTING DIMENSIONS

a. Mounting hole dimensions for wall mounting the plastic enclosure.



b. Mounting hole dimensions for wall mounting the stainless steel enclosure



C. PROGRAMMING PROCEDURE

This section of the technical manual deals with the programming of the operating modes with the programming of the operating modes and features as well as the self-calibration procedure. Sample displays are shown with programming prompts. Described under each sample display you will find the possible answers that the unit will accept, along with what effect this answer will have on the unit's operation.

Three keys will have the same function throughout the programming procedure. Their descriptions are:

ZERO- **This returns the programming routine to the previous step. This key will not function during calibration or when the display shows S FILE.**

CLEAR- **When pressed, the setup routine will accept the data displayed an will go the last step which is S FILE.**

PRINT- **The data displayed will be accepted and the routine will proceed to the next step.**

A comparison of the keyboard functions during operational programming and normal operation is shown below.

Normal Operation

Zero	Test	Tare	Clear	lb kg	Print

Operational Programming

Previous Step	Yes 1	No 0	Exit Program	Not Used	Enter

The following chart can be used as a quick reference for programming descriptions. Also listed is the recommended selection for each step as a beginning point for initial setup. Verify each selection, such as calibration in pounds, to be certain it coincides with actual usage before attempting calibration.

STEP	DESCRIPTION	INITIAL SETUP
F0	Span Adjustment	0
F1	Expand Display	0
F2	Display Filtering	1
F3	Tare Active	1
F4	Tare Interlock	0
F5	Auto Clear Tare	0
F6	Motion Sensitivity	1
F7	Pounds Calibration	1
F8	Power Up Pounds	1
F9	LB / KG Switching	1
F10	Auto Zero Maintenance	1
F11	Analog Verification	0
F12	Printer Output	1
	1 - Demand Mode	1
	2 - Baud Rate	300
	3 - Checksum	0
	4 - Printer Select	1
	5 - Data Format	2
	6 - Expanded Print	0
	7 - Continuous Format	0
F13	Net Zero Cursor	0
F14	Under Zero Blanking	0
CAL	Calibration Procedure	

NOTE: Jumper W2 on the Main PCB must be shorting the two pins to enter the setup mode. It is recommended that after programming, the jumper be placed on jut one pin so inadvertent program changes cannot be made.

To enter the setup mode, press both the TARE and CLEAR keys, then release at the same time. The following sequence of displays will occur.

On 8140's described in Tables 2 and 3, the setup mode is accessed immediately when W2 is inserted.

[F0 0] SPAN ADJUST

NOTE: This step is not present on units shown in Table 1 on page 1.

Press:

Test- To enter into the span adjust mode for small adjustments of span without total recalibration. The standard calibration must be completed to provide a reference point before attempting to use this step. See Section 4.4, for details on Span Adjustment procedure.

Tare- A "0" will be displayed on the right digit of the display and the span adjust mode will not be accessed.

NOTE: If span adjust is selected, after the span adjustment the display will show [CAL OFF] and setup jumper W2 must be removed. The rest of the setup procedure will be skipped.

NOTE: When calibrating a unit listed in Table 2 or 3 from page 1, the unit must remain closed or drifting will occur. Any air currents passing over the PCB will cause an error in calibration.

[F1 0] EXPAND MODE

Press:

Test- A "1" will be displayed on the right digit of the display and the weight display will be expanded.

Tare- A "0" will be displayed on the right digit of the display and the display will not be expanded.

[F2 1] DISPLAY FILTERING

This step selects different filtering rates available for the 8140. The higher the number selected, the slower the settling time will be.

Description for units in Tables 1 and 2 on page 1.

Press:

Test- The number to the right of the display will be accepted as the number of averaging A/D cycles.

Tare- The display will update to the next selectable filtering rate. Subsequent depressions will step through all selections which are 1,2,4,8 and 16.

NOTE: This step also affects step F6.

Description for units in Table 3 on page 1.

Press:

Test- The number to the right of the display will be accepted as the filtering rate.

Tare- The display will update to the next selectable filtering rate. Subsequent depressions will step through all selections which are 0, 1, 2, and 3.

0	**-**	**No Filtering**
1	**-**	**Low Filtering**
2	**-**	**Strong Filtering**
3	**-**	**Extreme Filtering**

[F3 1] TARE ACTIVE

Press:

Test- A "1" will be displayed and keyboard tare will be active.

Tare- A "0" will be shown on the display and keyboard tare will be inhibited.

NOTE: If tare is inhibited, step F5 will be skipped.

[F4 0] TARE INTERLOCK

Press:

Test- A "1" will be shown on the display and the indication must be at true zero before tare can be removed. (True zero is actually ZERO minus the tare value). Previous tare must be cleared before another tare can be entered. This also disables a weight display on power up. The display on power up will be E E E until zero has been captured.

Tare- A "0" will be displayed and tare may be cleared or changed at any weight indication. Multiple tares are accepted. The 8140 will also power up with a non-flashing weight display.

[F5 0] AUTO CLEAR TARE

Press:

Test- A "1" will be shown on the right of the display and tare will clear automatically when indication returns to zero after settling to a no motion condition at a weight greater than 10 increments. The CLEAR Key will also function.

Tare- A "0" will be displayed and tare must manually be cleared by use of the CLEAR key.

NOTE: If Tare is inhibited in Step F3, this prompt will not appear.

[F6 1] MOTION SENSITIVITY

This step programs the sensitivity of motion detection. Motion detection disables the Zero, Tare and Print functions.

Description for units in Tables 1 and 2 on page 1.

The sensitivity of this feature depends upon the value selected in step F2 (Display Filtering). The Sensitivity Chart shown the possible values.

SENSITIVITY CHART		
Step F2 Value	Sensitivity if 0 Selected	Sensitivity if 1 Selected
1	+/-1/2 Increment	+/-2 Increments
2	+/-1 Increment	+/-2 Increments
4	+/-2 Increments	+/-2 Increments
8	+/-4 Increments	+/-2 Increments
16	+/-8 Increments	+/-2 Increments

Press:

Test- A "1" will be shown on the display and the value shown in the right column of the Sensitivity Chart will be used for motion detection.

Tare- A "0" will be shown on the display and the value shown in the center column of the Sensitivity Chart will be used for motion detection.

Description for units in Table 3 from page 1.

Press:

Test- A "1" will be shown on the display and the Zero, Tare and Print functions will be inhibited when +/-2 Increments or more of motion are detected.

Tare- A "0" will be shown on the display and the Zero, Tare and Print functions will be inhibited when ± 2 increments or more of motion are detected.

[F7 1] POUNDS CALIBRATION

Press:

Test- A "1" will be displayed to indicate avoirdupois (LB) test weights ill be used for calibration.

Tare- A "0" will be displayed to show that kilogram (KG) test weights will be used for calibration.

[F8 1] POWER UP POUNDS

Press:

Test- A "1" will be displayed and the 8140 will weigh in pounds when power is applied.

Tare- A "0" will be shown on the right of the display to indicate the unit will be in kilogram mode when powered up.

[F9 1] LB/KG SWITCHING

Press:

Test- A "1" will be shown on the display to indicate switching between the pounds and the kilogram modes is possible via the front panel keyboard.

Tare- A ")" will be displayed to indicate that pound. kilogram switching is disabled.

NOTE: If the 8140 is to be selected for either a 0.0001 lb or 50 kg displayed increment size, do not enable pound-kilograms switching

[F10 1] AUTO ZERO MAINTENANCE

Description for units in Tables 1 and 2 on page 1.

Press:

Test- A "1" will be shown on the display and AZM will operate to keep the instrument on zero during small changes on the platform. Weight variations which occur at a rate of 0.1 increments per second or slower will be compensated. The zero pushbutton is operational.

Tare- A "0" will be displayed and AZM and Zero pushbutton are disabled.

NOTE: This function is only operational within ±2% of scale capacity from analog zero.

Description for units in Table 3 on page 1.

The range for AZM and pushbutton rezeroing of the scale is selectable as either 0% +/-2% or +/-20%.

Press:

Test- The selection on the right of the range for AZM.

Tare- The 8140 will advance to the next valid selection which will be:

0- Disable AZM and pushbutton Zero.
1-+/-2% of capacity.
2*-+/-20% of capacity.

NOTE: Increasing the zero capture range may conflict with Local and State Weights and Measures laws when the 8140 is installed in a "Legal for Trade" application.

[F11 0] VERIFICATION ENABLE

Description for units in Tables 1 and 2 on page 1.

Press:

Test- A "1" will be displayed and analog verification will be active. An automatic AV cycle will be initiated approximately every 4 hours. Six A's will be shown on the display.

Tare- A "0" will be shown and analog verification will be disabled.

NOTE: If an A/V cycle fails, an error code E6 will be displayed and the 8140 will be disabled until the problem is corrected.

Description for units in Table 3 on page 1.

Press:

Test- A "1" will be displayed and both display and analog verification will be active. An automatic AV cycle will be initiated approximately every four hours. Display verification will be continuous. six A's will be shown on the display during the AV cycle.

Tare- The "0" will be shown and both analog and display verification will be disabled.

NOTE: If an A/V cycle fails, an error code E6 will be displayed and the 8140 will be disabled until the problem is corrected.

[F12] PRINTER OUTPUT

Press:

Print- This gains to the serial I/O programming for use with a printer or other interface.

Tare- This will skip the printer steps under F12 and proceed to the next step.

Clear- This skips the setup procedure and proceeds to the last step of the setup routine which is S FILE.

[1 1] DEMAND MODE

Press:

Test- A "1" will be shown on the right of the display and the data output will be on demand (Print key).

Tare- A "0" will be displayed and the output will be continuous.

[2 300] BAUD RATE

Press:

Test- If the value displayed is the correct baud rate.

Tare- The unit will update to another baud rate selection. The choices are 300, 1200, 2400, 4800 and 9600.

NOTE: Printer output setup steps 3 through 6 are not displayed when the continuous output mode has been selected.

[3 0] CHECKSUM

Press:

Test- A "1" will be shown on the display and a checksum character will be transmitted.

Tare- A "0" will be displayed and no checksum is transmitted.

Checksum is defined as the 2's complement of the 7 low order bits or the binary sum of the 7 low order bits of all characters preceding the checksum including STX and CR. Bit 8 of Checksum is parity of the 7 low order bits of Checksum.

[4 1] PRINTER SELECT

Press:

Test- If the model number of the printer being used is correct. See Printer Model Chart.

Tare- If the model number is not correct and the display will advance to the next selection. see Printer Model Chart.

PRINTER MODEL CHART	
Selected Number	**Printer Model**
1	**307, 8804, 8806, 8840, 8855 8860.**
2	**8805* (Receive only mode)**
3	**8805 (Smart mode)**
4	**8820/8830 (Ram 1)**
5	**8820/8830 (Rams 2 and 3)**

*** The "receive only" mode is active when certain switches in the 8805 are programmed as follows:**

SWITCH	POSITION
SW2-7	**ON**
SW2-8	**OFF**
SW2-9	**ON**

NOTE: The two selections for the 8805 and 8820 / 8830 printers are required to determine how the 8140 will interpret the remote print signal. If the selected number is a 2 or 4 from the interpreted as a busy signal. If a code 3 or 5 is entered, the signal will be used as a print command.

NOTE: This step is only present in units found in Table 3 on page 1 and will only appear if Step F12.1 is programmed as an "0".

[F13 0] NET ZERO CURSOR

Press:

Test- A "1" will be shown on the right of the display and the zero cursor on the weight display will illuminate at both gross and net zero.

Tare- A "0" will be displayed and the zero cursor will be illuminated only when the scale is at gross zero.

NOTE: This step should be a "0" for all applications in the U.S.

[F14 0] UNDER ZERO BLANKING

Press:

Test- A "1" will be shown on the display and display blanking will occur at 5 increments below gross zero.

Tare- A "0" will be displayed and the 8140 will not blank until the scale is approximately 3% of capacity below gross zero.

[CAL] CALIBRATE MODE

Allow a minimum of 15 minutes for warmup before attempting to calibrate the 8140 indicator. This warmup time is required to stabilize the electronics and allow the load cell to "warmup".

NOTE: When calibrating a unit listed in Table 2 or 3 form page 1 the unit must remain closed or drifting will occur. Any air currents passing over the PCB will cause an error in calibration.

Press:

Clear- If calibration is not required and the setup routine will proceed to the last step which is S FILE.

Print- If calibration is required and the 8140 will continue with the calibration mode.

NOTE: Error codes that may be displayed during calibration are described in the trouble-shooting section of this manual.

[C1]

[5000] TOTAL INCREMENTS

Press:

Test- If the number displayed is the correct number of full scale increments.

Tare- If the number displayed is not the correct number and the display will update to the next possible selection. The valid selections are 1000, 2000, 2500, 3000, 4000 5000, 6000, 8000, and 10,000 increments.

[C2 5] INCREMENT SIZE

Press:

Test- If the number displayed is the correct increment size.

Tare- If the number displayed is not correct and the display will update to the next selection. Possible values are X1, X2 and X5.

[C3] DECIMAL POSITION

Press:

Test- If the position of the decimal is correct.

Tare- If the position of the decimal is not correct and the display will update with the next possible selection. The valid selections are 0.0001, 0.001, 0.01, 0.1, 1 and 10

NOTE: If the selection of Full scale Increments and Increment Size results in an invalid scale capacity, program returns to Step C1 (Full Scale Increments display). If the Clear button is pressed while Full Scale Increments. Increment Size multiplier or Decimal Point position are on the display, the currently entered values for these variables are lost.

[E SCL] EMPTY SCALE

Remove all weight form the scale platform then press Print to continue.

[10 SEC] TEN SECONDS

There will be a 10 second wait while the 8140 sets initial.

[Add Ld] ADD LOAD

Place the selected test weight on the scale platform. This must be a minimum of 10% of full capacity on early PCB's. Newer PCB's (that have the jumper W5) do not have a minimum value. Press the print key to continue.

[00000] TEST WEIGHT

The value of test weights used must be entered. Fractional or decimal weights are not accepted - only whole numbers. The blank digit to the left will be entered first.

Press:

Tare- To increment the blanked digit by one unit until the correct value is displayed for that position.

Test- To shift the weight selection to the next position to the right after a correct value has been selected. A blank digit is entered as a 0.

Print- To enter the entire display as the value of test weights used. A blank digit will be entered as a 0.

[10 SEC] TEN SECONDS

There will be a 10 second wait while span is adjusted.

[E SCL] EMPTY SCALE

Remove the test weights then press Print to allow the 8140 to recheck zero.

[10 SEC] TEN SECONDS

There will be a 10 a second wait while zero is rechecked.

[CAL d] CALIBRATION DONE

This display will appear after calibration is complete and be displayed for approx. three seconds.

[S FILE] SAVE FILE?

This determines if the programming just entered is to be saved in memory or not.

Press:

Test- If the programming just completed is to be retained in memory and used again after a power down.

W2 must be inserted to save the file. The display [S FILE] will remain on the display if the W2 jumper is not inserted.

Tare- If the programming to be completed is to be used until power loss but not entered into memory for use after a power down.

Clear- If the programming changes just made are to be disregarded and the previously stored setup used.

[CAL OFF] CALIBRAITON JUMPER OFF?

NOTE: This step is only present on units in Tables II and III from page 1.

At this time remove the setup jumper W2 and place the jumper on just one pin of W2 so it will not be misplaced. The 8140 will exit the setup routine.

After the calibration is complete and before closing the tube of sealant (part number 118251 00A) included with each unit MUST be applied to the door gasket. This is required to insure a water tight seal. the procedure for applying this sealant is:

1. **Clean the gasket, on the inside of the door of the enclosure, with a clean cloth to remove any debris.**
2. **Apply a bead of sealant to the gasket.**
3. **Smooth out the sealant with your finger so it is applied in an even, thin coat on the gasket.**
4. **After closing and properly tightening the door, wipe off any sealant that has squeezed out.**

D. SPAN ADJUSTMENT

After standard calibration has been completed on the new 8140's (Those in Tables 2 and 3), the span may be adjusted without repeating the entire calibration procedure. This is especially useful on large capacity scales, tank scales and hopper scales where a "build-up" procedure is used for calibration. the procedure for using the span adjustment feature follows.

1. **Apply known test weights to the scale and if an adjustment is required, proceed to step 2.**

2. **Install the setup jumper (W2), press both the TARE and CLEAR keys, then release at the same time to enter the setup mode.**

   Newer 8140's will immediately proceed into the setup mode when W2 is inserted without have to press the Tare and Clear keys.

NOTE: When calibrating a until listed in Table 2 or 3 form page , unit must remain closed or drifting will occur. Any air currents passing over the PCB will cause an error in calibration.

3. **When the display shows [F0 0], press the TEST key. The display will then show [00000].**

4. **Enter the correct test weight applied to the scale. The weight value is entered the same way as in the standard calibration procedure. See Note C.**

   a. Pressing the TARE key will increment the selected digit by one.
   b. Pressing the TEST key moves the digit to be changed to the next position to the right.

5. **When the correct weight value is displayed on the 8140, press the PRINT key.**

6. **When the display shows [CAL OFF], remove the setup jumper W2 and place it on only one pin of W2. The 8140 display should now show the weight value corresponding to the test weight applied to the scale..**

NOTES:

1). This procedure will work correctly once when in the net mode. This is useful if a device to hold the test weights is required. Simply attach the holding device then press TARE. Add the test weights then follow the span adjustment procedure. After one adjustment - tare must be cleared then reentered if required again.

2). Weights that are entered in values other than multiples of the increment size will be accepted and used as valid weights. For example entering 103 pounds on the scale when the increment size is 2 pounds.

3). The entire weight value can be entered including numbers to the right of the decimal point. This is different from the standard calibration where only numbers to the left of the decimal point may be entered.

4). The adjustment for calibration is limited to ± 50% of the original weight value shown after standard calibration.

V. OPERATING INSTRUCTIONS

A. DISPLAY

The display shows the digital resultant of the analog signal from the load cell(s). The display blanks at overcapacity and also blanks, except for the minus (-) sign, at undercapacity.

B. LEGENDS

The 8140 illuminates a pointer above the proper legend for the status of the display. The printed legends are:

1. **Zero- Will be illuminated when the instrument is within ±0.25 increments of the zero increment and there is no motion.**
2. **LB- Will be lit LB mode has been selected.**
3. **KG- This is illuminated when there is no motion and the KG mode has been selected.**
4. **Gross- When lit, this indicates no tare has been taken.**
5. **Net- When illuminated indicates tare has been entered.**
6. **Print- This will light during data transmission to a printer in demand output mode or, when the "PRINT" key is depressed in continuous mode.**

C. KEYBOARD

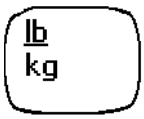
1. **ZERO KEY- This key provides rezeroing of the scale over a selectable percentage of scale capacity from zero. A setup selection permits disabling the pushbutton zero and automatic zero maintenance.**

The Zero key must be depressed for approximately 2 seconds to initiate this function.

2. **TEST KEY- Pressing and releasing the test key will cause the display to blank and then sequentially light each segment of all digits and each descriptor. These results show that all drivers and displays operate in both off and on conditions.**

3. **TARE KEY - When the Tare key is depressed with weight on the scale, and no weight motion present, the tare weight will be subtracted from the gross weight to provide a net weight display of zero. If the weight is removed from the scale, the tare weight will be displayed as a negative value.**

4. CLEAR KEY - Tare may be cleared by the use of the Clear key or automatically by the use of Automatic Clear. Automatic Clear may be enabled in setup mode.



5. LB / KG KEY - An alternate action pushbutton is provided for pounds/kilogram section. When switching, the increment size will be adjusted and the decimal point will be shifted, if required. The instrument can be locked into the LB or KG mode by a setup selection which disables the LB / KG key.

6. PRINT KEY - A Print key is provided to initiate a print cycle to an external device. The format of the print is programmed by keyboard setup selection.

VI. PREVENTIVE MAINTENANCE

The Model 8140 Digital Indicator is designed to require a minimum of maintenance and service. This section provides instructions and procedures for maintenance of the indicator, as well as a troubleshooting guide to problem analysis.

A. REQUIRED TOOLS AND SUPPLIES

The following items are recommended for 8136 maintenance and repairs. Common hand tools are also required:

- **-- Volt - Ohm Meter**
- **-- Load Cell simulator (P/N 100865 00A)**
- **-- Cleaning Cloth**
- **-- Static Bag**
- **-- Static Wrist Strap**

B. MAINTENANCE SCHEDULE

The frequency at which normal maintenance (cleaning and inspection) should be performed, when installed in a clean office environment, should be twice a year. However, if the unit is subjected to a dusty or a dirty environment the frequency should be increased as required.

C. CLEANING

Clean the keyboard and cover with a soft, clean cloth that has been dampened with a mild window type cleaner. DO NOT USE ANY TYPE OF INDUSTRIAL SOLVENT. DOT NOT SPRAY CLEANER DIRECTLY ONTO THE UNIT.

D. TROUBLESHOOTING

1. PROCEDURE

a. If operational difficulties are encountered, obtain as much information as possible regarding the particular problem as this may eliminate a lengthy, detailed checkout procedure.

b. Check fuses, primary power lines, external circuit elements and related wiring for possible defects. Failures and malfunctions often may be traced to simple causes such as loose or improper circuits, power supply connections or fuse failure.

c. Use the electrical interconnecting diagram as an aid in locating trouble causes. The diagram contains various voltage measurements that are average for normal operation. Use instrument probes carefully to avoid causing short circuits and damaging circuit components.

d. Malfunctions in the 8140 are best located by substitution. A printed circuit board believed to be defective may be checked by replacing it with a known good PCB and observing whether the problem is corrected. WHEN HANDLING A PCB, USE A STATIC BAG FOR BOTH THE NEW AND DEFECTIVE PCB.

e. To verify the problem, as being in the removed PCB, reinstall the defective PCB and retest. This simple test will eliminate the possibility of having replaced a good PCB because of a loose or poor connection.

Be sure to consult the technical manual for proper programming. Do not automatically program the replacement PCB like the suspected faulty PCB as the problem may be a programming error. Exchange PCB's or sub-assemblies are available from your authorized Toledo Scale representative. These assemblies are repaired and tested at various Toledo Scale factories.

2. ERROR CODES

Error Codes are displayed by the 8140 when one of the following malfunctions occur.

ERROR CODES		
ERROR	**CAUSE**	**CORRECTIVE MEASURE**
E1	ROM Error	Try Power Down/ Replace main PCB
E2	Ram Error	Try Power Down/Replace main PCB
E3	NOVRAM Error	Try Power Down/ Replace Main PCB
E4	Print Fault	Check Printer/Format
E5	Display Verify Error	Replace Main PCB
E6	Analog Verify Error	Recalibrate
E7	EEROM Error	Try Power Down/Replace Main PCB
E8	Scale in Motion	Waits Unit Motion Stops
E9	Illegal Configuration	Reconfigure Increment Size
E10	Calibration error	Recalibrate
E11	Calibration Error	Recalibrate
E12	Over Capacity	Reconfigure
E13	Low Capacity	Reconfigure
EA	Insufficient Test Wt.	Use more Test Weights/Try Again
AAAAAA	Analog Verify Cycle	None- This indicates an AV cycle is in process.

NOTE: The 8140 cannot display a negative six digit net weight with a minus sign since it only has six display digits . If a negative six digit net weight occurs, the display will blank with the net cursor lit. The proper data will be printed.

3. TESTING THE POWER SUPPLY VOLTAGES.

NOTE: ALL UNITS ARE SHIPPED FOR 120 VAC OPERATION. REFER TO SECTION 4 FOR ALTERNATIVE VOLTAGE OPERATION.

a. Transformer Voltages

These voltages are average voltages for 117 volt A-C power line.

FROM	TO	VOLTAGE (With J3 Connected)	VOLTAGE (With J3 Disconnected)
J3-2	J3-1	20,6 VAC	22.2 VAC
J3-5	J3-1	21.0 VAC	22.1 VAC
J3-7	J3-6	1.55 VAC	1.75 VAC
J3-8	J3-6	1.55 VAC	1.75 VAC
	J3-9	10.2 VAC	10.8 VAC

A tolerance of ±10% of these values is acceptable.

b. Regulated 5V Supply

This can be measured at J2 (printer output) between Pin7 (Ground) and Pin 10 (±5V). the voltage should be 5 V ±0.15 volts with a maximum ripple of 0.01 V p-p.

c. Load Cell Excitation

This voltage can be measured at the load cell terminal block TB1 between terminals 1 and 7. The excitation voltage is produced from the AC voltage present at PJ3 - pins 1,2, and 4. The voltage measured depends upon which the Main PCB is tested. The three possibilities are:

i). 15 Volt Excitation

PCB Part Numbers
122751 00A
122752 00A
125632 00A
125635 00A

There should be 15 volts* DC between terminals 1 and 7 on TB1.

***The load cell excitation voltage is gated and therefore, cannot be measured accurately with a digital or analog voltmeter since they generally measure average volts. The voltages you actually see will be 7.5 volts.**

ii). 1.25 Volt Excitation

PCB Part Numbers
126656 00A
126659 00A
126660 00A
126661 00A
126738 00A

There should be 12.5 volts DC between terminals 1 and 7 on TB1.

iii). 5 Volt Excitation

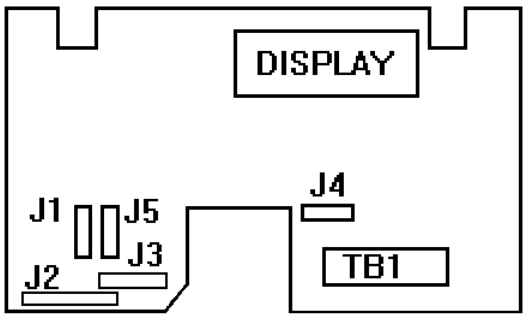
PCB Part Numbers
126662 00A

On this PCB, the excitation voltage measured between terminals 1 and 7 on TB1 should be 5 volts DC.

VII. INPUT AND OUTPUT CONNECTIONS

A. MAIN PRINTED CIRCUIT BOARD

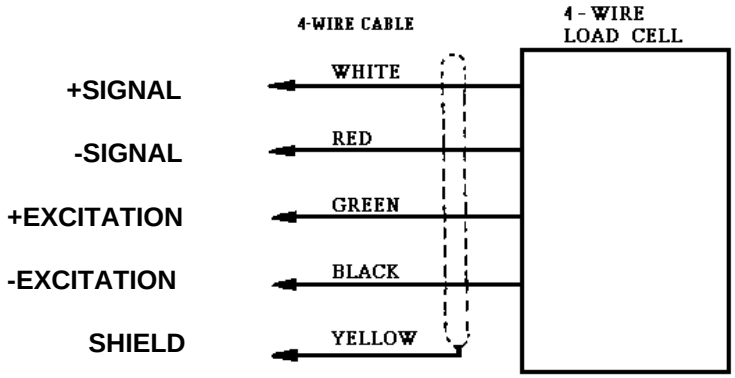
CONNECTOR	DESCRIPTION
J1	Keyboard Connector
J2	Serial I/O
J3	Transformer Input
J4	Analog Output
J5	External Keyboard Connector*
TB1	Load Cell Terminal Block
* Not present on early style PCB's	



B. LOAD CELL CONNECTIONS

1. STANDARD LOAD CELL INPUT/OUTPUT

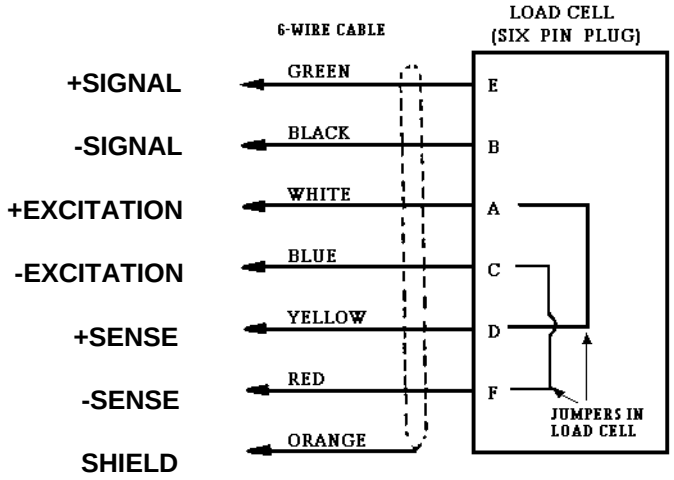
a. Four wire load cells.



NOTE: When connecting a four wire load cell to the 8140, always jumper + excitation to + sense and - excitation to - sense at the junction closest to the load cell.

*** When using a Model 951 load cell in tension, reverse the signal wires form that which is shown above, ie. + Signal is red and - Signal is white.**

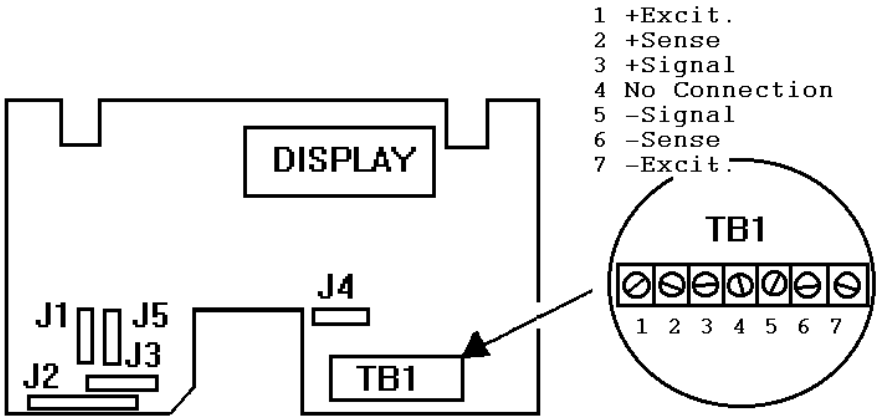
b. Six wire load cells.



2. DESK ENCLOSURE

a. Non RFI Units

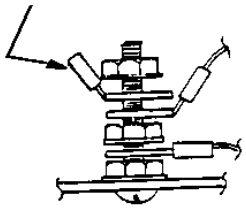
i). Attach the load cell cable or extension harness to the terminal strip TB1 on the Main PCB. The configuration is shown.



ii). Route the load cell cable through the hollow channel at the bottom of the rear cover.

iii). Attach the mounting bracket as shown to act as a strain relief on the load cell cable then snap the enclosure shut.

NOTE: The shield of the load cell cable attaches to the ground screw directly below TB1.

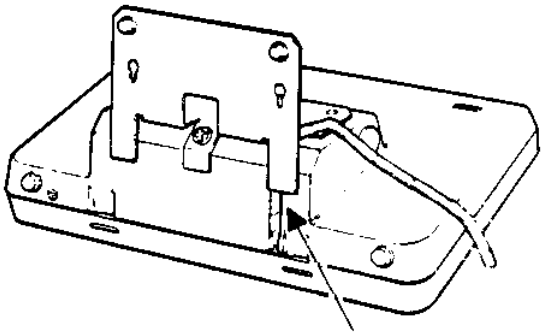


NOTES:

1).There are two parts to the terminal strip. One is soldered to the PCB and the other may be removed by pulling downward for easy cable connections.

2). The only load cell cables that can easily attach directly to the terminal strip are the 20 and 24 gauge cables. Others may require the use of an extension harness, Toledo part number 117207 00A or 127854 00A. See load cell connections under Section 7.

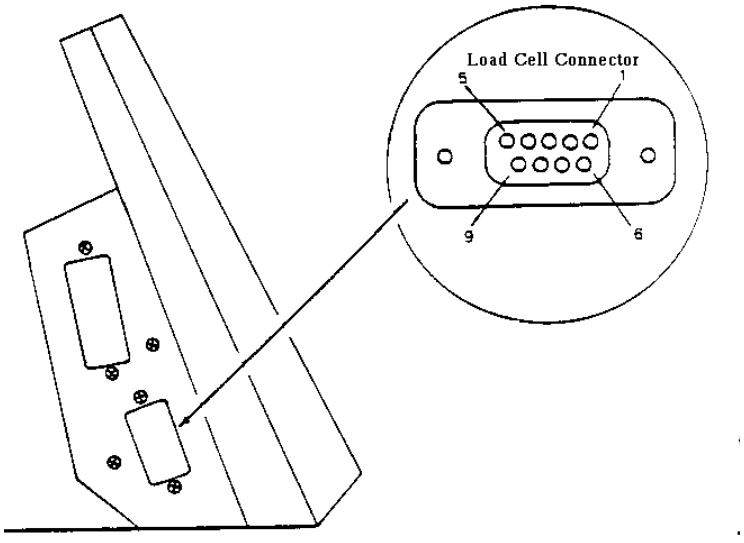
3). Toledo Scale now uses a dual shield cable. The ground shield (green with yellow stripe) also connects to the ground screw.



ROUTE LOAD CELL CABLE THROUGH THIS CHANNEL

b. RFI Units

i). To attach an understructure or loadcell to an RFI protected plastic enclosure, the cable must be terminated with a 9 pin connector as shown below. If the cable is open ended, a connector must be added. If 16 gauge load cell cable is used, an adapter cable is required. See Part 4 of this Section for details of the adapter cables.



ii.) Secure the load cell cable or adapter harness to the J8 connector on the side of the enclosure. The pin configuration is shown.

PIN CONFIGURATION

PIN	DESCRIPTION
1	+ Excitation
2	+ Sense
3	Shield
4	- Sense
5	- Excitation
7	+ Signal
8	- Signal

NOTE: Toledo Scale now uses a dual shield load cell cable in which the inner shield is still used as the shield connection and the outer shield is used for a chassis ground connection between the scale base and indicator. Connect the outer shield to the shell of the 9 pin load cell connector.

3. STAINLESS STEEL ENCLOSURE

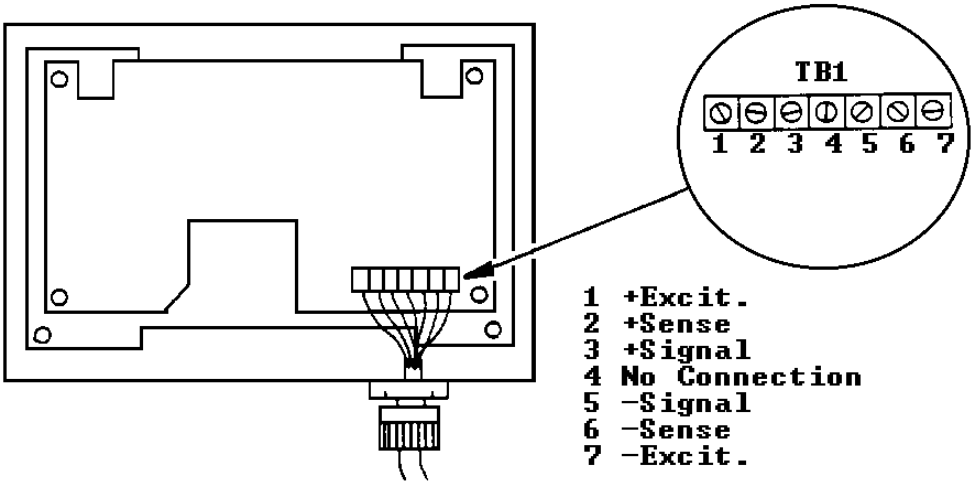
a. Non RFI Units

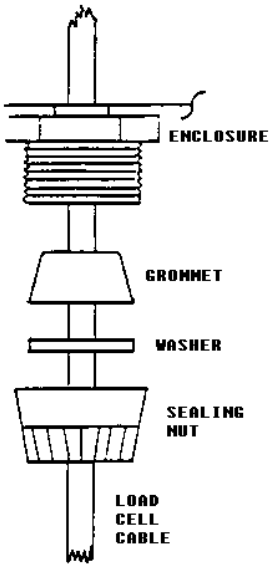
i). Select the correct size grommet to properly seal the connector around the load cell cable at the bottom of the enclosure.

ii). Thread the load cell cable through the connector at the bottom of the enclosure making sure all parts required to clamp the cable are present. See drawing at right.

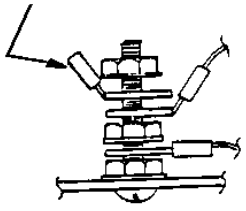
iii). Attach the load cell cable to the terminal strip TB1 on the Main PCB. The configuration is shown below.

iv). Tighten the nut on the load cell clamp on the bottom of the enclosure and then close the enclosure.





NOTE: The shield of the load cell cable attaches to the ground screw directly below TB1.



NOTES:
1). There are two parts to the terminal strip. One is soldered to the PCB, and the other may be removed by pulling downward for easy cable connections.

2). Toledo Scale now uses a dual shield cable . The ground shield (green with yellow stripe) also connects to the ground screw.

b. RFI Units

i). Select the correct size grommet to properly sec the connector around the load cell cable at the bottom of the enclosure.

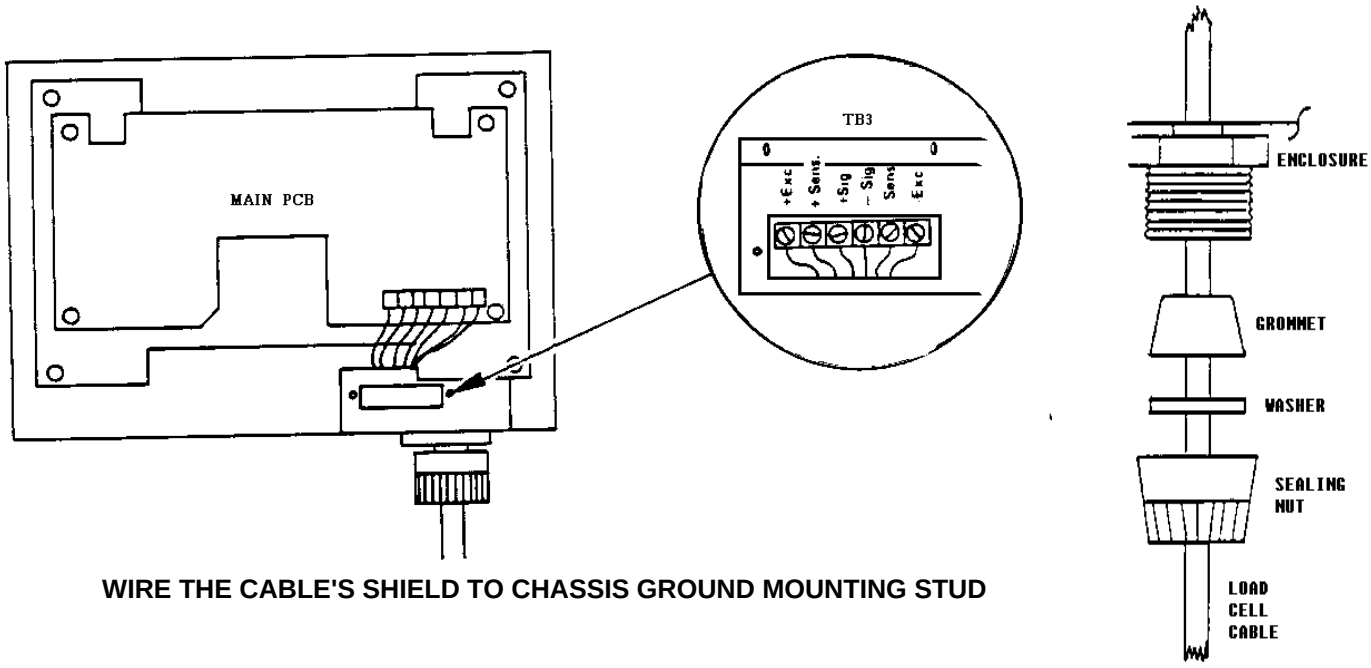
ii). Thread the load cell cable through the connector at the bottom of the enclosure making sure all parts required to clamp the cable are present. Reference the drawing to the right.

iii). Loosen the cover from the RFI load cell box by removing the two screws. Attach the load cell cable to the terminal strip as shown, then reinstall the cover plate.

iv). The shined form the load cell cable attaches to the chassis ground screw under the RFI/EMI load cell box assembly.

v). Make certain the RFI/EMI box contracts the enclosure around all edges of the box. If a small air gap is left anywhere between the enclosure and the RFI/EMI box, the filtering performance will be degraded. There is enough room around the mounting studs that hold the RFI/EMI box to adjust for a snug fit.

vi). Tighten the nut on the load cell clamp on the bottom of the enclosure hand tight then close the enclosure.



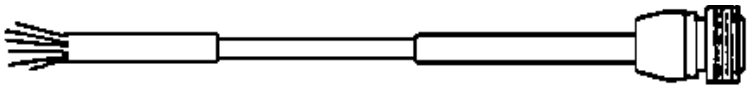
WIRE THE CABLE'S SHIELD TO CHASSIS GROUND MOUNTING STUD

NOTE: Toledo Scale now uses a dual shield cable. The ground shield (green with yellow stripe) also connects to the ground screw.

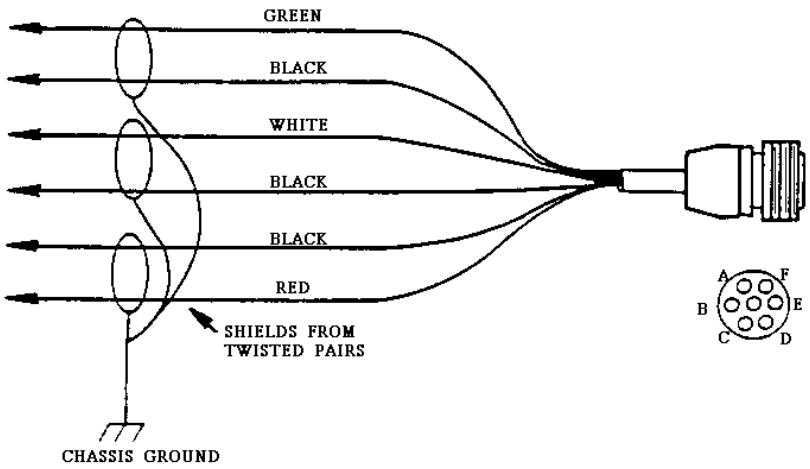
4. ADAPTER CABLES

These cables offer a way to connect 16 gauge load cell cable to the desk version of the 8140. This larger cable is required when the load cell cable length exceeds 300 feet. The adapter cables require the use of a 7 pin MS type connector which has been used by Toledo Scale previously.

a. Part numbers 117207 00A and A117207 00A
These cables adapt the 16 gauge cable for connection to a non-RFI type 8140. Either cable will work satisfactorily.

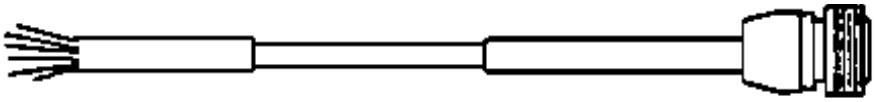


117207 CABLE

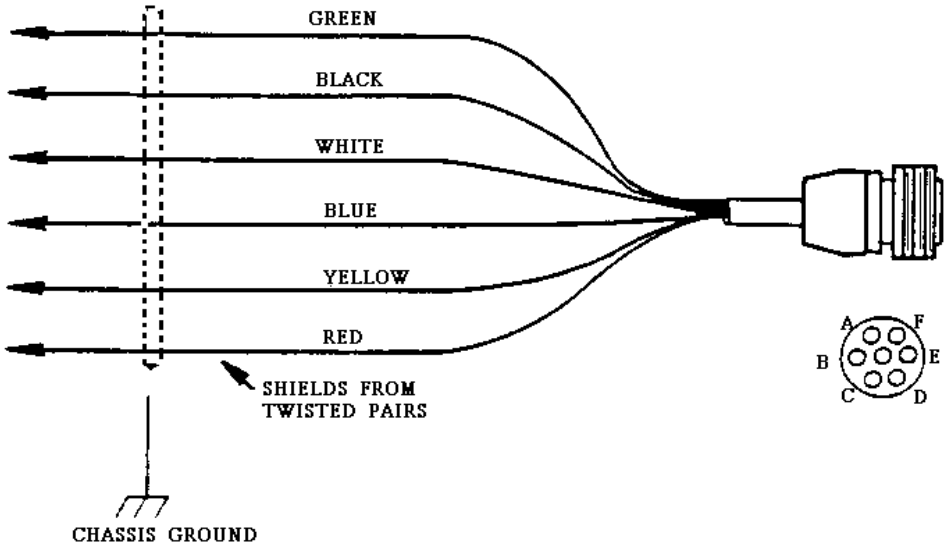


J4-7 PIN CONNECTOR

PIN	
A	+ SIGNAL
B	- SIGNAL
C	+ EXCITATION
D	- EXCITATION
E	+ SENSE
F	- SENSE
G	SHIELD



A117207 00A CABLE

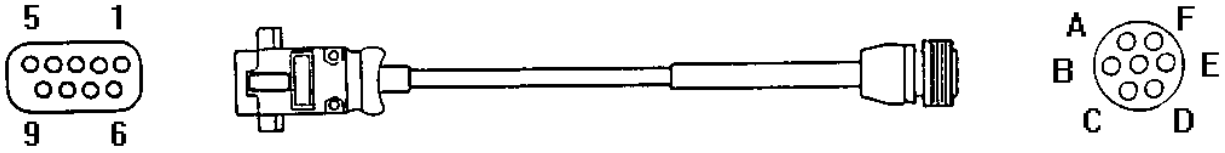


J4-7 PIN CONNECTOR

PIN	
A	+ SIGNAL
B	- SIGNAL
C	+ EXCITATION
D	- EXCITATION
E	+ SENSE
F	- SENSE
G	SHIELD

b. Part number B117611001A

This adapter cable provides a way to connect 16 gauge load cell cable to RFI protected 8140. This adapter cable requires the use of a 7 pin MS type connector.

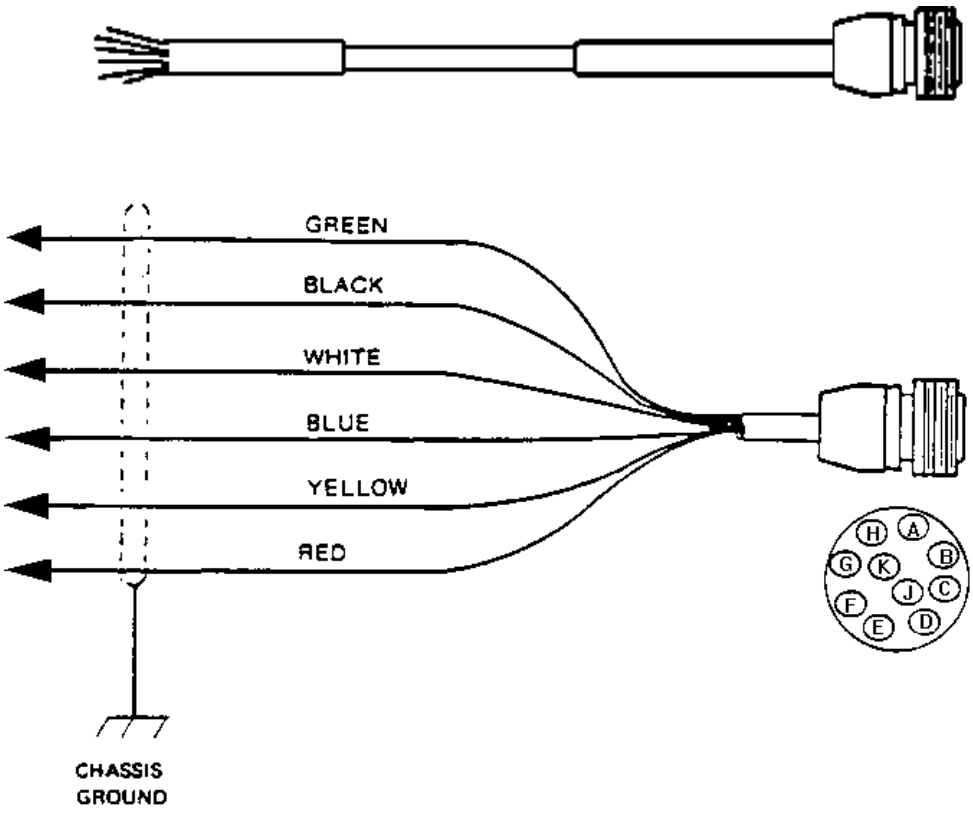


PIN	DESCRIPTION
1	+ Excitation
2	+ Sense
3	Shield
4	- Sense
5	- Excitation
7	+ Signal
8	- Signal

PIN	DESCRIPTION
A	+ Signal
B	- Signal
C	+ Excitation
D	- Excitation
E	+ Sense
F	- Sense
G	Shield

c. Part number 127854 00A

This adapter cable provides a way to connect the newer 10 pin bayonet type connector to the 8140. This 10 pin connector is the one used on the 8142 stainless enclosure and may be found on various stainless steel understructures.

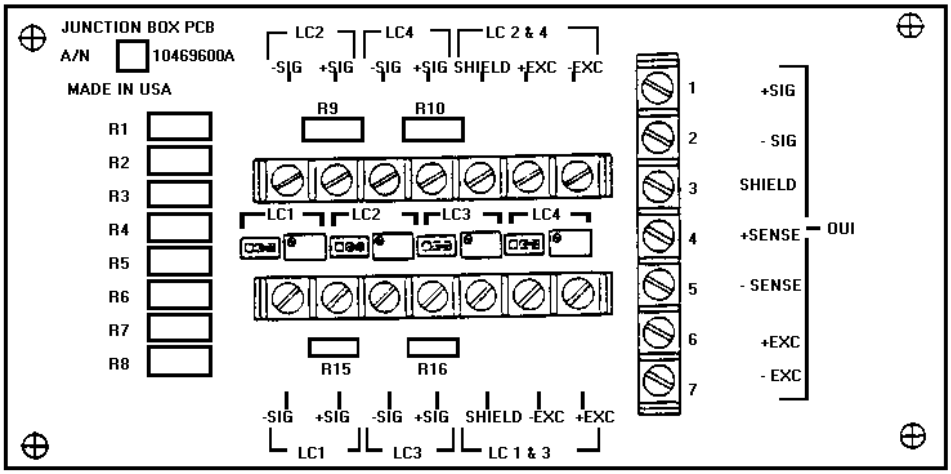


J4-7 PIN CONNECTOR PIN

A	+ SIGNAL
B	- SIGNAL
C	+ EXCITATION
D	- EXCITATION
E	+ SENSE
F	- SENSE
G	SHIELD

5. JUNCTION BOX CONNECTIONS

a. Low Profile Style



Terminal strip TB1 is the output terminal strip to the 8140 digital indictor. It should be wired as shown.

TERMINAL	SIGNAL DESCRIPTION
1	+ Signal
2	- Signal
3	Shield
4	+ Sense
5	- Sense
6	- Excitation
7	+ Excitation

Terminal strips TB2 and TB3 are the connections for the load cells. Wire the load cells as described below. See part 1 of this section for load cell color code.

NOTE: Load Cell will be abbreviated as L/C in this chart

TERMINAL	TB2 DESCRIPTION	TB3 DESCRIPTION
1	-Signal L/C2	-Signal L/C1
2	+Signal L/C2	+Signal L/C1
3	-Signal L/C4	-Signal L/C3
4	+Signal L/C4	+Signal L/C3
5*	Shields	Shields
6**	+Excit. L/C 2 & 4	+Excit. L/C 1 & 3
7**	-Excit L/C 2 & 4	-Excit. L/C 1 & 3

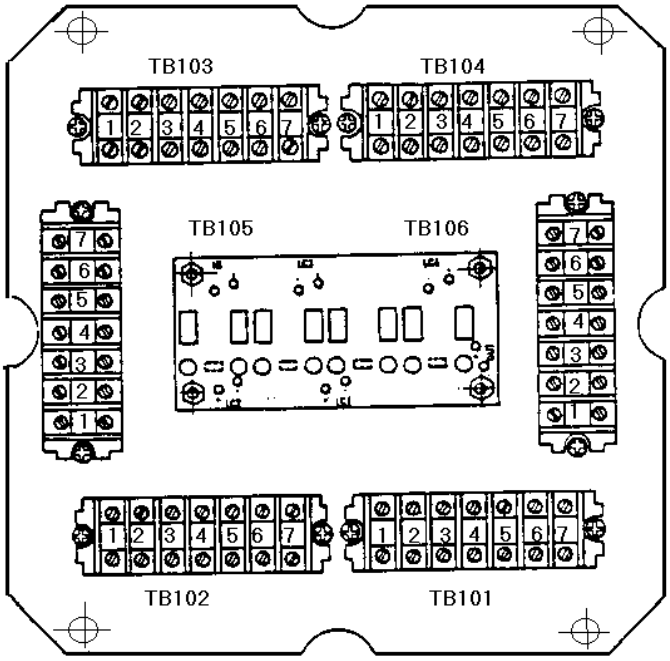
Note that no sense leads are connected form the load cells.

*** Each load cell shield connection is not required when all load cells are contained within one steel understructure.**

**** Terminals 6 & 7 will each have two wires connected to them. One wire will go to each load cell supplied.**

NOTE: Toledo Scale now uses a dual shield cable. The ground shield (green with yellow stripe) connects to structure (chassis) ground.

b. Vehicle Style



On terminal strips TB101*, TB102, TB103 and TB104 a load cell is connected using the following guide. see part 1 of this section for load cell color code.

TERMINAL	SIGNAL DESCRIPTION
1	+Signal
2	-Signal
3	Shield
4	-Excitation
5	+Excitation
6*	+Sense
7*	-Sense

TB105 is the input terminal strip that another junction box output would connect to if multiple junction boxes were required. The wiring is the same as the chart above.
TB106 is the output terminal strip to the digital indicator. The wiring for this is the same as the above chart.

*** If four wire load cells (no sense leads) are used, there must be two jumpers installed on TB 101. The two jumpers should be placed from terminal 5 to terminal 6. These jumpers are not required with 6 wire cells. If four wire load cells are used, no wires will be connected to terminal 6 and 7 on TB 102, TB 103, and TB 104.**

C. PRINTER AND SERIAL I/O

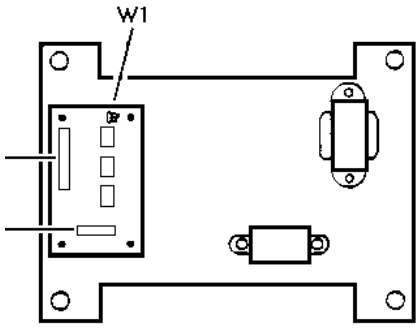
The standard 8140 does not contain the circuitry required to interface to a Toledo printer. To be able to operate, a Toledo printer a Printer Interface KOP (for stainless steel enclosure) or Printer Pod (for plastic enclosure) must be installed.

1. STAINLESS STEEL ENCLOSURE

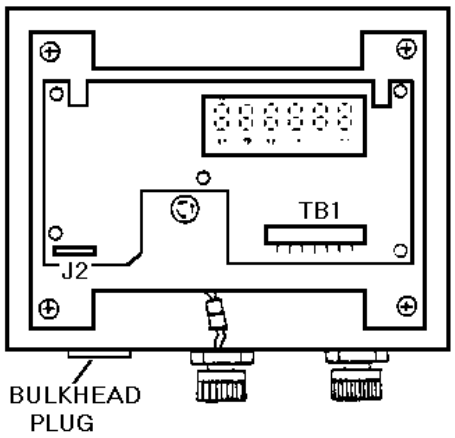
To install, remove the Main PCB complete with backing plate and install Interface PCB on the back of the plate. The PCB should be oriented as shown in Figure 1. The interconnecting harnesses should be installed as described in Figure 1.

HARNESS TO MAIN PCB - J2

HARNESS TO OUTPUT - J7



The bulkhead plug shown in Figure 2 is then removed from the bottom of the enclosure and the output connector is installed in its place. A more detailed set of instructions is included with the Printer Interface KOP 122810 00A.

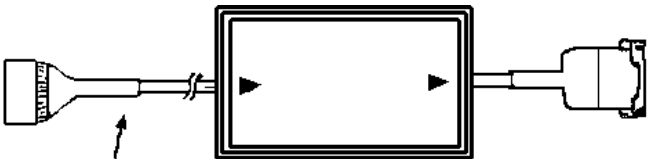


2. PLASTIC ENCLOSURE

The plastic enclosure requires the addition of a separate box or "pod". There are two different styles of printer pods described below - an earlier style and the new style.

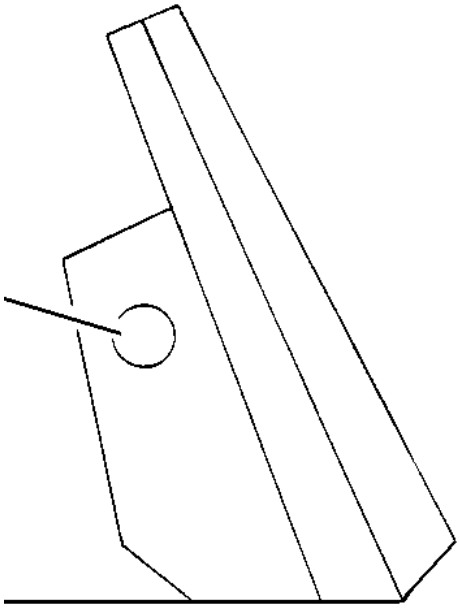
a. Earlier Style (122809 00A)

The assembly, shown in Figure 3, is installed by removing the round plastic plug form the left side of the enclosure. See Figure 4. The pod cable should then be routed inside the enclosure through this hole and plugged onto J2 at the lower left of the Main PCB. The grommet provided should be installed around the cable and pressed into the hole where the plug was removed as a strain relief.



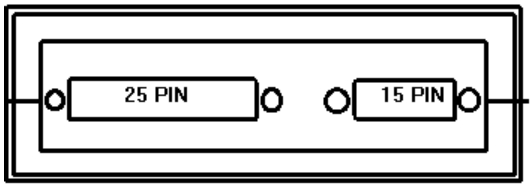
ROUTE CABLE THROUGH HOLE

PLASTIC PLUG



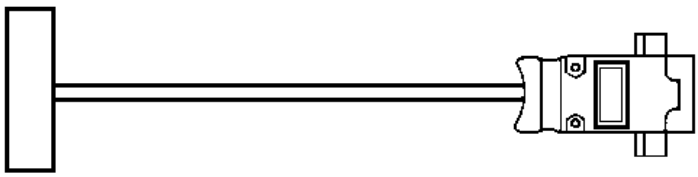
b. Newer Style (126724 00A)

This type of printer pod consists of a box with 2 connectors on the front as shown in Figure 5. The connector on the left is the output to which a printer cable is connected. The connector on the right is of the input cable. The type of 8140 enclosure (either RFI protected or standard) determines which input cable is required.



i). Standard Enclosure

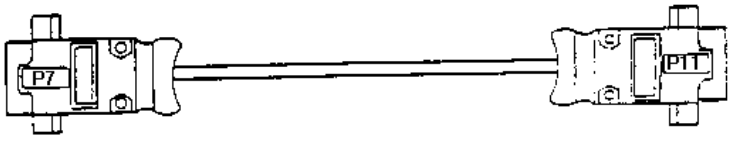
This requires the use of cable part number 126735 00A which connects to the printer pod with the 15 pin D type connector and attaches to J2 on the 8140 Main PCB with the 19 pin end. The cable is routed through the hole on there rear cover after removing the round plastic plug. See Figure 4. The grommet provided should be installed around the cable and pressed into the hole where the plug was removed as a stain relief.



Cable Number 126735 00A

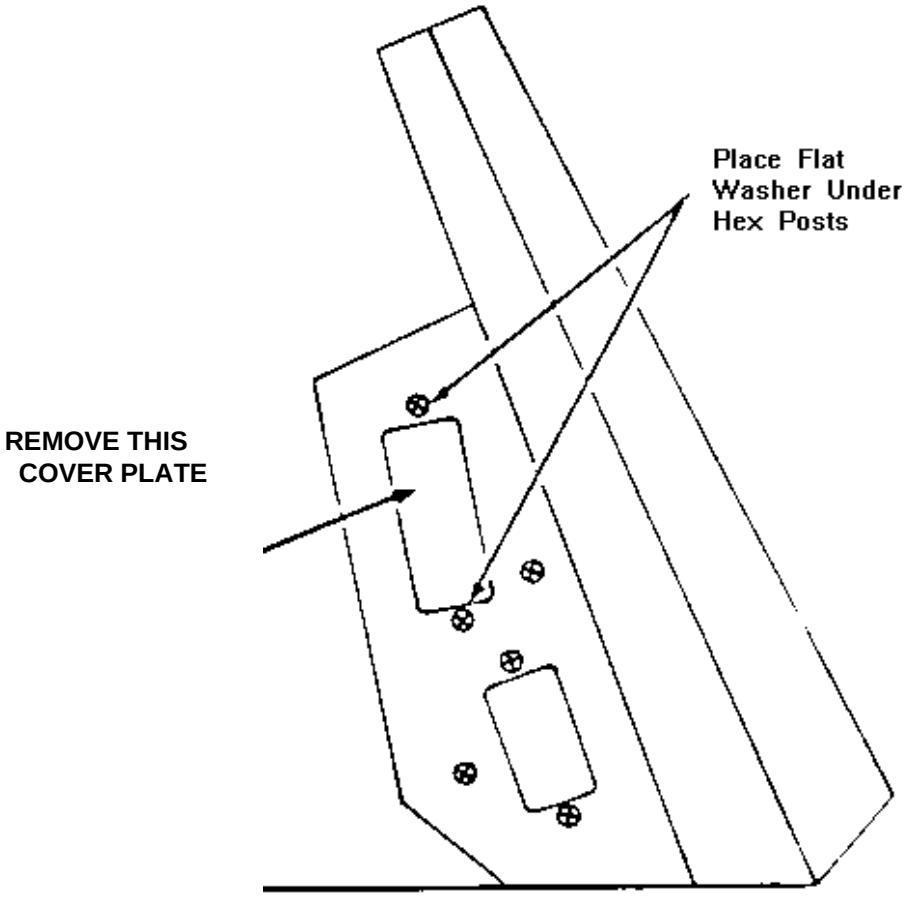
ii). RFI Protected Enclosure

This requires the use of cable part number 126720 00A and harness part number 126139 00A. The cable has a 15 pin D type connector at each end and is wired pin to pin.



Cable Number 126720 00A

Install the harness inside the 8140 enclosure by removing the cover plate on the left rear of the enclosure (See Figure 6) and attaching the 15 pin connector using the screw-lock kit provided. Be sure to secure the green ground wire of this harness to the rear of mounting hardware. The other end of the harness attaches to J2 on the Main PCB. This 15 pin cable is now installed between the new connector on the side of the enclosure and the input connector on the printer pod.



3. SERIAL INPUT AND OUTPUT DESCRIPTIONS

Signal Name	8140 Plastic	8140 Stainless	301 307 J9	8805 J1	8804 J2 8806 J7 8860 J7 J7	8820 8830 J25	8840	8855 J1
Chassis Ground	*	*	*	*	*	*	*	*
TxD (RS -232-C)	2	B					3	
RxD (RS-232-C)	3	C						
RTS (RS-232-C)	4 }**	D }**						
CTS (RS-232-C)	5	E						
DSR (RS-232-C)	6	F						
Logic Ground	7	G				15	7	3
+ Print (20mA)	8	H		24	11	16		
20mA Transmit--	9	J	6	26	16	14		
--Print (20mA)	10	K		19	22			
RS-422 (A)	11	L						
RS-422 (B)	12	M						
Not Used	13	N						
20mA Transmit+	14 }**	P }**						
20mA supply (+12v)	15	R						
+Print (20mA)	16	S						
20 mA Supply (-12v)	17	T						
-Print (20mA)	18	U						
Logic Ground	19	V						
DTR (RS-232-C)	20	W						
20mA Supply (-12v)	21	X						
Logic Ground	22	Y	7	28	18	18		22
Logic Ground	23	Z						
Not Used	24	a						
Not Used	25	b						
		c						
Jumper shown is in printer end of interconnecting cable					12 23	9 19		

RS-422 is available on Factory Number 8140-1XXX units only.

*** Denotes shield connection.**

**** Jumper is in 8140 end of interconnecting cable.**

HANDSHAKING AND SIGNAL DESCRIPTIONS

RTS (Request to Send) - Not used at this time.

CTS (Clear to Send) -This input signal can be used to control when the 8140 is able to transmit data. If this line is held to - 12VDC the 8140 will have a not clear to send signal and will abort any programmed or requested data transmission. This line does not need to be held to + 12VDC to allow a data transmission but it can be if desired.

DSR (Data Set Ready) -This input line may be pulsed to 0VDC or lower (-15VDC minimum) for approximately 300 ms to initiate a data transmission. If the output is in the continuous mode, bit 3 in status word C for "print button pushed" will change.

DTR (Data Terminal Ready) -This output signal will go to + 12VDC while the 8140 unit is powered ON.

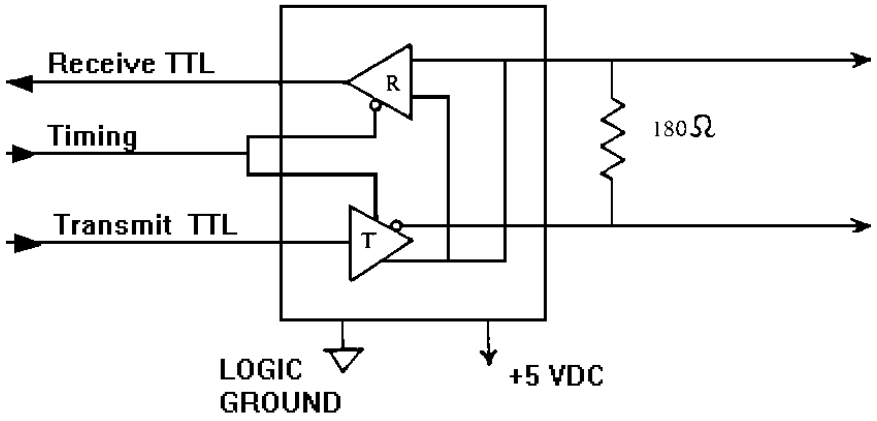
TxD ASCII coded data will be transmitted via RS-232C from this pin.

RxD This is a receive pin for RS-232-C that is not used in the 8140 at this time.

NOTE: Where a 12 volt level is stated above, a voltage level from 3 to 15 volts is acceptable. Toledo Scale normally uses a 12 volt level for its equipment.

Interface Notes on RS-422

The wiring configuration used on the Model 8140 for RS-422 can be referred to as a "two-wire" scheme. That is, the data output is totally contained on only two wires. the following schematic shows how the 8140 utilizes RS-422.



Interface to a "four-wire" scheme should not be required since the 8140 is not capable of receiving any data, only transmitting data. All data sent will be ASCII coded and transmitted at the baud rate selected in the data output setup. Step F12.

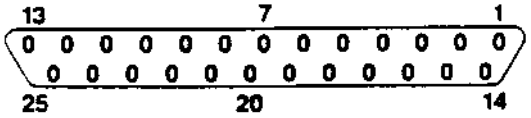
4. INTERCONNECTING CABLES

PRINTER	8140	LENGTH	SERVICE PART NO.	FACTORY NO.
301/307	Desk	6'	A119714 00A	0900-0191
		20'	A119715 00A	0900-0199
	Wall	6'	A122570 00A	0900-0180
		20'	A122571 00A	0900-0181
8805	Desk	6'	A119716 00A	0900-0200
		20'	A119717 00A	0900-0201
	Wall	6'	A122572 00A	0900-0182
		20'	A122573 00A	0900-0183
8804* 8806 8860*	Desk	6'	A115544 00A	0900-0136
		20'	A115545 00A	0900-0137
	Wall	6'	A122574 00A	0900-0188
		20'	A122575 00A	0900-0189
8810 8820 8830	Desk	6'	B119720 00A	0900-0195
		20'	B119721 00A	0900-0196
	Wall	6'	A122576 00A	0900-0184
		20'	A122577 00A	0900-0185
8840	Desk	6'	B128220 00A	0900-0214
	Wall	20'	128221 00A	0900-0215
8855	Desk	6'	B119722 00A	0900-0197
		20'	B119723 00A	0900-0198
	Wall	6'	A122578 00A	0900-0186
		20'	A122579 00A	0900-0187

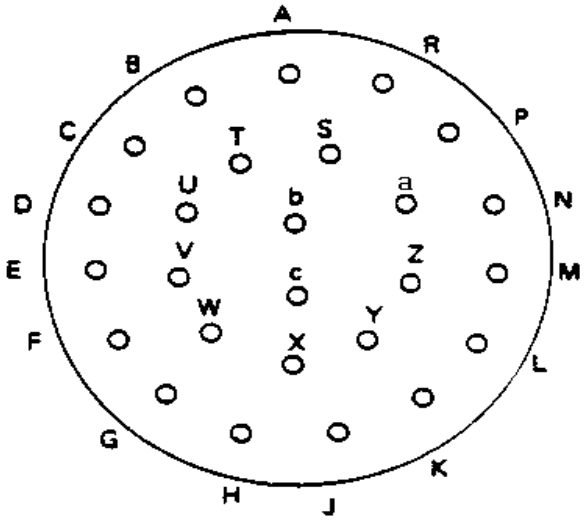
NOTE: To remove wall mount printer cables, press in toward enclosure and twist counterclockwise.

*** Must use adapter plug include with the printer.**

PRINTER PROD CONNECTOR (plastic enclosure) PIN LOCATION



PRINTER OUTPUT (stainless steel enclosure) PIN LOCATION



5. DATA OUTPUT TABLES

a. Demand Output

The mode of data output from the 8140 is selectable via the Setup routine as either on demand or continuous. If demand is selected, there are six different formats for which the data may be configured. The following descriptions give the formats of the data for all available selections and some notes that should be considered. All weight data fields are six active characters in length. This will be expanded to seven characters when a decimal point is included and when a negative six digit net weight is transmitted.

When a minus sign is included in a weight field, the data field will be expanded as follows:

1. **Single Line G-T-N or Displayed Weight**
   Only the respective field (Gross or Net) is expanded by one character.

2. **Multiple Line G-T-N**

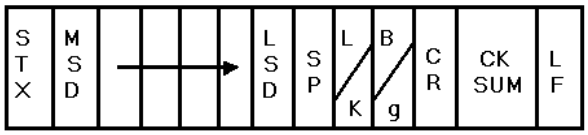
All fields (Gross, Tare and Net) are expanded by one character.

Non-significant leading zeroes will be transmitted as spaces unless the 8140 is locked into the kilogram mode (no LB/kg switching) then the leading zeroes will be transmitted.

When transmitting data to a Ram 2 or 3 8820 or 8830 the output must be single line. if multiple line print is desired, it must be programmed in the printer.

All data sent is 11 Bit ASCII (1 Start Bit, 7 Data Bits, 1 Even Parity Bit, 2 Stop Bits)

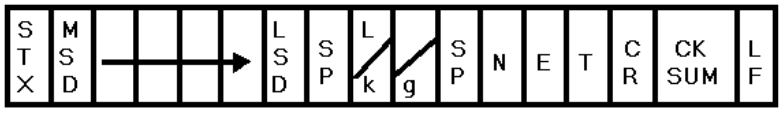
i). Displayed Weight Only - Single Width



Gross Weight Only

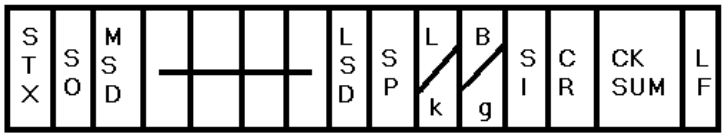
OR

Net Weight Only



Start of Text | **Weight Data** | **Space** | **Space** | **Carriage Return** | **Line Feed** | **Opt. Checksum Char.**

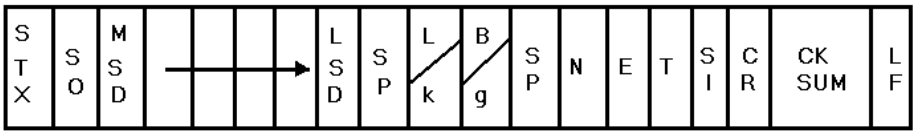
ii). Displayed weight Only - Double Width (See Note 2)



Gross Weight Only

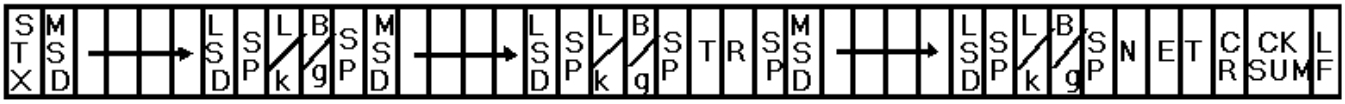
OR

Net Weight Only



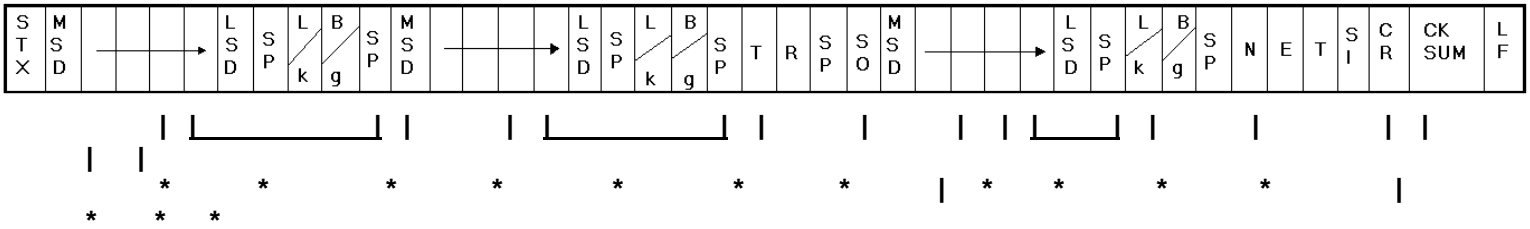
Start of Text | Shift Out Char. | Weight Data | Space | Space | Shift In Char. | Carriage Return | Opt. Check Sum Character | Line Feed

iii.) Gross, Tare, Net -- Single Line -- Single Width



Start | Gross Weight | Space | Space | Tare Wgt. | Space | Space | Space | Net Wgt. | Space | Space | Carriage Return | Optional Checksum Char. | Line Feed

iv). Gross, Tare, Net - Single Line - Net Double Width (See Note 2)

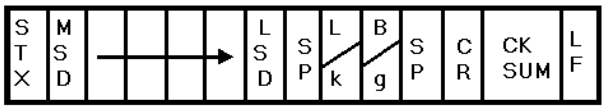


Shift Out Character **Shift In Character**

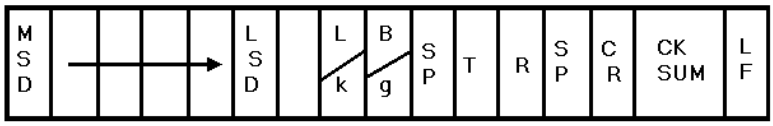
*** All other characters are labeled as above in " iii.) "**

v). Gross, Tare, Net - Multiple Line - Single Width (See Note 1)

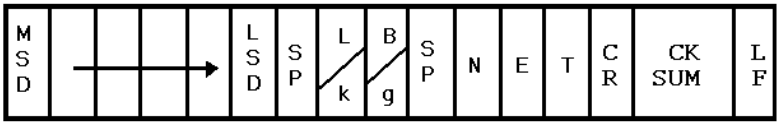
Gross Weight



Tare Weight



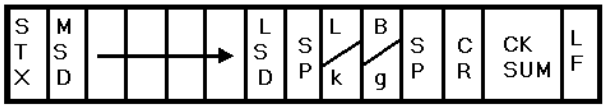
Net Weight



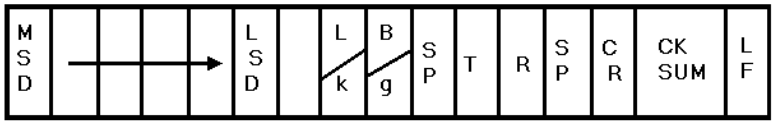
Weight Data **Space** **Space** **Carriage Return** **Line Feed** **Optional Check Sum Character**

vi). Gross, Tare, Net - Multiple Line - Net double Width
(See Notes 1 and 2)

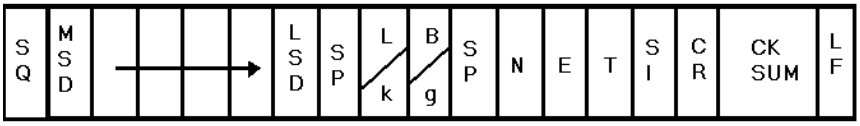
Gross Weight



Tare Weight



Net Weight



Shift Out Character * * * **Shift In Character** * * *

*** All other characters are labeled as above in " v.) "**

NOTES:
1. When transmitting data to an 8820 or 8830 Ram 1 printer, an STX character is added to the beginning of the second and third lines.

2. The shift-out character (SO) is added to the data transmission to tell the receiving device that the following data, up to the first shift-in character (IS) should be printed in double width.

b. Continuous Output (Toledo Format)

Function	Selection	Bit						
		6	5	4	3	2	1	0
Decimal Point or Dummy Zero	X0 X 0.X 0.0X 0.00X 0.000X	ALWAYS 0	ALWAYS 1	*		0 0 0 1 1 1	0 1 1 0 0 1	1 0 1 0 1 0
Increment Size	X = 1 X = 2 X = 5			0 1 1	1 0 1	*		

JN Port Status Word A Bit Definitions
(*) Bits Not Applicable to Function

Function	Bit
Gross/Net, Net = 1	0
Under Zero, Negative = 1	1
Overcapacity = 1, Normal = 0	2
Motion = 1, No Motion = 0	3
lb = 0, kg = 1	4
Always 1	5
Powerup = 1	6

JN Port Status Word B Bit Definitions

Function	Bit
Always a 0	0
Always a 0	1
Always a 0	2
Print Request = 1	3
Expanded Data = 1	4
Always 1	5
Always 0	6

JN Port Status Word C Bit Definitions

ASCII CHARACTER CHART

ASCII CHAR.	DECIMAL	HEX	76543210	ASCII CHAR.	DECIMAL	HEX	76543210
NULL	0	00	00000000	@	64	40	01000000
SOH	1	01	00000001	A	65	41	01000001
STX	2	02	00000010	B	66	42	01000010
ETX	3	03	00000011	C	67	43	01000011
EOT	4	04	00000100	D	68	44	01000100
ENQ	5	05	00000101	E	69	45	01000101
ACK	6	06	00000110	F	70	46	01000110
BELL	7	07	00000111	G	71	47	01000111
BACKSPACE	8	08	00001000	H	72	48	01001000
TAB	9	09	00001001	I	73	49	01001001
LineFeed	10	0A	00001010	J	74	4A	01001010
Vert. Tab	11	0B	00001011	K	75	4B	01001011
Form Feed	12	0C	00001100	L	76	4C	01001100
Carr.Return	13	0D	00001101	M	77	4D	01001101
Shift Out	14	0E	00001110	N	78	4E	01001110
Shift In	15	0F	00001111	O	79	4F	01001111
Data Link Esc	16	10	00010000	P	80	50	01010000
DC1	17	11	000010001	Q	81	51	01010001
DC2	18	12	00010010	R	82	52	01010010
DC3	19	13	00010011	S	83	53	01010011
DC4	20	14	00010100	T	84	54	01010100
NAK	21	15	00010101	U	85	55	01010101
SYNCH IDLE	22	16	00010110	V	86	56	01010110
End Trans. Block	23	17	00010111	W	87	57	01010111
CANCEL	24	18	00011000	X	88	58	01011000
End Of Medium	25	19	00011001	Y	89	59	01011001
SUBSTITUTE	26	1A	00011010	Z	90	5A	01011010
ESCAPE	27	1B	00011011	[	91	5B	01011011
FS (Cursor Right)	28	1C	00011100	\	92	5C	01011100
GS (Cursor Left)	29	1D	00011101	]	93	5D	01011101
RS (Cursor Up)	30	1E	00011110	^	94	5E	01011110
US (Cursor Down)	31	1F	00011111	_	95	5F	01011111
SPACE	32	20	00100000	`	96	60	01100000
!	33	21	00100001	a	97	61	01100001
"	34	22	00100010	b	98	62	01100010
#	35	23	00100011	c	99	63	01100011
$	36	24	00100100	d	100	64	01100100
%	37	25	00100101	e	101	65	01100101
&	38	26	00100110	f	102	66	01100110
'	39	27	00100111	g	103	67	01100111
(	40	28	00101000	h	104	68	01101000
)	41	29	00101001	i	105	69	01101001
*	42	2A	00101010	j	106	6A	01101010
+	43	2B	00101011	k	107	6B	01101011
,	44	2C	00101100	l	108	6C	01101100
-	45	2D	00101101	m	109	6D	01101101
.	46	2E	00101110	n	110	6E	01101110
/	47	2F	00101111	o	111	6F	01101111
0	48	30	00110000	p	112	70	01110000
1	49	31	00110001	q	113	71	01110001
2	50	32	00110010	r	114	72	01110010
3	51	33	00110011	s	115	73	01110011
4	52	34	00110100	t	116	74	01110100
5	53	35	00110101	u	117	75	01110101
6	54	36	00110110	v	118	76	01110110
7	55	37	00110111	w	119	77	01110111
8	56	38	00111000	x	120	78	01111000
9	57	39	00111001	y	121	79	01111001
:	58	3A	00111010	z	122	7A	01111010
;	59	3B	00111011	{	123	7B	01111011
<	60	3C	00111100	|	124	7C	01111100
=	61	3D	00111101	}	125	7D	01111101
>	62	3E	00111110	~	126	7E	01111110
?	63	3F	00111111		127	7F	01111111

D. ANALOG OUTPUT

The connector J4 on the Main PCB contains an analog output signal. This output is isolated with a 10k metal film resistor. The pin configuration is shown below for J4.

Pin No.	Description
J4-1	+22 VDC
J4-2	-22VDC
J4-3	Analog Ground
J4-4	Key
J4-5	Analog Output

The actual voltage present will vary depending upon which Main PCB is used. The charts below show what voltage should be present at no load and at full load.

ANALOG OUTPUT			
	RAM 0XXX	RAM 1XXX	
Load Description		W5 between 1 & 2	W5 between 2 & 3
No load on load cell	0VDC	6.2 VDC	6.2 VDC
Fully loaded 2mV/V load cell	-10VDC	1.2 VDC	2.9 VDC
fully loaded 3mV/V	*	*	1.2 VDC
* Not Applicable			

NOTE: The analog output voltage relates directly to the input voltage from the load cell and not to the calibrated display of the 8140. The calibration of the 8140 will not affect the analog output voltage.

E. PARTS LISTING

1. RECOMMENDED SPARE PARTS

PLASTIC ENCLOSURE	
Keyboard	125634 00A
Main PCB	B122751 00A or B126659 00A
Terminal Strip	119241 00A
L/C Harness	A117207 00A

STAINLESS STEEL ENCLOSURE	
Keyboard	125634 00A
Main PCB	B122751 00A or B126659 00A
Plastic Keyboard Window	114667 00A
Terminal Strip	119241 00A

2. PRINTER INTERFACE KITS AND MISCELLANEOUS HARDWARE

PLASTIC ENCLOSURE		
DESCRIPTION	NON RFI PART NO.	RFI TYPE PART NO.
Printer Interface Pod	A122809 00A or 126733 00A*	A126732 00A*
Load Cell Adapt. Harness	A117207 00A	A117611 00A

*KOP Number A126734 00A converts the 126733 00A Assembly for use with an RFI enclosure.

STAINLESS STEEL ENCLOSURE	
DESCRIPTION	PART NO.
Printer Interface KOP	122810 00A
Load Cell Connector Grommet	A117419 00A

3. MATING CONNECTORS

MATING CONNECTORS FOR 8140 INPUTS/OUTPUTS			
TYPE	DESCRIPTION	DESK	WALL
Load Cell 7 Pin	Connector Clamp	117661 00A 117662 00A	Not Used
Load Cell (RFI) 9 Pin	Connector and Clamp KOP	125819 00A	Not Used
Serial I/O	Male Plug Clamp Pins Complete KOP	107187 00A 125389 00A 107189 00A 128881 00A	123478 00A* 126232 00A*

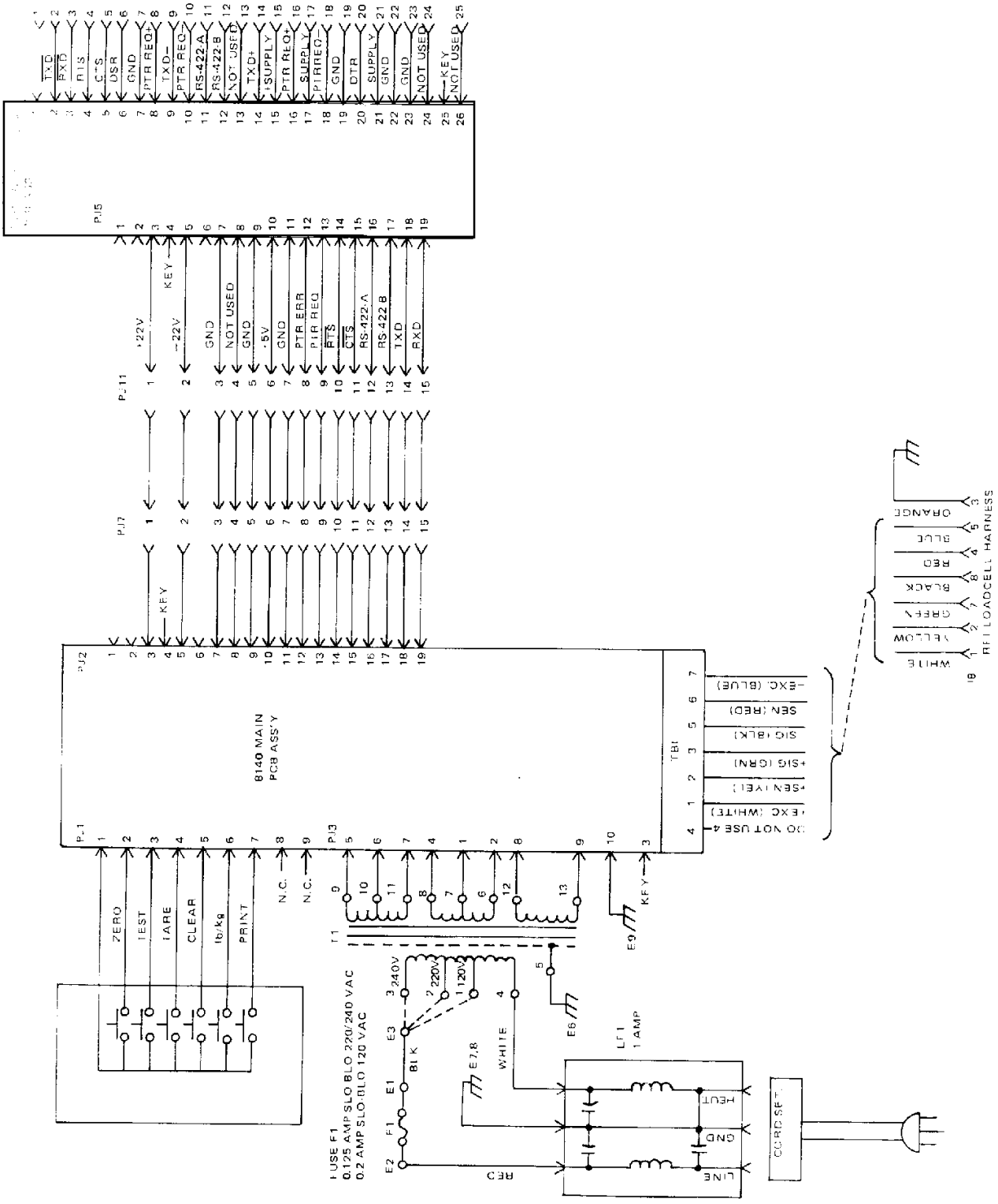
*Requires Potting and Cleaning KOP's

4. MISCELLANEOUS

DESCRIPTION	PART NUMBER
Potting KOP	125839 00A
Potting Refill KOP	125874 00A
Universal Cleaning KOP	125875 00A

F. INTERCONNECT DIAGRAM

1. DESK ENCLOSURE



2. WALL ENCLOSURE