8139

Indicator

Service Manual

TM008139I03

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:

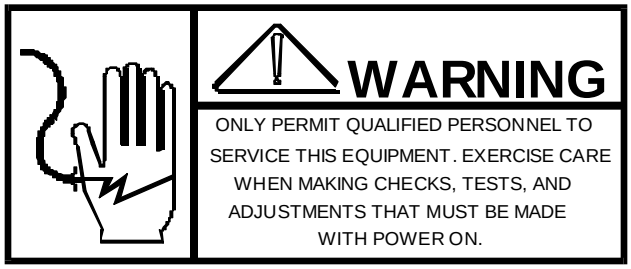
METTLER TOLEDO
Training Center
P.O. Box 1705
Columbus, Ohio 43216
(614) 438-4400

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.**

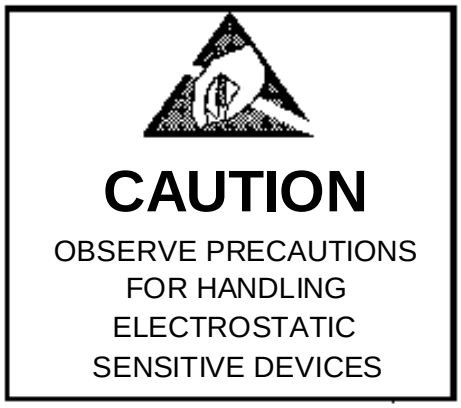


- **DO NOT connect or disconnect a load cell scale base to the equipment with power connected or damage will result.**

- **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.**

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1. GENERAL DESCRIPTION

The Model 8139 Electronic Digital Indicator is intended for use with strain gauge load cell scales. The 8139 displays gross or net weights up to five digits. The unit is available n either plastic or stainless steel enclosure which can be mounted to a desk, wall or column.

FEATURES

- **Switch selectable capacity of 2000, 2500 or 3000 increments.**
- **Displays Gross or Net weight in either pounds (LB) or kilograms (KG).**
- **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 IV 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 ± 2% of scale capacity from zero).**
- **Pushbutton zero (within ±2% of scale capacity form zero).**
- **Lighted indicator above the zero legend when scale is within ±.25 increments of zero.**
- **Pushbutton Tare.**
- **Under capacity blanking at approximately 130 increments below zero.**
- **Over capacity blanking at 5 increments over scale capacity.**
- **Power up blink which does not display weight data.**

2. SYSTEM DESCRIPTION

The smallest increment is .0001 LB (.00005 KG) and the largest increment is 20 LB (10 KG).

2.1 The 8139 consists of three (3) major blocks. These are:

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

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

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

2.2 There is an optional Printer Interface PCB which converts the 8139 output to a 20 mA current loop output.

There is also an optional printer Interface PCB which converts the 8139 (Desk Mount only) output to RS232 output.

2.3 The Model 8139 provides 10 volts of excitation for strain gauge load cells.

The initial range is adjustable from 0 to 13.4mV.
The span range is adjustable form 6.7 to 20mV.

2.3.1 Zero drift and temperature changes are compensated for by gating the excitation voltage.

2.3.2 Excitation current is provided for up to 4-350 ohm load cells.

3. SPECIFICATIONS

3.1 ELECTRICAL AND PHYSICAL SPECIFICATIONS

3.1.1 Environment

The 8130 operates from -10 C (14 F) to + 40 C (14 F) at 95 % relative humidity, non-condensing. Zero Temperature Coefficient is 0.5 uV/ C maximum. The span temperature coefficient is 8 PPM / C maximum.

3.1.2 Power Requirements

The model 81390 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.

CAUTION: ALL UNITS ARE SHIPPED FOR 120 AC OPERATION. REFER TO SECTION 4 FOR ALTERNATE VOLTAGE OPERATION.

3.1.3 U.L. and C.S.A. Standards

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

3.1.4 FCC Regulations

The 8139 meets or exceeds the FCC conducted and radiated emissions requirements.

3.1.5 RFI Specifications

In environments where high RFI radiation exists, the stainless steel enclosure Ram 14, or the plastic enclosure Ram 4, 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 with a conductive layer and had an RFI filtered load cell connector and a screened display lens added. The stainless steel enclosure has a conductive gasket and an RFI filtered load cell connector and a screened display lens added.

3.1.6 Appearance and DimensionsTthe color of the Model 8139 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 10" tall (25.4 cm) x 12" wide (30.5 cm) x 3.8" deep (9.6 cm) and can be wall mounted or column mounted. The desk model weighs approximately 4.6 LBS (7.7 KG.)

3.2 INTERNAL FUNCTIONS

The 8139 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.

3.3 DISPLAY FORMAT

The display is a green-blue, vacuum fluorescent, six character (minus sign and up to five digit weight display) with lighted decimal point. There are lighted indicators above the Zero, LB, KG, Gross, Net and Print legends. Sample display:

5 8 8 8 0

LB KG Gross Net Print

3.4 PRINTER INTERFACE

The 8139 is capable of transmitting TTL logic level data at 300 or 4800 baud selectable by an internal programming switch. An optional printer interface PCB may be connected to allow conversion to a 20 mA current loop output.

3.4.1 300 Baud Operation

When a print command is received, either from the PRINT key or an external "PRINT DEMAND" signal, the two internal switches (SW2-7 and SW2-8). Scale motion, expand mode or under zero operation will disable a print command. The display blanks during data transmission. The output is disabled when Gross weight is negative. No checksum is sent.

3.4.2 4800 Baud Operation

The data output is continuous and is similar to the output of the Toledo Model 8132 indicator. (See output tables, Section 6.) A checksum character is always transmitted.

3.5 RAM CONFIGURATION GUIDE

FACTORY NO.	ENCLOSURE	KEYBOARD AND LEGEND DESCRIPTION	USE
8139-0001	Plastic	English	Domestic
8139-0002	Plastic*	Blank	Export
8139-0003	Plastic*	Spanish	Export
8139-0004	Plastic*	English	Domestic
8139-0005	Plastic*	UK	Export
8139-0011	Stainless Steel	English	Domestic
8139-0012	Stainless Steel*	Blank	Export
8139-0013	Stainless Steel*	Spanish	Export
8139-0014	Stainless Steel*	English	Domestic
8139-0015	Stainless Steel*	UK	Export

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

4. INSTALLATION INSTRUCTIONS

4.1 SET-UP PROCEDURE

4.1.1 Inspect the outer case for loose or damaged parts.

4.1.2 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 the rear cover and twisting 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.

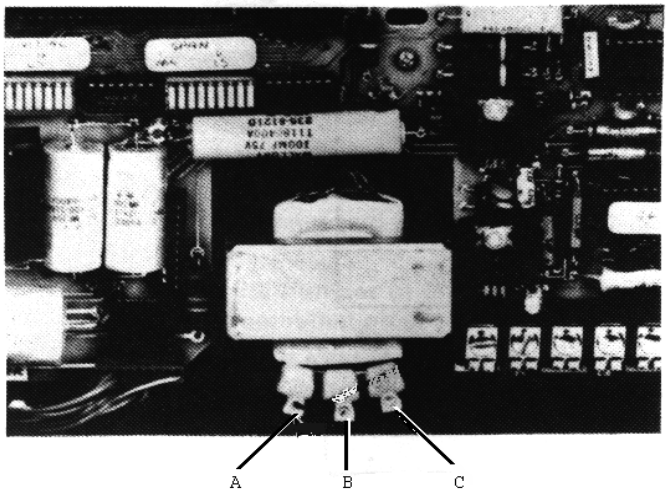
b). The NEMA 4 enclosure is opened by loosening the screw holding the clamps to the front panel until the clamps can be moved aside to allow the front door to swing open.

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

CAUTION: BE SURE POWER IS DISCONNECTED BEFORE MAKING ANY ADJUSTMENTS TO THE TRANSFORMER FOR VOLTAGE CHANGES.

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

CAUTION: ALL U.S. UNITS ARE SHIPPED FOR 120 VAC OPERATION.



A - Transformer shown connected for 120 VAC.

B - Transformer shown connected for 220 VAC.

C - Transformer shown connected for 240 VAC.

4.1.4 Preliminary Calculations

Before any work is done 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. Figure out 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:

1). Scale capacity*
2). Increment size*
3). Number of load cells or total lever ratio
4). Size of load cell(s)*
5). Cell output rating in mV/V - (millivolts per volt of excitation)

*** In LB or KG depending on how scale is to be calibrated and used.**

b). Find the total load cell output in millivolts by multiplying the cell output rating* by the 8139 excitation voltage, 10 volts.

NOTE: Toledo load cells are 2mV/V. Other types may be 2mV/V or 3mV/V. The Model 2300 is 1mV/V.

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

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

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

e). The Microvolt Chart shows the limits in microvolts for each increment selection.

MICROVOLT PER INCREMENT CHART

NUMBER OF PROGRAMMED INCREMENTS	MINIMUM* uV/INC.	MAXIMUM* uV/INC.
2000	3.33	10
2500	2.67	8
3000	2	6.67

***NOTE: The 8139 will not be stable if these limits are exceeded.**

f). Examples on finding uV/Inc.

a).EXAMPLE #1
Model 2184

Scale Capacity	**300 LB**
Increment Size	**0.1 LB**
Lever Ration	**8.1 to 1**
Size of Cell	**100 LB**
Cell Output Rating	**2mV/V**

Step 1) Find total load cell output (mV)
(mV)
2mV/V X 10V = 20 mV

Step 2) Use the formula for finding uV/Inc.
uV/Inc.

$$\frac{0.1 \text{ LB} \times 20 \text{ mV} \times 1000}{100 \text{ LB} \times 8.1} = 2.47 \text{ uV/Inc.}$$

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

$$\frac{300 \text{ LB}}{0.1 \text{ LB}} = 3000 \text{ Increments}$$

Step 4) Check the Microvolt Per Increment Chart to see if this build fits into the 3000 increment range. It does, so this will be a satisfactory build.
build.

EXAMPLE #2
Model 1985

Scale Capacity	**40 LB**
Increment Size	**0.02**
Number Cells	**1**
Size of Cell	**100 LB**
Cell Output Rating	**2 mV/V**

Step 1) Find total load cell output

2mV/V X 10 V = 20 mV

Step 2) Use the formula for finding

$$\frac{0.02 \text{ LB} \times 20 \text{ mV} \times 1000}{100 \text{ LB} \times 1} = 4 \text{ uV/Inc.}$$

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

$$\frac{40\text{LB}}{0.02 \text{ LB}} = 2000 \text{ Increments}$$

Step 4) Check the Microvolt Per Increment Chart to see if this build fits into the 2000 Increment range. It does, so this will be a satisfactory

4.1.5 Programming the 8139 functions.

See Section 4, for description of switches and jumpers.

a). Select the proper increment size with switches SW1-1 and SW 1-2.

b). Select the correct decimal point location and/ or dummy zero with SW1-4, SW1-5 and SW1-6.

c). Select the number of increments required using a combination of SW1-3 and SW1-7.

d). Determine if AZM (Auto Zero Maintenance) is to be used and position SW1-8 accordingly.

e). Leave EXPAND MODE switch SW1-9 Off at this time.

f). Select the proper operations for print formatting and tare functions using SW2-7 through SW2-9 and SW3-7 through SW3-9.

g). Make sure JMP1, JMP2, and JMP3 are in the proper positions.

4.2 PRECALIBRATION OF THE INSTRUMENT USING A LOAD CELL SIMULATOR

NOTE: Precalibration of the 8139 is not a required step; however, it can reduce the number of times test weights need to be applied to the scale platform.

FIRST FIND:

----- **Number of cells used.**

----- **Capacity of one cell*.**

----- **Total level ration (if required).**

----- **Millivolt output of the cell(s).**

*** In LB or KG depending on how the scale is to be calibrated and used.**

THEN:

4.2.1 **Multiply the cell capacity by the number of cells used. Multiply this number by the lever ratio, if required, to find the Total Cell Capacity.**

4.2.2 **Divide the Total Cell Capacity by the correct division number to find LB or KG per step on the simulator. Refer to the following chart for this number.**

MILLIVOLTS/VOLT CELL OUTPUT	DIVISION NUMBER
1	5
1.8	9
2	10
3	15

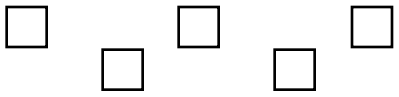
4.2.3 **At this time connect the simulator to the instrument.**

4.2.4 **Set all initial switches SW2-1 through SW2-6 and all span switch SW3-6 to the OFF position.**

4.2.5 **Turn the span pot. (R21) and the initial pot. (R22) fully counterclockwise.**

4.2.6 **Connect to the power line.**

4.2.7 **At this time, the instrument will blink with the following display. (Only if SW 1-8 is OFF).**



4.2.8 **Turn the simulator switch to the zero position.**

4.2.9 Turn SW1-9 (Expand) On and adjust initial reading to zero with initial switches SW2-1 through SW2-6 by turning them On one at a time starting with SW2-1, leaving On only the switches that do not take the display behind zero. Finish by adjusting zero pot. (R22).

4.2.10 Turn Expand switch SW1-9 OFF and capture zero with the Zero pushbutton.

4.2.11 Calibrate the instrument. Use the maximum number of steps on the simulator without exceeding the instrument's capacity. Calibrate the 8139 by turning switches SW3-1 through SW3-6 ON one at a time leaving ON only the switches that do not take the display over the desired value. Adjust the fine pot. for span (R21) at this time to obtain the desired weight display.

4.2.12 Due to the interaction between span and initial, these steps may have to be repeated until both zero and span are correct.

4.2.13 Remove power, disconnect the simulator form the instrument and connect the load cell(s). Reconnect to power. At this time, the 8139 will blink with the power up display. Repeat steps 9 and 10 to capture zero.

4.2.14 Only a small adjustment of the span pot. (R21) should be necessary to finish the calibration using test weights. Be sure to recheck zero.

4.2.15 It may be helpful to connect a load cell simulator to the instrument and record the readings at each step of the simulator. Attach this record to the instrument so that it can be used as an aid to locating problems in the future.

4.3 CALIBRATION OF 8139 LOAD CELL(S)

For ease of calibration, it might be helpful to first calibrate the indicator with a load cell simulator. See section 4.2.

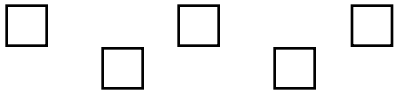
4.3.1 Connect the load cell(s) to the 8139. See Section 4.5.

4.3.2 Set all initial switches SW2-1 through SW2-6 and all span switches SW3-1 through SW3-1 through SW3-6 to the OFF position.

4.3.3 Turn the span pot. (R21) an d the initial pot. (R22) fully counterclockwise.

4.3.4 Connect to the power line.

4.3.5 At this time, the instrument will blink with the following display (Only if SW1-8 is OFF).



4.3.6 Turn SW1-9 (Expand) ON and adjust initial reading to zero with initial switches SW2-1 through SW2-6 by turning them ON one at a time starting with SW2-1, leaving ON only the switches that do not take the display behind zero. Finish by adjusting zero pot. (R22).

4.3.7 Turn Expand switch SW1-9 OFF and capture zero with the Zero pushbutton.

4.3.8 Place test weights equal to at least 10% of scale capacity on the platform. Calibrate the 8139 to display the proper wight by turning switches SW3-1 through SW3-6 ON one at a time leaving ON only the switches that do not take the display over the desired value. Adjust the fine pot. for span (R21) at this time to obtain the desired weight display. Remove the test weights and check zero.

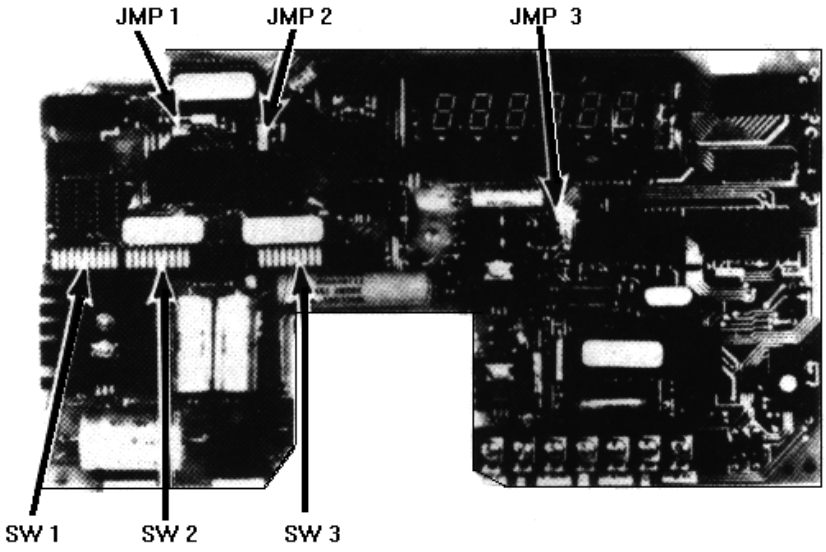
4.3.9 Due to the interaction between span and initial, these steps may have to be repeated until both zero and span are correct.

4.3.10 Turn SW1-9 ON and make final calibration with as much weight as possible. DO NOT EXCEED THE SCALE'S CAPACITY.

4.3.11 Turn Expand switch SW1-9 OFF.

4.3.12 It may be helpful to connect a load cell simulator to the instrument and record the readings at each step for the simulator. Attach this record to the instrument so that it can be used as an aid in locating problems in the future.

4.4 PROGRAM SWITCH AND JUMPER SUMMARY



4.4.1 PROGRAM SWITCHES

SW1-1 Increment Size
SW1-2 Increment Size

LB	KG	SW1-1	SW1-2
X1	X.5	OFF	OFF
X2	X1	OFF	ON
X5	X2	ON	OFF
X10	X5	ON	ON

NOTE: An increment size of 20 LB (10 KG) is possible by selecting X2 and using a dummy zero.

SW1-3 Increment Capacity

Used along with SW1-7 to select the desired increment capacity.

INCREMENT CAPACITY	SW1-3	SW1-7
2000	OFF	OFF
2500	ON	ON
3000	OFF	ON
NOTE: Select only the combinations shown.		

SW1-4 Decimal Point

SW1-5 Decimal Point

SW1-6 Decimal point

DISPLAY	SW1-4	SW1-5	SW1-6
XXXXX0	OFF	OFF	ON
XXXXX	OFF	ON	OFF
XXXX.X	OFF	ON	ON
XXX.XX	ON	OFF	OFF
XX.XXX	ON	OFF	ON
X.XXXX	ON	ON	OFF
NOTE: Select only the combinations shown.			

SW1-7 Increment Capacity

Used along with SW1-3 to select the desired increment capacity.

INCREMENT CAPACITY	SW1-3	SW1-7
2000	OFF	OFF
2500	ON	ON
3000	OFF	ON
NOTE: Select only the combinations shown.		

SW1-8 Automatic Zero Maintenance Inhibit

ON- AZM and the Zero pushbutton are disabled. The display blink on power up is also disabled.

OFF- AZM will operate to keep the instrument on zero in spite of 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 and the display will blink when power is first applied.

SW1-9 Expand Mode

ON- Display is expanded for calibration.

INCREMENT SIZE	DISPLAY EXPANDED BY
X1	10
X2	5
X5	2
The dummy zero on X10 and X20 increment sizes are dropped and expanded by 10 and 5 respectively.	

OFF- Normal mode

NOTE: AZM is disabled in expand mode. Be sure to check zero after switching expand mode ON.

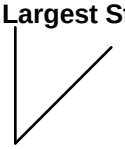
SW2-1Through SW2-6 Initial Switches

Turning On any of the initial switches SW2-1 through SW2-6 will increase the initial compensation.

SW2-2 has 1/2 the effect of SW2-1.

SW2-3 has 1/2 the effect of SW2-2 and so on down to SW2-6.

INITIAL SWITCHES	
SW2-1	Largest Step
SW2-2	
SW2-3	
SW2-4	
SW2-5	
SW2-6	Smallest Step



SW2-7 Print Format (300 baud only)

SW2-8 Print Format (300 baud only)

SW2-7	SW2-8	OUTPUT FORMAT
OFF	OFF	Displayed Weight Single Width
OFF	ON	Gross-Tare-Net Single Line
ON	OFF	Displayed Weight double Width
ON	ON	Gross- Tare-Net Multiple Line

SW2-9 Baud Select

ON- Output is continuous at 4800 baud.

OFF- Output is 300 baud.

SW3-1 Through SW3-6 Span Switches

Turning ON any of the span switches SW3-1 through SW3-6 will increase the weight indication.

SW3-3 has 1/2 the effect of SW3-1.

SW3-3 has 1/2 the effect of SW3-2 and so on down to SW3-6.

SPAN SWITCHES	
SW3-1	Largest Step
SW3-2	
SW3-3	
SW3-4	
SW3-5	
SW3-6	Smallest Step

SW3-7 Power Up KG

ON- The display will be in KG when power is applied and is not switchable to LB.

OFF- The display will be in LB when power is applied and can be switched by alternate action of the LB/KG key on the keyboard.

NOTE: This switch MUST be set before power is applied.

SW3-8 Auto Clear Enable

ON- Tare will clear automatically when indication returns to zero after settling to a no motion condition at a weight greater than 10 increments.

OFF- Tare must manually be cleared by use of the Clear key.

NOTE: Check possible interaction with Tare Interlock SW3-9.

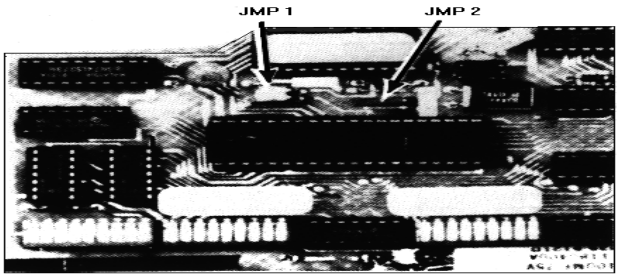
SW3-9 Tare Interlock

ON- The indication must be at true zero before Tare can be removed. (True zero is actually ZERO minus Tare value). Previous tare must be cleared before another tare can be entered.

OFF- Tare may be cleared or changed at any weight indication. Multiple tares are accepted.

4.4.2 JUMPERS

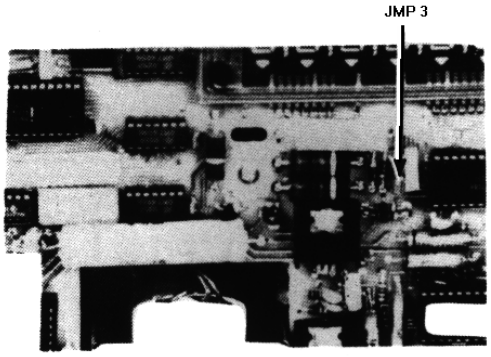
2.1 JMP 1 and JMP 2 positions are determined by the type of microprocessor used. These are set at the factory and should not be changed.



2.2 JMP3 - Decimal or Comma Selection

ON - Jumper connecting pins will cause comma to be displayed.

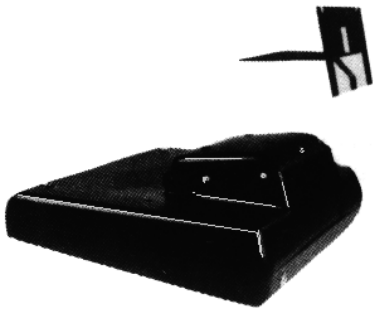
OFF- Jumper not shorting pins will cause decimal point to be displayed.



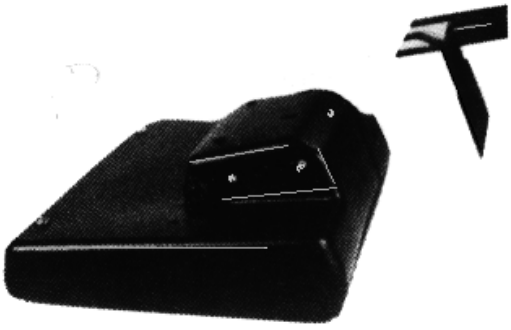
4.5 REVERSIBLE BRACKET FOR PLASTIC ENCLOSURE

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.

1. Bracket being installed for desk top mounting.



2. Bracket being installed for wall mounting.



5. OPERATING INSTRUCTIONS

5.1 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.

5.2 LEGENDS

The 8139 illuminates a pointer above the proper legend for the status of the display. The printed legends are:

5.2.1 Zero - Will be illuminated when the instrument is within ±0.25 increments of the zero increment and there is no motion.

5.2.2 LB - Will be lit when motion has ceased and the LB mode has been selected.

5.2.3 KG - This is illuminated when there is no motion and the KG mode has been selected.

5.2.4 Gross - When lit, this indicates no tare has been taken.

5.2.6 Net - When illuminated indicates tare has been entered.

5.2.7 Print - This will light when the display blanks during data transmission to a printer. A continuous flashing shows 4800 baud operation.

5.3 KEYBOARD

5.3.1 Zero Key - This key provides rezeroing of the scale over a range of ±2% of scale capacity from zero. A program switch premits disabling the pushbutton Zero and Automatic Zero Maintenance. The Zero key must be depressed for approximately 2 seconds to initiate this function.

5.3.2 Test Key - Pressing and holding the Test key once will cause all of the display segments and legends to blank. Pressing and holding the Test key once again will cause all of the display segments and legends to be illuminated. These results show that all drives and displays operate in both ON and OFF conditions.

5.3.3 Tare Key - When the Tare key is depressed with weight on the scale, and no 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 form the scale, the tare weight will be displayed as a negative value.

5.3.4 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 disabled by an internal program switch.

5.3.5 LB/KG- An alternate action pushbutton is provided for pounds, kilogram selection. When switching, the increment size will be adjusted and the decimal point will be shifted, if required. The instrument can be locked into the KG mode by an internal programming switch which disables the LB/KG key.

5.3.6 Print Key- A Print key is provided to initiate a print cycle to an external device. The format for the print is programmed by internal switches.

6. PREVENTIVE MAINTENANCE

The Model 8139 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.

6.1. REQUIRED TOOLS AND SUPPLIES

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

Volt - Ohm Meter
Load Cell simulator (Part No. 100865 00A)
Cleaning Cloth
Static Bag
Static Wrist Strap

6.2 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.

6.3 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.) DO NOT SPRAY CLEANER DIRECTLY ONTO THE UNIT).

6.4 TROUBLESHOOTING

6.4.1 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 8139 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 "VELOSTAT" 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 switch settings. 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.

6.4.2 ERROR CODES

Error Codes are displayed by the 8139 when one of the following malfunctions occur.

ERROR CODES		
ERROR	**CAUSE**	**CORRECTIVE MEASURE**
E1	**ROM or RAM Error**	**Replace Control PCB**
E2	**Print Fault**	**Check printer cables and internal connections. May be defective Control PCB, Printer Interface PCB or Printer PCB**

6.4.3 TESTING THE POWER SUPPLY VOLTAGES.

CAUTION: 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.

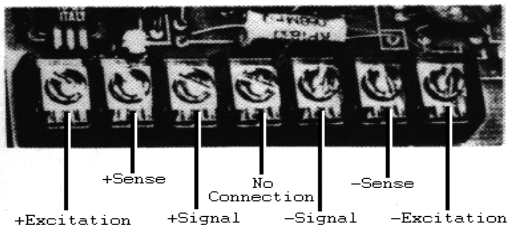
FROM	TO	VOLTAGE (With J2 Connected)	VOLTAGE (With J2Disconnected)
J2-1	J2-4	21 VAC ±3 VAC	22.5 VAC
J2-1	J2-5	21 VAC ± 3 VAC	22.5 VAC
J2-4	J2-5	42 VAC ±5 VAC	45 VAC
J2-8	J2-9	10 VAC ±1.5 VAC	10.9 VAC

b). Regulated 5V Supply
This can be measured at J3 (printer output) between Pin 3 (Ground) and Pin 8 (±5V). the voltage should be 5 V ±0.25 volts with a maximum ripple of 0.01 V p-p.

c). Excitation
This voltage can be measured at the load cell terminal block TB1. There should be ±5.0* volts between terminals 1 and 4 and -5.0* volts between terminals 4 and 7.

***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:**

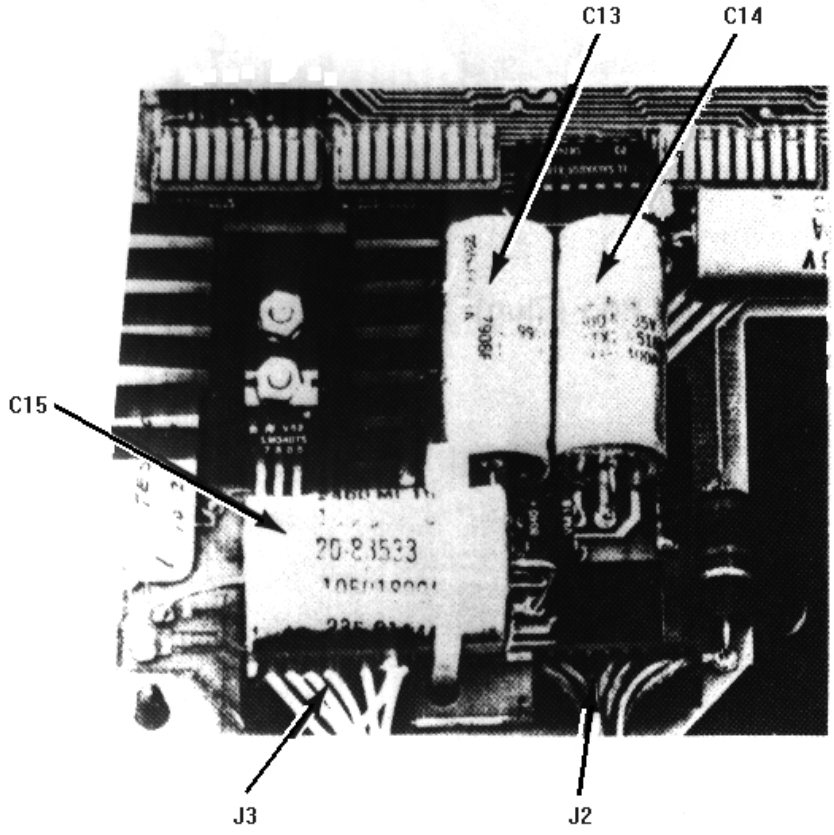
SIGNAL	TBI -- CONNECTION	A-C VOLTAGE	METER READING
+ Excitation	1 - 4	5V p-p	2.4 VDC ±.2VDC
- Excitation	4 - 7	5V p-p	2.4 VDC ±.2VDC



d). Raw Voltages

The raw supply voltages can be measured at the filter capacitors, the voltage present will usually indicate the condition of the filter capacitor if the line voltage is correct for the transformer tap in use.

CAPACITOR	OPERATING VOLTAGES			RIPPLE VOLTAGES	
	Min.	Typical	Max.	Typical	Max.
C13	22.2 VDC	26.8 VDC	29.4 VDC	28V p-p	2.1V p-p
C14	22.2 VDC	26.5 VDC	29.4 VDC	.8V p-p	2.1Vp-p
C15	9.1 VDC	10.8 VDC	12.6 VDC	.7V p-p	1Vp-p



6.4.4 TESTING THE 20 MILLIAMP CURRENT LOOP

This test must be performed at the printer end of the Interconnecting cable with the cable connected to the 8139 Printer Interface POD, but removed from the printer. Set your volt-ohm meter to read D-C milliamps.

a). 300 Baud

After determining which printer is being used, refer to the following chart by printer model number to determine where to connect your meter leads. After connecting your meter leads to the proper cable pins, your meter should show from 18.0 to 40.0 milliamps. Depress the print pushbutton on the 8139 keyboard, and observe the meter reading. The reading should fluctuate to half the original meter reading, which indicates there is a transmission, then return to your original meter reading.

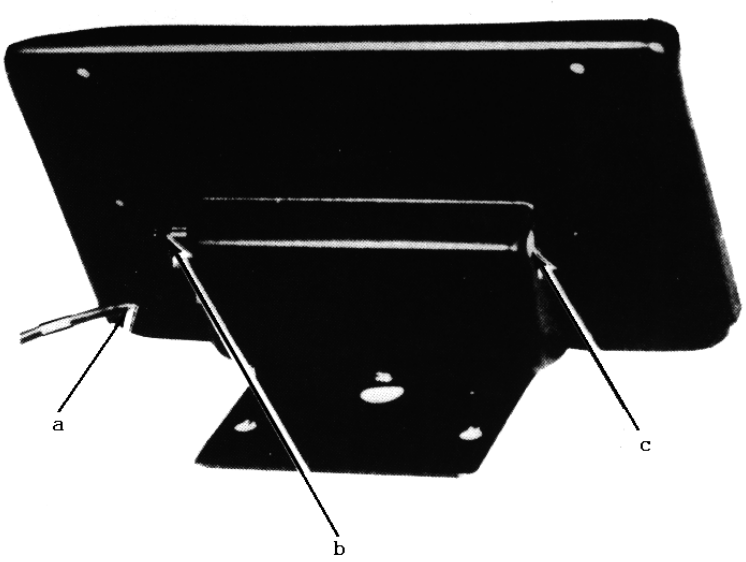
b). 4800 Baud

On the printer end of the interconnecting cable, connect your meter leads to the proper pins as shown on the chart. At this time your meter will read between 16.0 and 22.0 milliamps with a continuous change in the meter reading. This shows actual continuous data transmission.

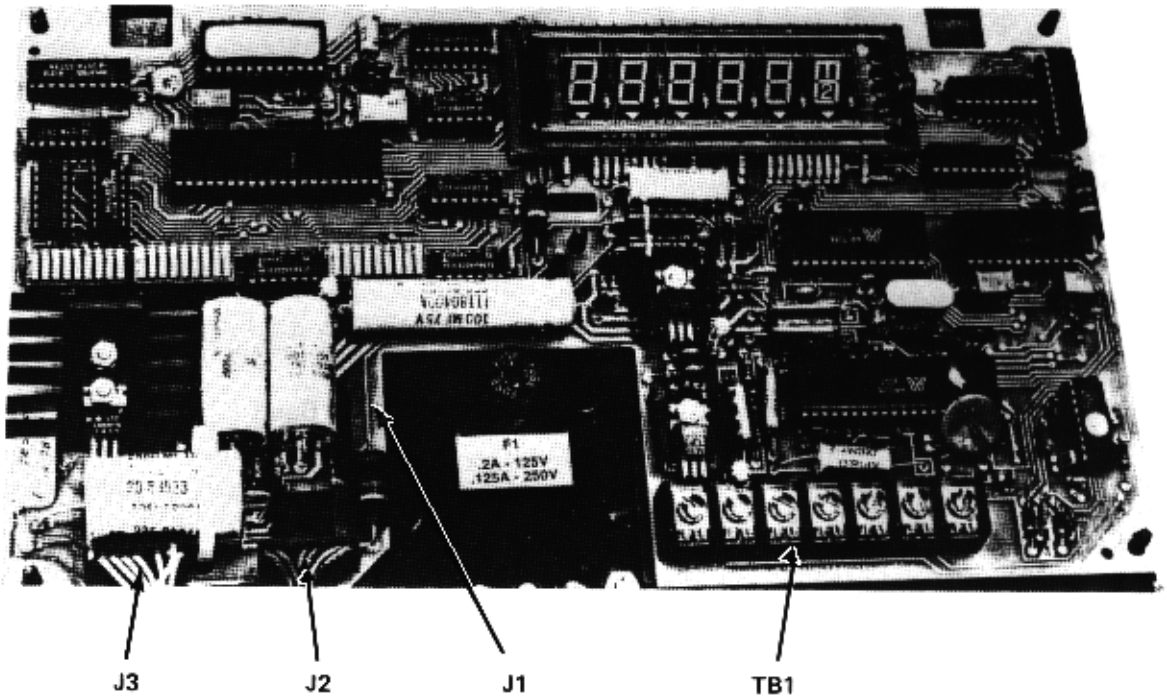
MODEL NUMBER	PLACE RED LEAD ON PIN # (20 mA RECEIVE +)	PLACE BLACK LEAD ON PIN # (20 mA RECEIVE -)
301,307	6	7
8805	26	28
8806,8810	16	18
8855	3	22

6.5 INPUT/OUTPUT CONNECTIONS

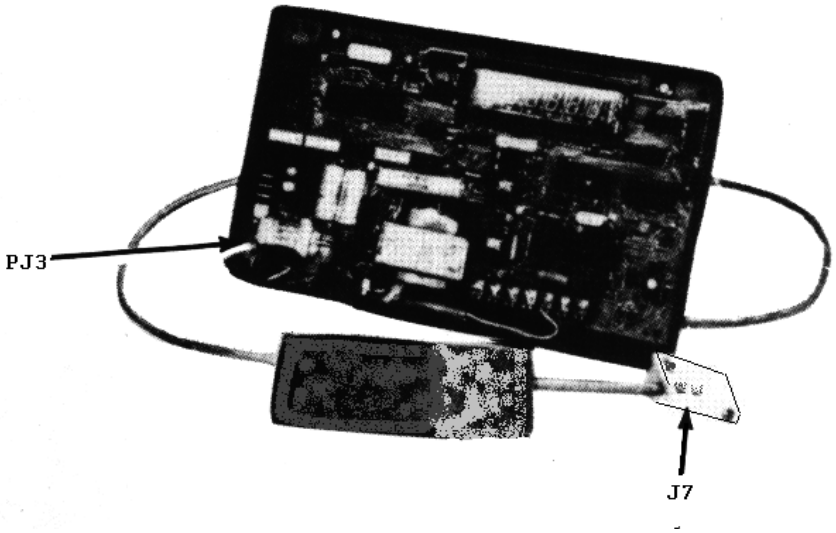
6.5.1 PLASTIC ENCLOSURE



a). Line Cord
b). Fuse
c). Output to Printer Pod (Plug)



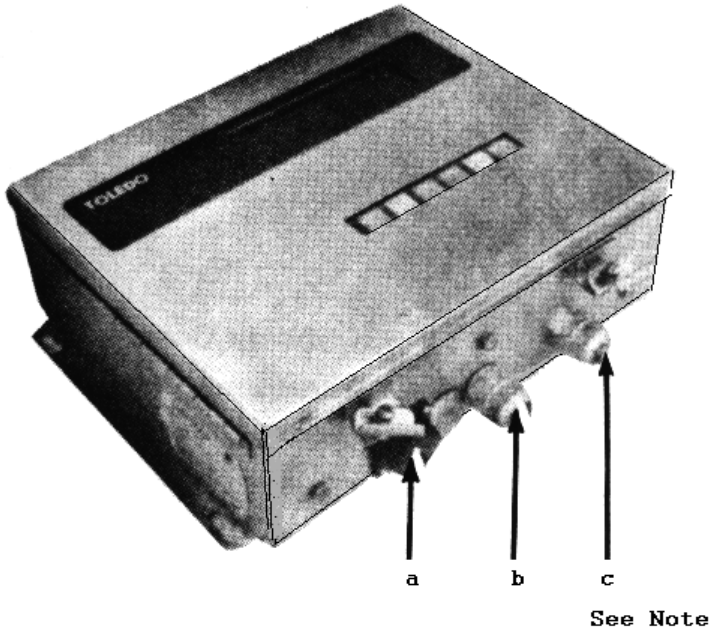
J1- Keyboard connector **J3- Printer Pod Connector**
J2- Transformer Connector **TB1- Load Cell Terminal Block**



PJ3 - Connector to 8139 Control PCB

J7 - Output Connector to Printer

6.5.2 NEMA 4 ENCLOSURE

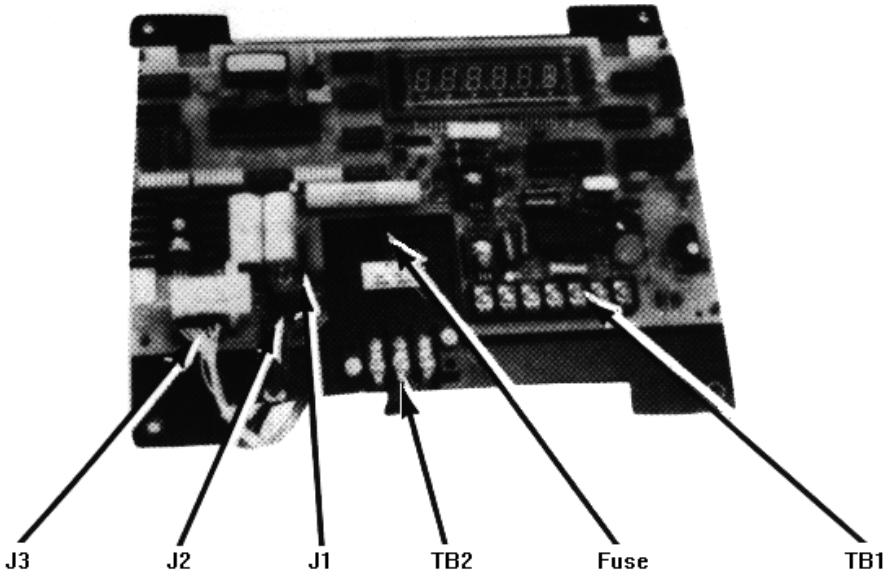


a). Output to Printer - J7

b). Power Input

c). Load Cell Cable Input

NOTE: Select the proper sized grommet to seal around the load cell cable where it enters the NEMA4 enclosure.



J1- **Keyboard Connector**

J2- **Transformer Connector**

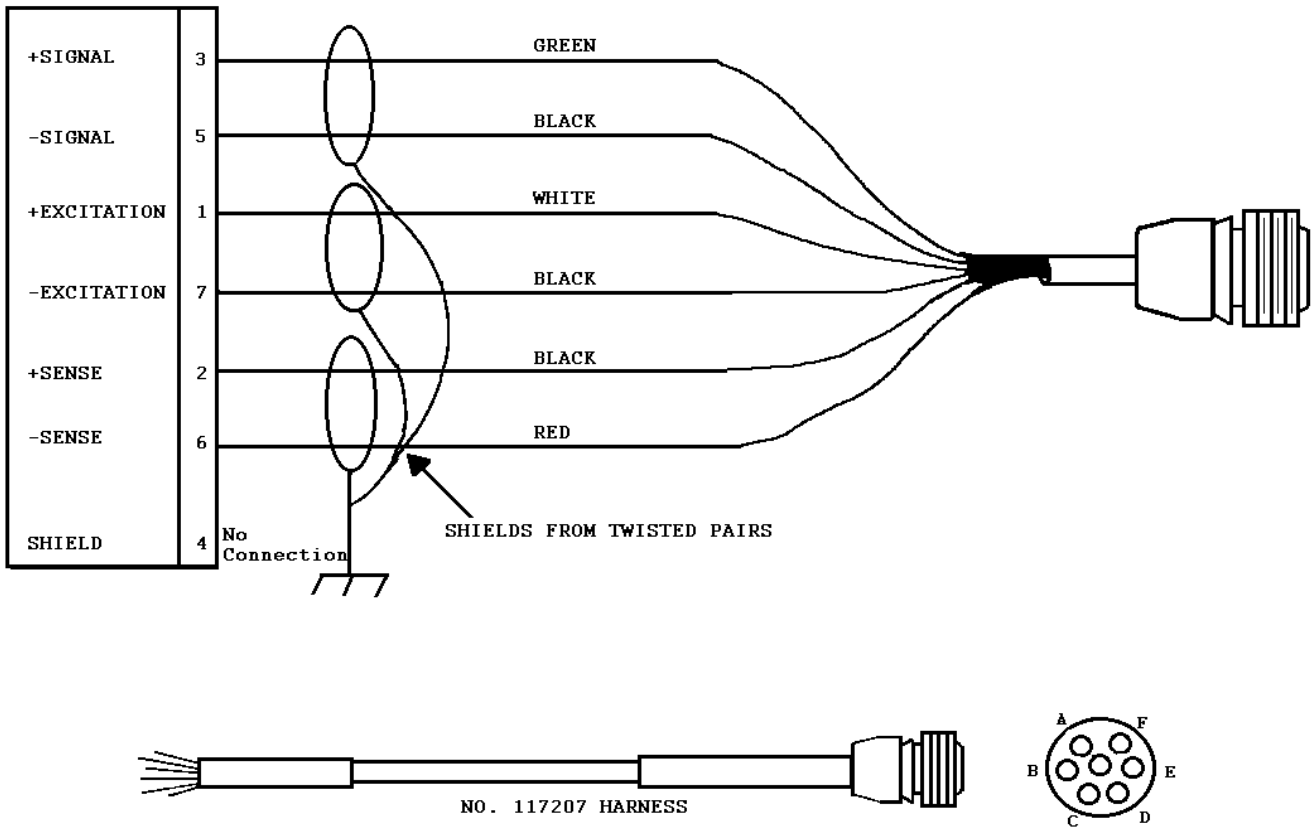
J3- **Printer Interface PCB Connector**

TB1- **Load Cell Terminal Block**

TB2- **Power Cord Terminal Block**

6.5.3 LOAD CELL CONNECTIONS TO THE PLASTIC ENCLOSURE

a). Ram 1 load cell connections using the 117207 00A Load Cell Extension



harness.*

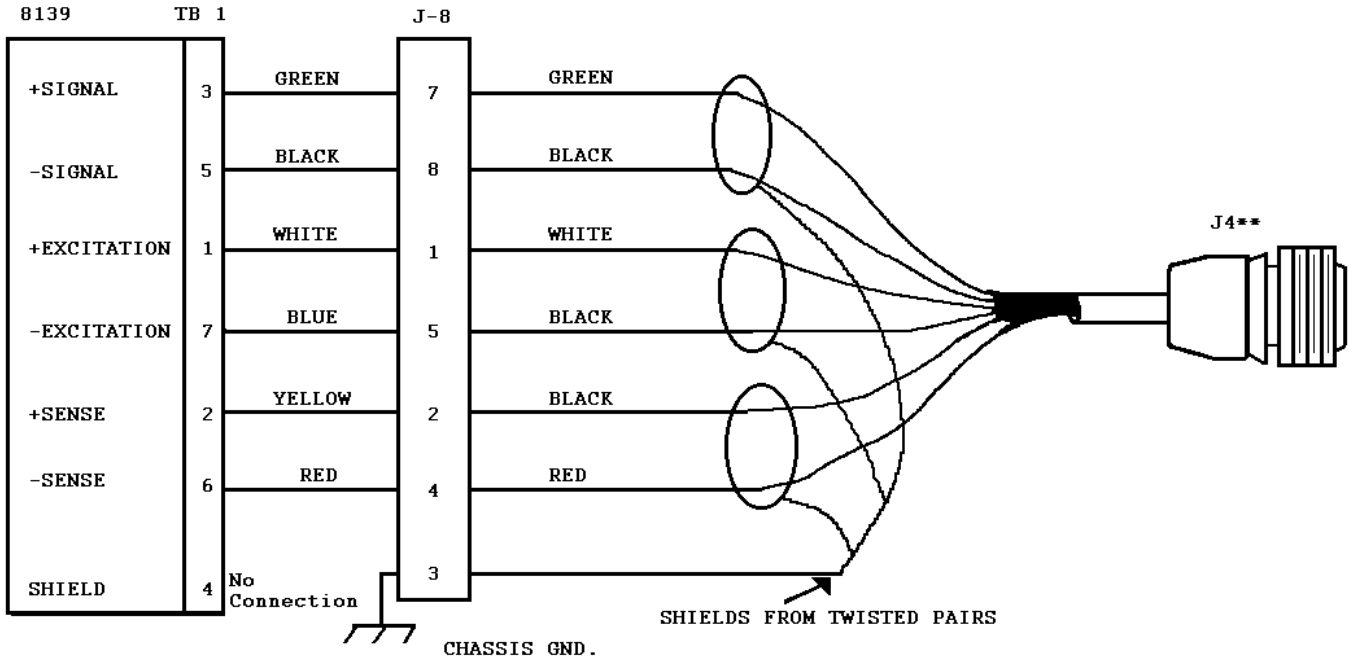
J4 - 7 PIN CONNECTOR

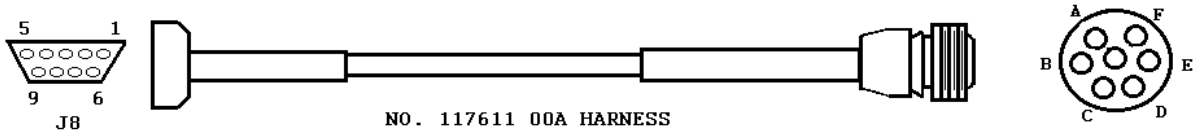
PIN		
A	+	SIGNAL
B	-	SIGNAL
C	+	EXCITATION
D	-	EXCITATION
E	+	SENSE
F	-	SENSE
G		SHIELD

*** All load cell connections to the 8139 Ram 1 use this harness except the Model 2300 which connects directly to TB1 on the 8139.**

**** J4 is a female jack that will connect directly to the standard Toledo 7 pin indicator/load cell cable connector.**

b). Ram 4 load cell connections using the 117611 00A load cell extension harness.*





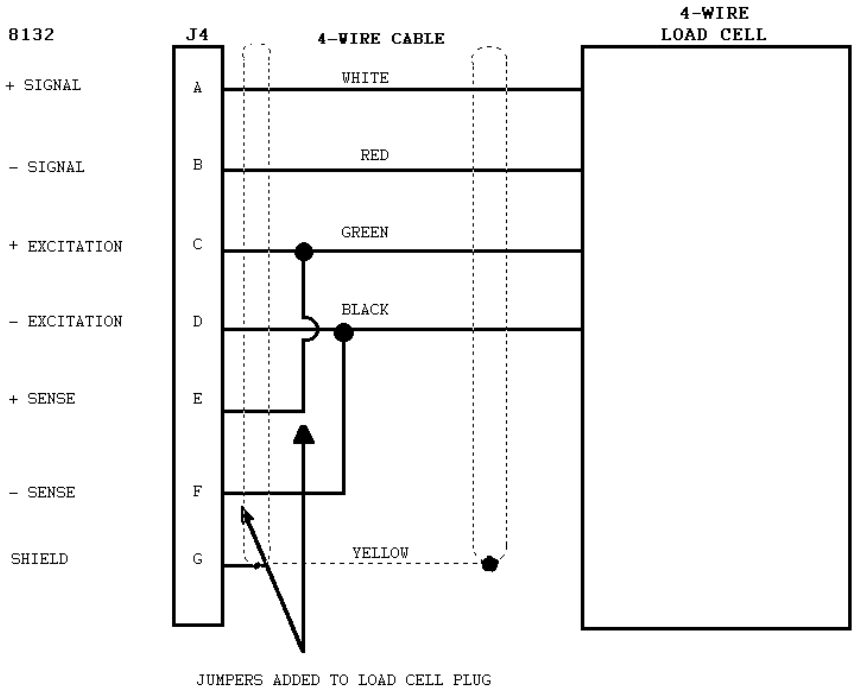
J4 - 7 PIN CONNECTOR

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

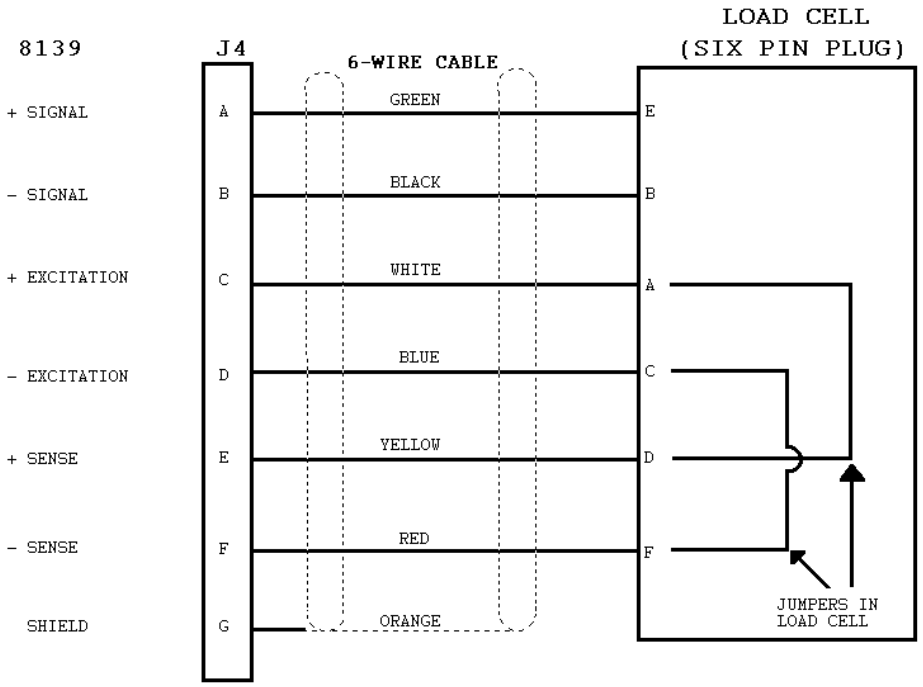
*** All load cell connections to the 8139 ram 4 use this harness except the Model 2300 which connects directly to J8 in the 8139.**

**** J4 is a female jack that will connect directly to the standard 7 Pin indicator/load cell cable connector.**

c). Typical signal load cell connections with load cell harness No. 117207 00A



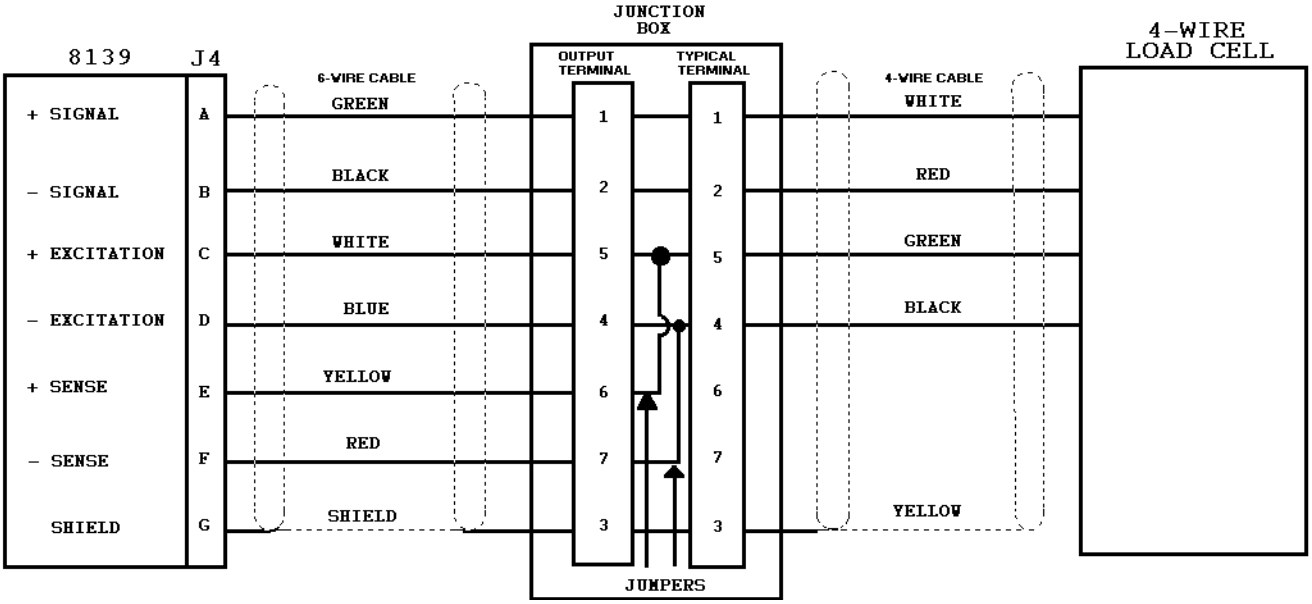
n box.



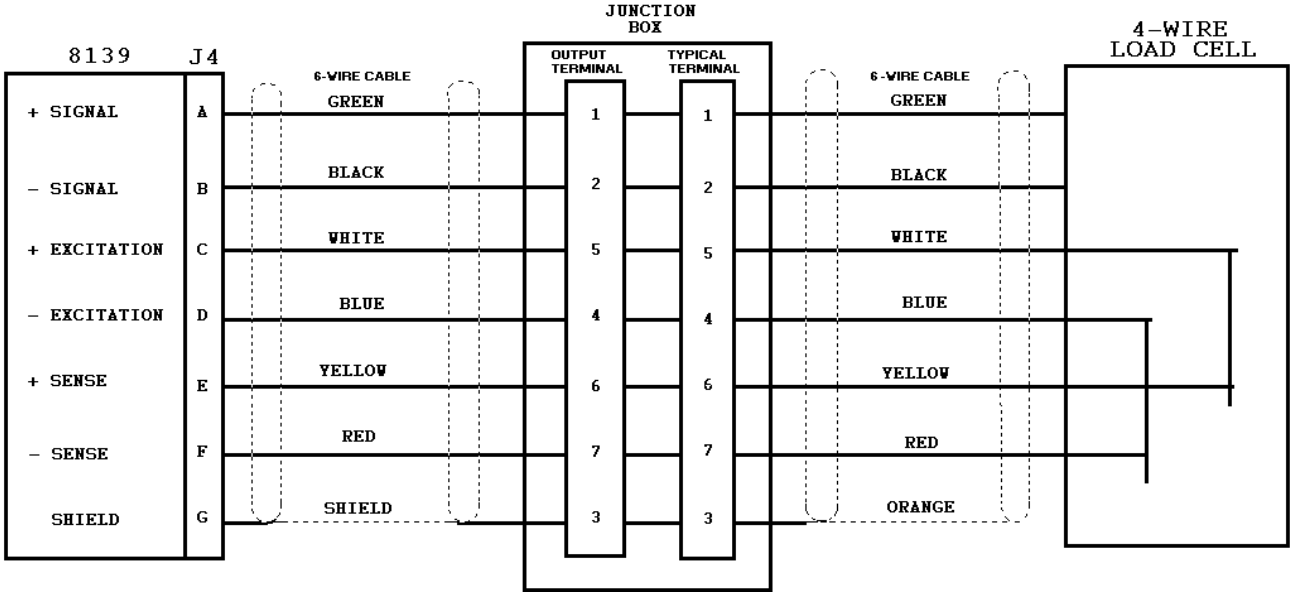
d). Typical single and multiple load cell connections with junction box.

When using 4 wire cells, there will be jumpers between terminals 4 and 7 and between terminals 5 and 6 on TB101. On the 6 wire cells the jumpers are built into the load cell and they are between pins A and D and between pins C and F. use terminal strip # 1 if only one L/C is used.

4 WIRE LOAD CELL(S) WITH JUNCTION BOX
JUNCTION BOX

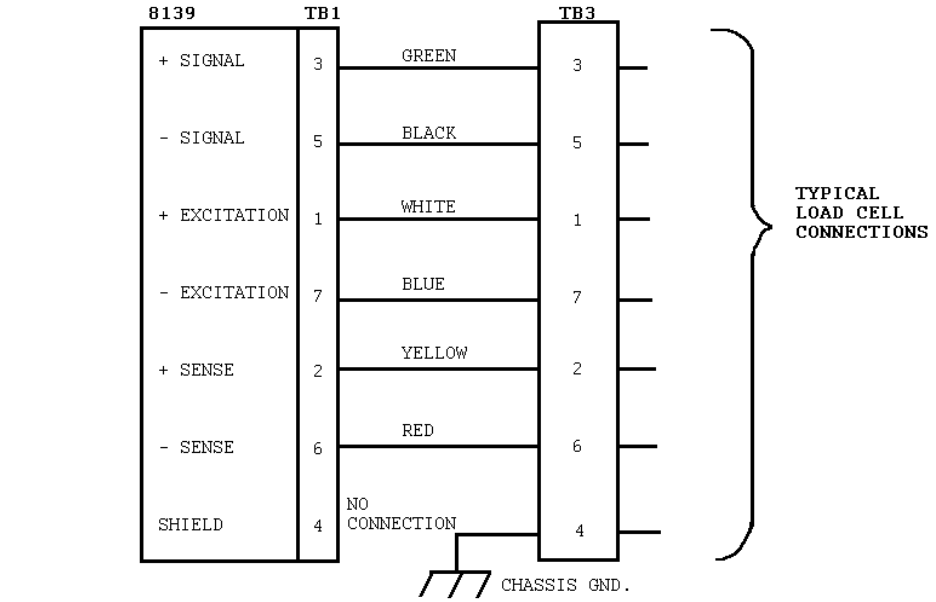


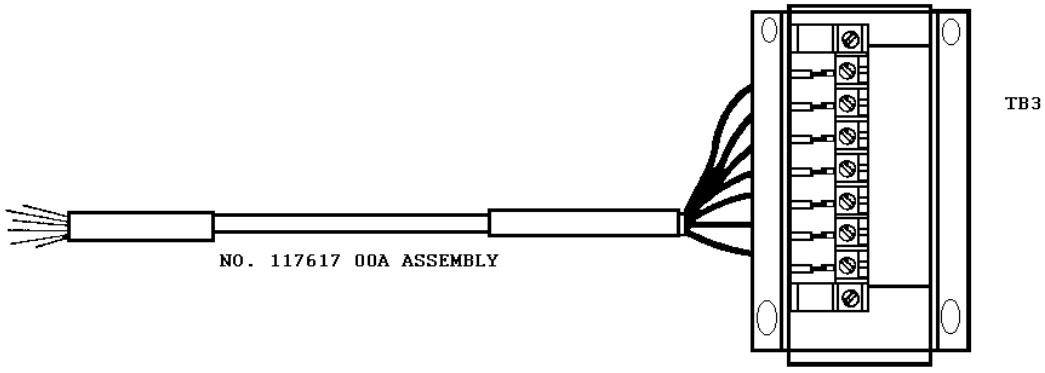
6 WIRE LOAD CELL(S) WITH JUNCTION BOX
JUNCTION BOX



6.5.4 LOAD CELL CONNECTIONS TO THE STAINLESS STEEL ENCLOSURE

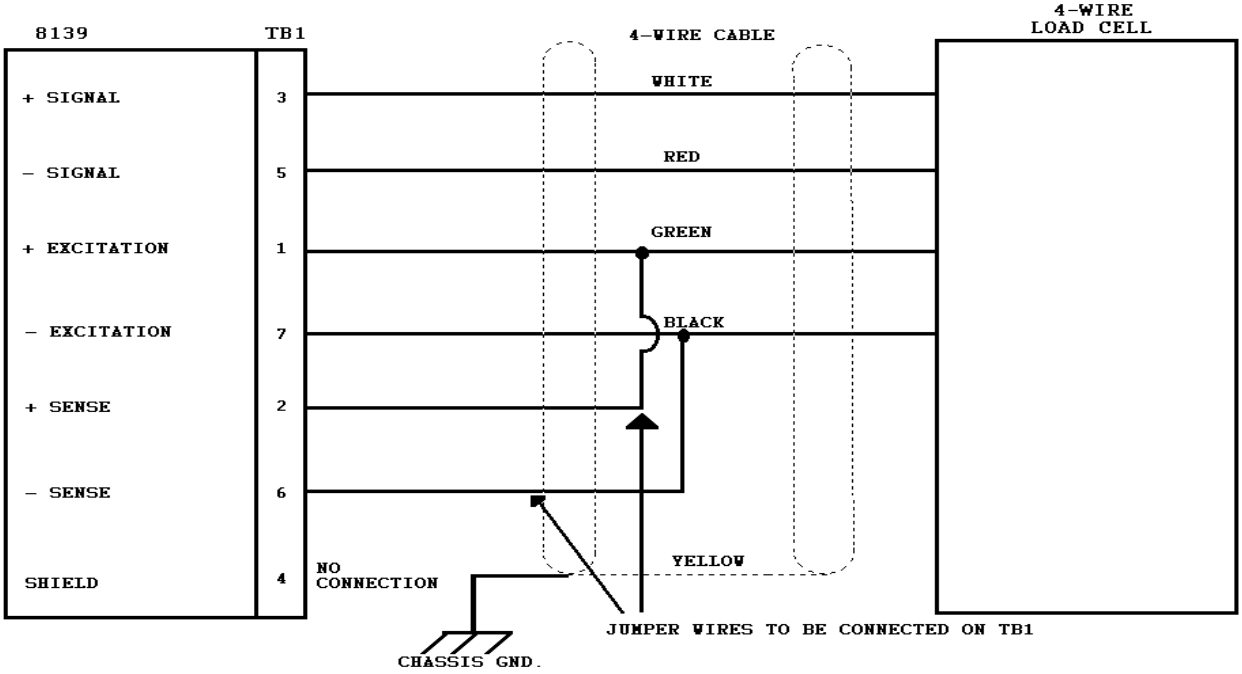
a). The Ram 148139 contains a filtering assembly (part number 117617 00A) for RFI filtering. The load cell connections are made to TB3 on this assembly.



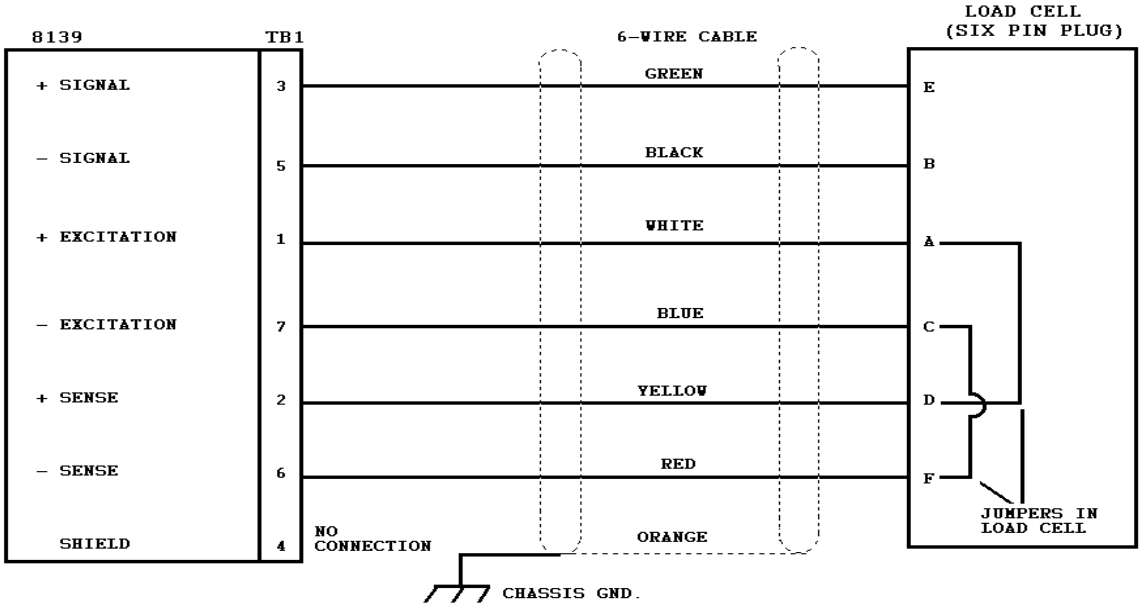


b). Typical single load cell connections:

SINGLE 4 WIRE CELL

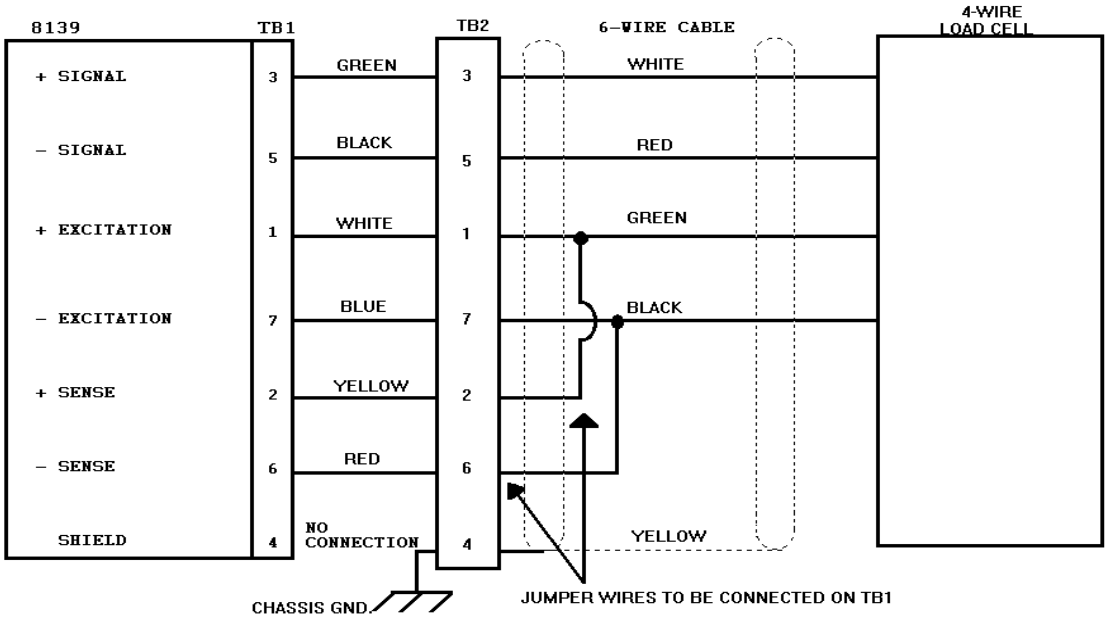


SINGLE 6 WIRE CELL

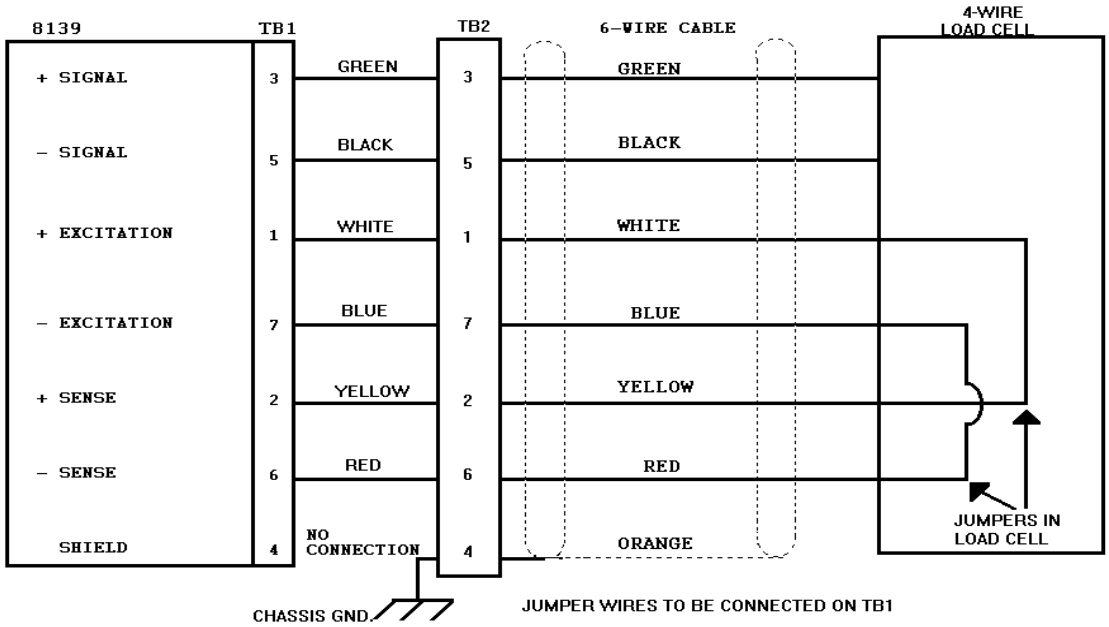


c). Typical single load cell connections:

SINGLE 4 WIRE CELL



SINGLE 6 WIRE CELL

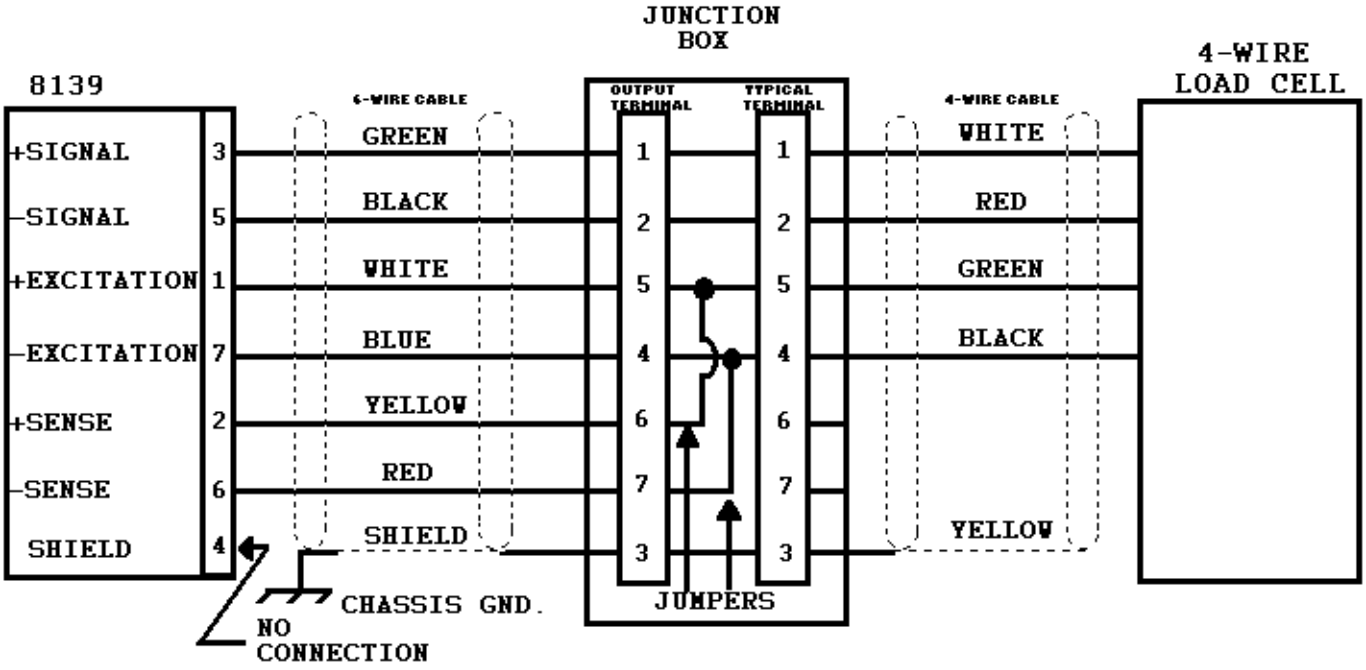


*** TB 3 is the terminal strip on the bracket that contains the RFI filters on Rams 12, 13, 14 and 15. Ram 11 uses TB1 for these connections.**

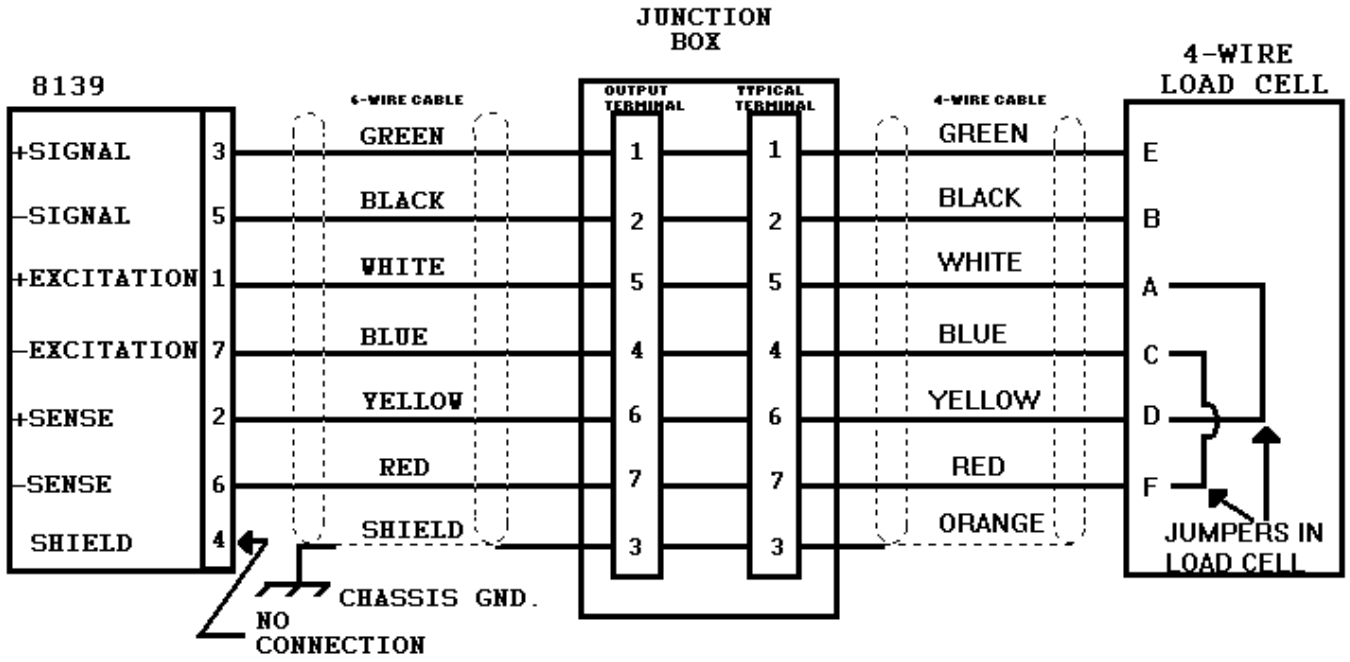
d). Typical single and multiple cell connections with a junction box.

When using 4 wire cells. there will be jumpers between terminals 4 and 7 and between terminals 5 and 6 on TB101. On the 6 wire cells the jumpers are built into the load cell and they are between pins A and D and between pins C and F. use terminal strip # 1 if only one LC is used.

4 WIRE LOAD CELL(s) WITH JUNCTION BOX



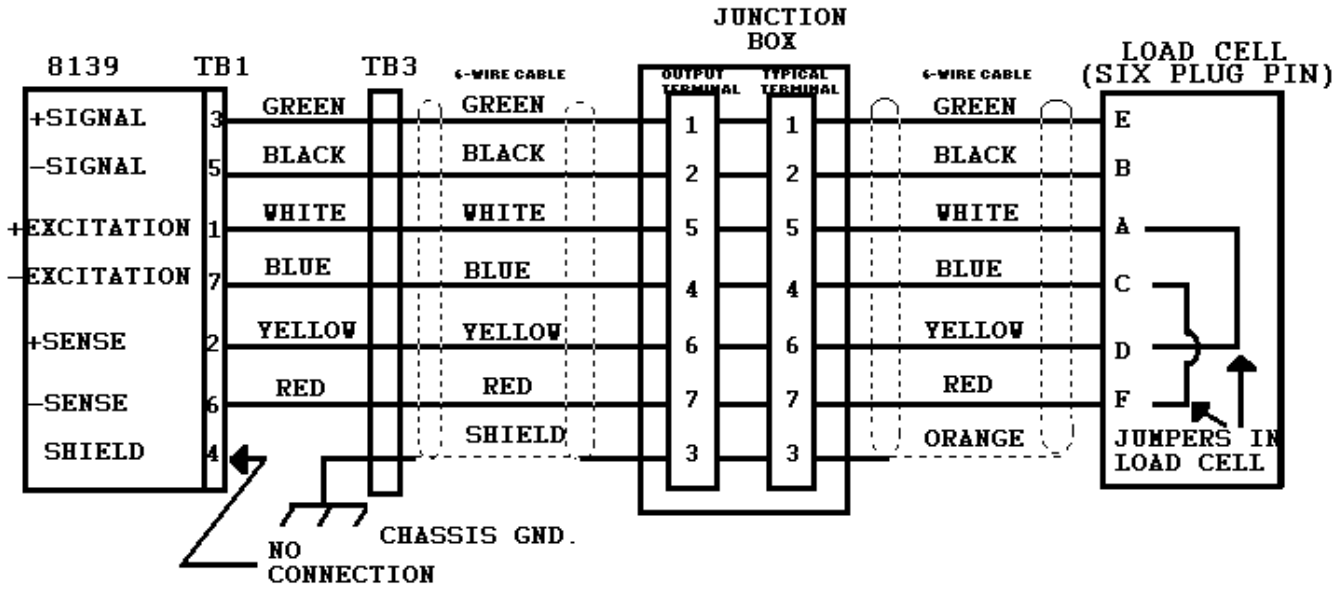
6 WIRE LOAD CELL(s) WITH JUNCTION BOX



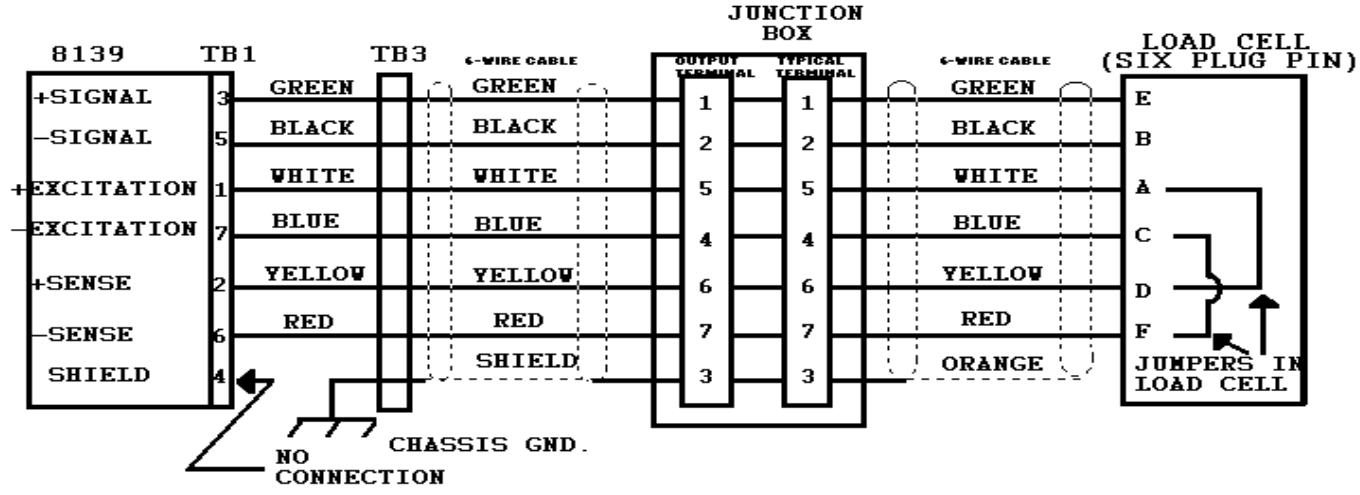
e). Typical single and multiple cell connections with a junction box.

When using 4 wire cells, there will be jumpers between terminals 4 and 7 and between terminals 5 and 6 on TB101. On the wire cells the jumpers are built into the load cell and they are between pins A and D and Between pins C and F. use terminal strip # 1 if only one LC is used.

4 WIRE LOAD CELL(s) WITH JUNCTION BOX



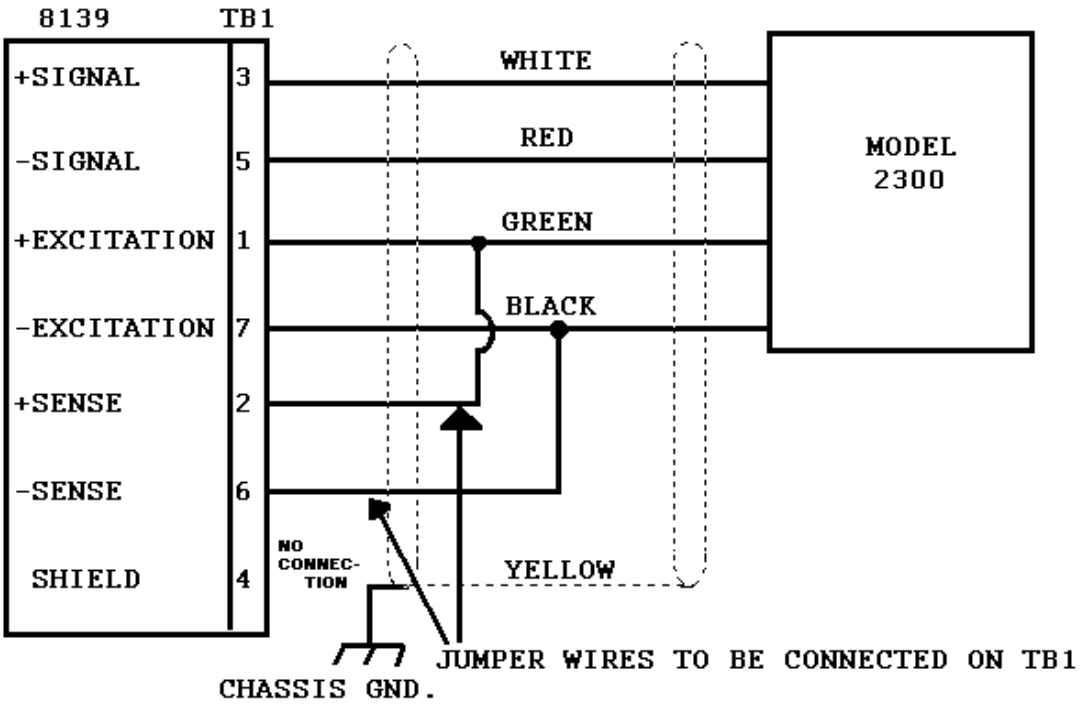
6 WIRE LOAD CELL(s) WITH JUNCTION BOX

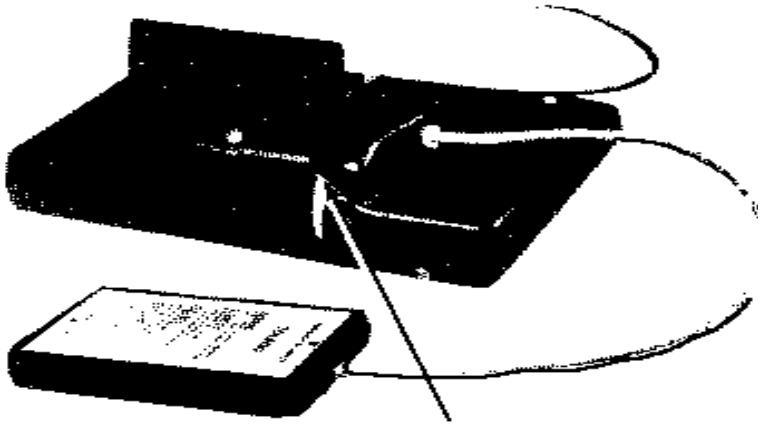


*** TB3 is the terminal strip on the bracket that contains the RFI filters on Rams 12, 13, 14, and 15. Ram 11 uses TB1 for these connections.**

6.5.5 LOAD CELL CONNECTIONS FROM THE MODEL 2300

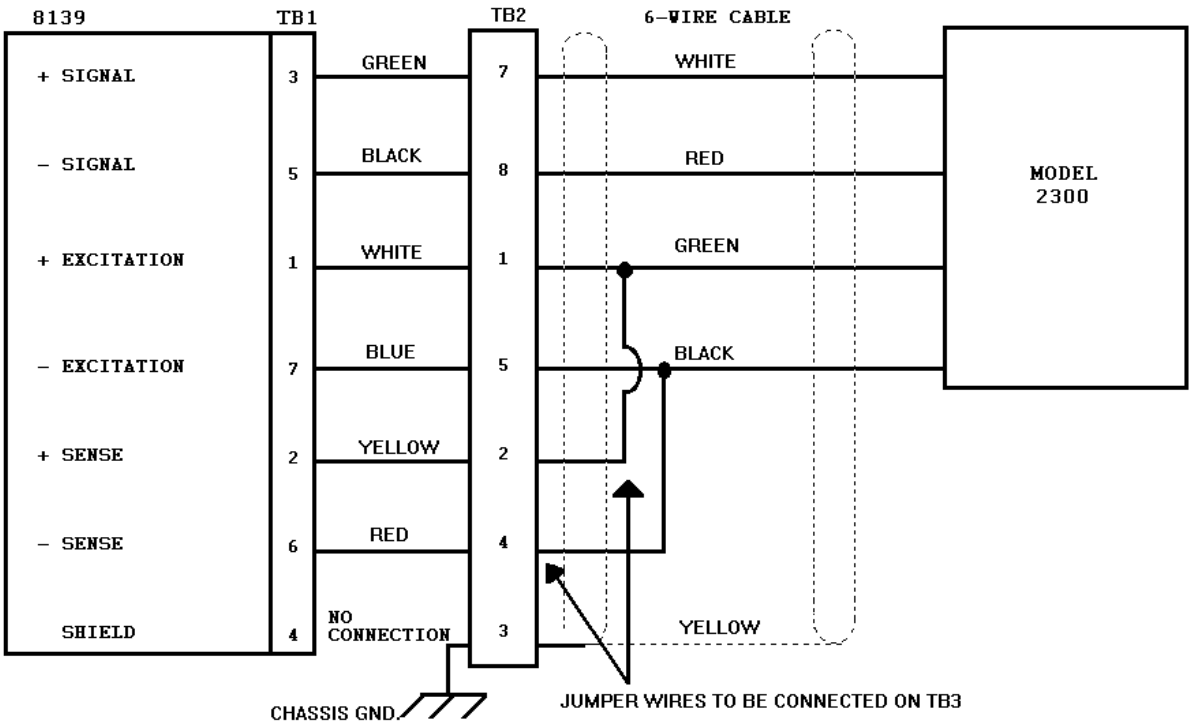
a). The Model 2300 connects directly to TB1 in both Ram 1 and Ram 11 8139's.

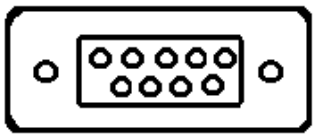




Be sure the rubber "sleeve" on the load cell cable is in position to act as a strain relief where the load cell cable is clamped between the desk bracket and the bottom of the plastic case.

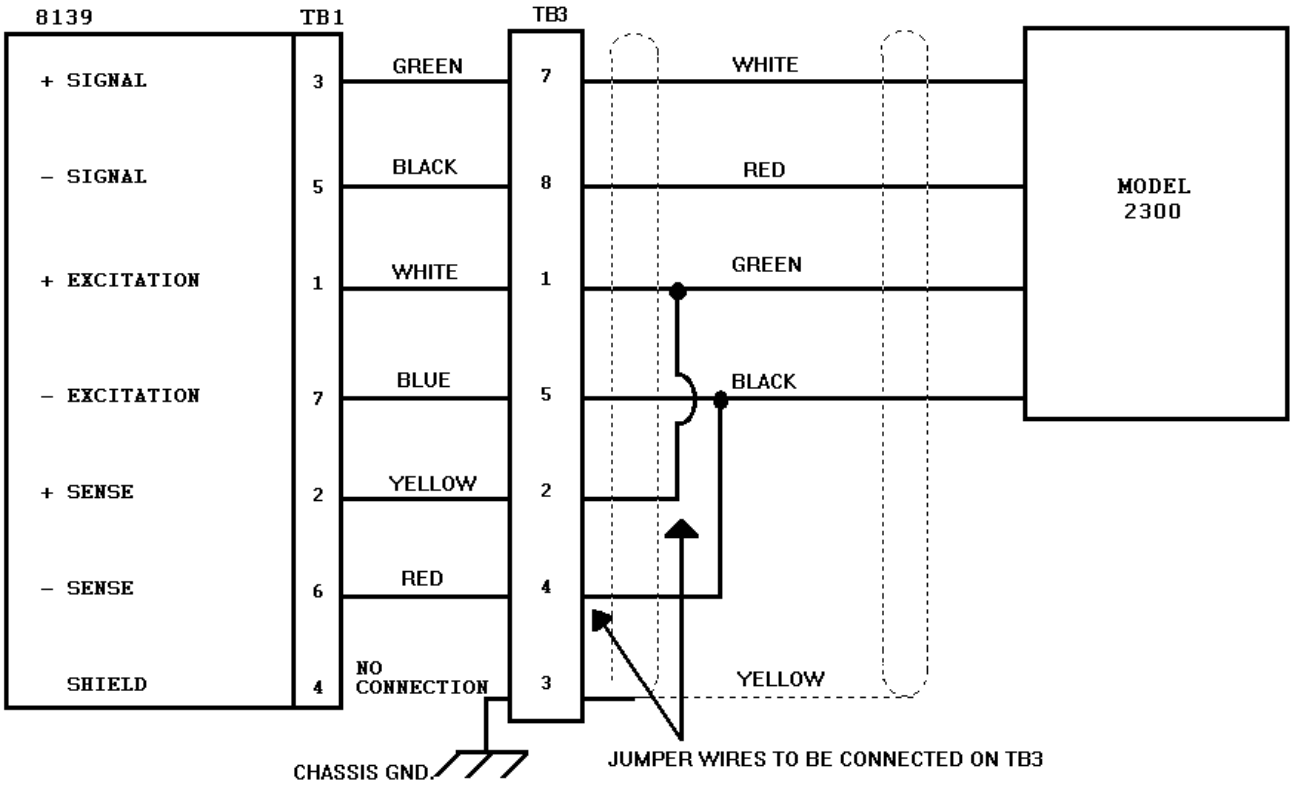
b). The Model 2300 connects to J8 on the 8139 Ram 4 plastic enclosure.

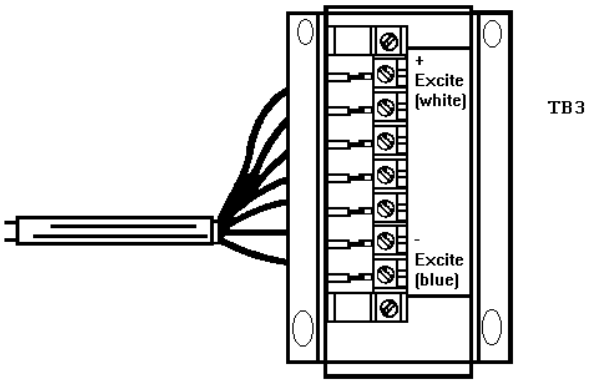




J-8

c). The Model 2300 connects to TB3 on the 8139 Ram 14 stainless steel enclosure.



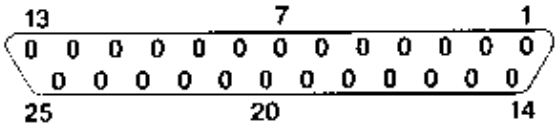


6.5.6 SERIAL OUTPUT CONNECTIONS

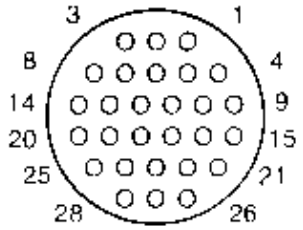
a). 20 mA Output

SIGNAL NAME	8139 POD J-7	301/307 J-9	8805 J-1	8806 J-7	8820/8830 J-25	8855 J-1
Ground (Chassis)	1					
N.C.	2				2	
N.C.	3				7	
20mA Transmit+	10	7	28		18	22
20mA Transmit -	11			16		
Supply Ground	12			18		
N.C.	15*		25*		14	
-Print Request (20mA)	16		19	13	14	
N.C.	20*	5*				
Print Fault+	23		24	23	15	
Print Fault-	24		6			
20mA supply (Transmit)	25	6	26		16	3
				10	9	
				25	19	
		11	11		11	11
		12	12		12	12
* Wires are present in interconnecting cables but are not used with the 8139. Jumper is in 8139 end of interconnecting cable. Jumper is in printer end of interconnecting cable.						

Printer Pod connector plastic enclosure pin location.



Printer Output (Stainless Steel enclosure) pin location.



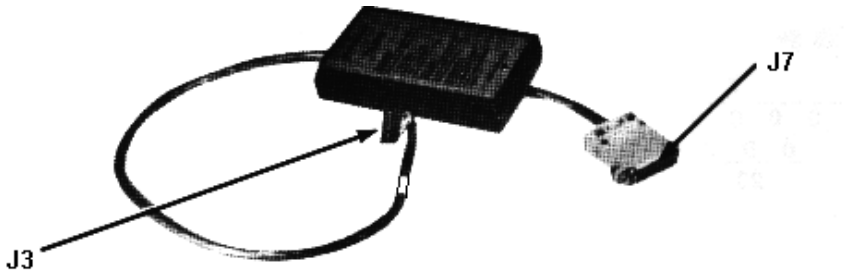
b). RS- 232-C Output

SIGNAL NAME	8139 POD J7
T x D (RS-232)	2
Print Request *	6
Logic Ground	7
DTR (+12 VDC)	20

- **To initiate a remote print request, a 200ms pulse of between +3 VDC and +15 VDC is required.**

SERIAL OUTPUT INTERCONNECTING CABLES

MODEL	TYPE OF 8139	LENGTH	PART NO.
301/307	8139 Plastic With Pod	20'	112156 00A
301/307	8139 NEMA 4	20'	112157 00A
8805	8139 Plastic With Pod	6'	110837 00A
8805	8139 Plastic With Pod	20'	110838 00A
8805	8139 NEMA 4	6'	110849 00A
8805	8139 NEMA 4	20'	110850 00A
8806	8139 Plastic With POD	6'	115494 00A
8806	8139 Plastic With POD	20'	115495 00A
8806	8139 NEMA 4	6'	115496 00A
8806	8139 NEMA 4	20'	115497 00A
8820/8830	8139 Plastic With Pod	6'	114033 00A
8820/8830	8129 Plastic With Pod	20'	114034 00A
8820/8830	8139 NEMA 4	6'	114035 00A
8820/8830	8139 NEMA 4	20'	114036 00A
8855	8139 Plastic With Pod	6'	114285 00A
8855	8139 Plastic With Pod	20'	114408 00A
8855	8139 NEMA 4	6'	114104 00A
8855	8139 NEMA 4	20'	114105 00A
NOTE THAT THE INTERCONNECTING CABLES ARE THE SAME FOR THE 8139 AS THE 8136			



Printer pod used with Rams 1,2,3,4 and 5

J3- Connection to 8139 control PCB
J7- Output (similar to J-19 on the 8136)

NOTES
1. The printer pod used with the plastic enclosure is not a serviceable item. If it fails, a complete new pod should be installed.
2. In the stainless steel enclosure the Printer Interface PCB attaches to the rear of the chassis plate inside the enclosure.

ASCII CHARACTER CHART

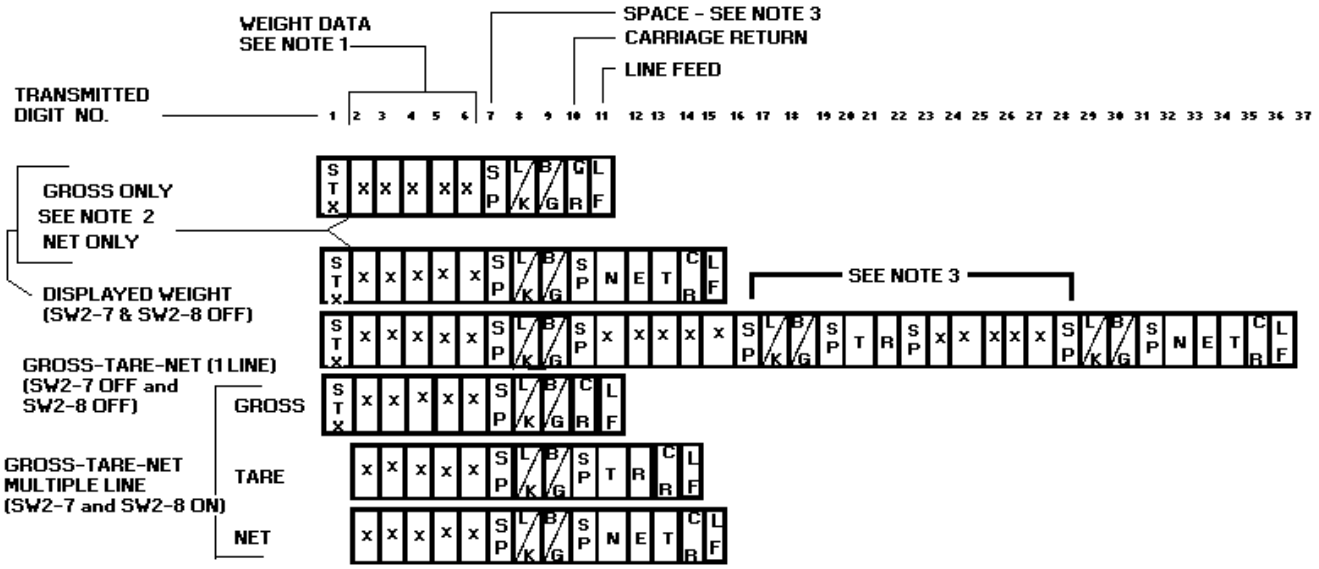
ASCII CHAR.	DECIMAL	HEX	76543210	ASCII CHAR.	DECIMAL	HEX	76543210
NULL	0	00	00000000	@	64	40	01000000
SOH	1	01	00000001	A	65	41	01000001
STX	2	02	00000010	B	66	42	01000010
ETX	3	03	00000011	C	67	43	01000011
EOT	4	04	00000100	D	68	44	01000100
ENQ	5	05	00000101	E	69	45	01000101
ACK	6	06	00000110	F	70	46	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

6.6 DATA OUTPUT TABLES

6.6.1 300 BAUD OUTPUT

All data sent is 11 bit ASCII (1 start bit, 7 data bits, 1 even parity bit, 2 stop bits)
Data is sent once each time print button on front of module is pressed.

LOW SPEED DATA FORMAT 300 BAUD (SW2-9 OFF)



1. **An extra byte is inserted in the format when a decimal point is required.**

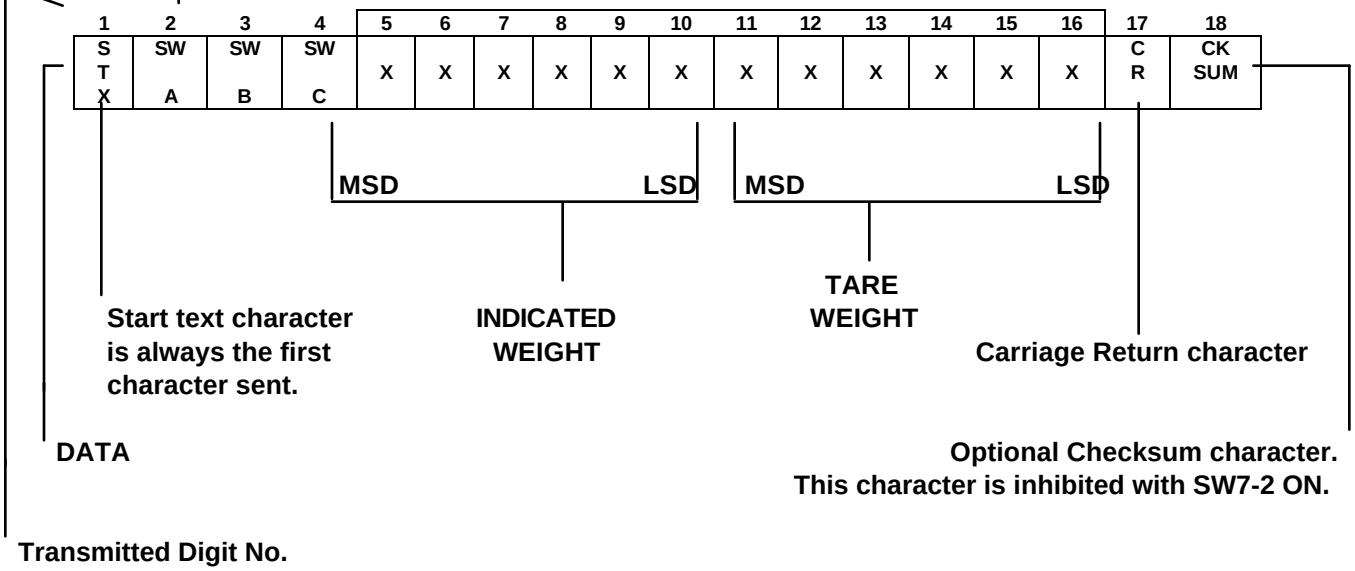
2. **If double width printing is selected (SW2-9 and SW2-8 OFF) an "SO" character (HEX E) is inserted at this point. All following characters are shifted right 1 location.**

3. **A space is not sent in the KG mode.**

6.6.2 4800 BAUD OUTPUT

HIGH SPEED ACSII DATA OUTPUT FORMAT DECODING TABLE (4800 BUAD SW7-6 & SW7-7 ON)

BIT NO	STX	STATUS WORD 'A'								STATUS WORD ' B '	STATUS WORD 'C'								SPACE	NUMERIC DATA 0-9										CR
		X 100	X 10	1	.X	.XX	.XXX	.XXXX	.XXXX		NO 151	151 CHANNEL SELECTED									0	1	2	3	4	5	6	7	8	9	
												1	2	3	4	5	6	SUM													
0	0	0	1	0	1	0	1	0	1	NET MODE = 1	0	1	0	1	0	1	0	1	0	0	1	0	1	0	1	0	1	0	1	1
1	1	0	0	1	1	0	0	1	1	NEGATIVE DATA = 1	0	0	1	1	0	0	1	1	0	0	0	1	1	0	0	1	1	0	0	0
2	0	0	0	0	0	1	1	1	1	OVER CAP = 1 NORMAL = 0	0	0	0	0	1	1	1	1	0	0	0	0	0	1	1	1	1	0	0	1
3	0	X1 = 1 X2 = 0 X5 = 1								MOTION = 1 NO MOTION = 0	PRINT BUTTON PUSHED = 1								0	0	0	0	0	0	0	0	0	1	1	1
4	0	X1 = 0 X2 = 1 X5 = 1								LB = 0 KG = 1	EXPANDED DATA = 1								0											0
5	0	ALWAYS 1								ALWAYS 1	ALWAYS 1								1	ALWAYS 1										0
6	0	ALWAYS 0								POWER UP = 1	SEE NOTE 1								0	ALWAYS 0										0
7	1	EVEN PARITY								EVEN PARITY	EVEN PARITY								1	0	1	1	0	1	0	0	1	1	0	1



NOTE: THIS BIT IS "1" ONLY WHEN KEYBOARD TARE IS ENTERED IN KG MODE.

6.7 CONFIGURATION GUIDE FOR THE MODEL 2300

The capacity is shown on the data plate for each understructure and the increment size must agree with the following chart.

		CAPACITY	
FACTORY NUMBER	**PLATFORM SIZE**	**LB**	**KG**
2300-1111	12" X 12	30 X .01	15 X .005
2300-1112		60 X .02	30 X .01
2300-1113		150 X .05	60 X .02`
2300-2112	18" X 18"	60 X .02	30 X .01
2300-2113		150 X .05	60 X .02
2300-2114		300 X .1	150 X .05
2300-3113	24" X 24	150 X .05	60 X .02
2300-3114		300 X .1	150 X .05
2300-3115		600 X .2	300 X.1
2300-4114	30" X 30"	300 X .1	150 X .05
2300-4115		600 X .2	300 X .1
2300-4116		1000 X .5	500 X .2
2300-4117		1500 X .5	600 X .2

6.8 INTERFACE KOP'S AND MATING HARDWARE

PLASTIC ENCLOSURE

DESCRIPTION	PART NUMBER
Printer Interface Pod (20 mA)	116250 00A
Printer Interface Pod (RS-232)	119221 00A
Load Cell Extension Harness (Ram 1)	A117207 00A
Load Cell Extension Harness (Rams 2.3.4.5)	A117611 00A

STAINLESS STEEL ENCLOSURE

DESCRIPTION	PART NUMBER
Printer Interface KOP	117196 00A
Load Cell Connector Grommet Kit	A117419 00A

MATING CONNECTORS for 8139 INPUTS/OUTPUTS			
TYPE	**DESCRIPTION**	**DESK**	**WALL**
Load Cell	Connector	A117661 00A	Not Used
7 Pin	Clamp	117662 00A	
Load Cell (RFI)	Connector	117599 00A	Not Used
9 Pin	Clamp	117600 020	
Serial I/O	Male Plug	107187 00A	112139 00A
	Clamp	107188 00A	110803 00A
	Pins	107189 00A	107189 00A
	Sealing Clamp		110802 00A

6.9 PARTS LISTING FOR THE 8139

Parts common to the plastic and NEMA 4 enclosures:

Keyboard	**B114648 00A**
Control PCB	**117175 00A**
Fuse, .2A Slo-Blo	**P00685 020**

Parts used with the Plastic enclosure only:

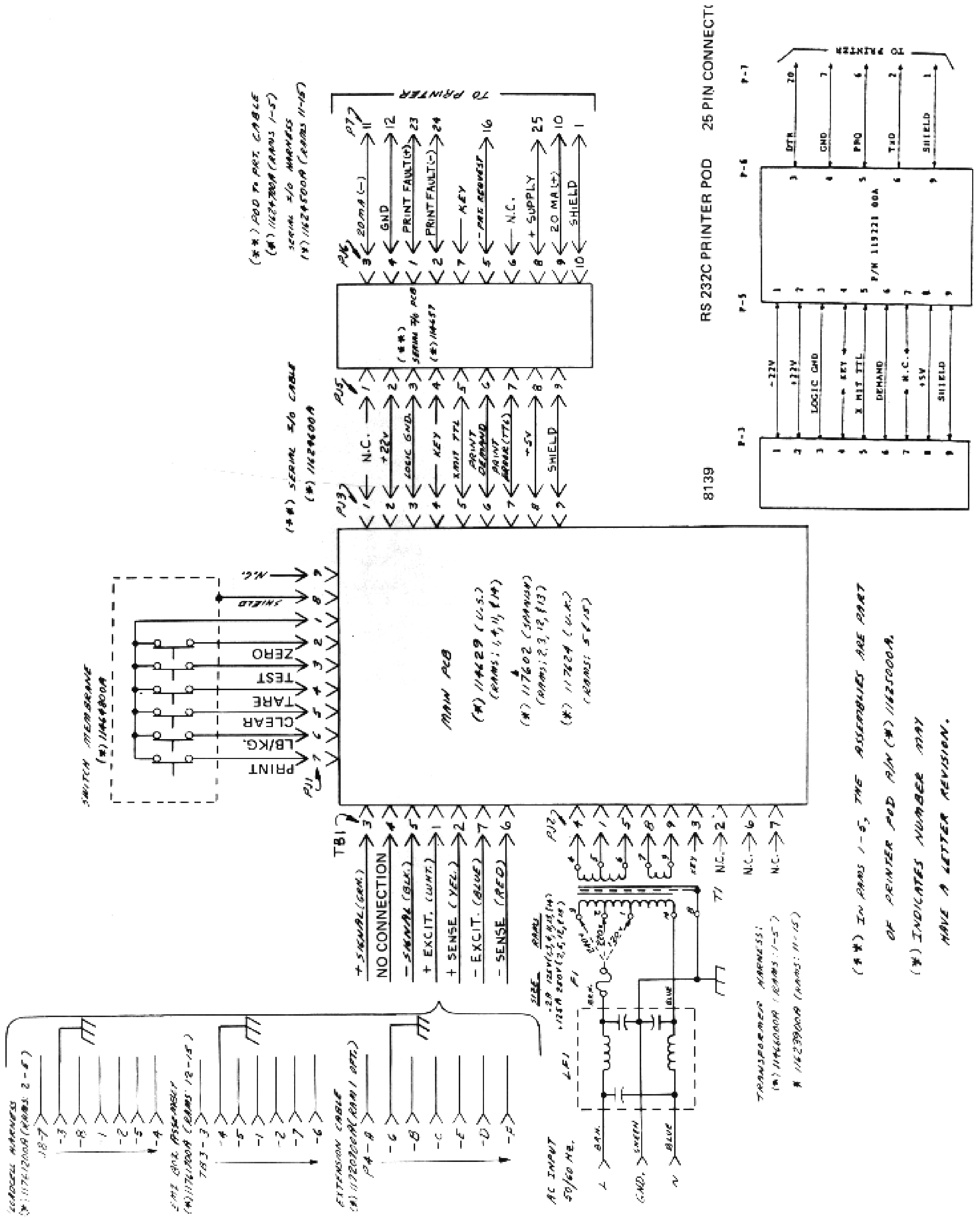
Line Cord	**103867 00A**
Front Cover*	**A114661 00A**
Printer Pod	**116250 00A**
Load Cell Extender Harness (Ram 1)	**A117207 00A**
Load Cell Extender Harness (Other Rams)	**A117611 00A**

***Includes Keyboard**

Parts used only with the NEMA 4 Stainless Steel enclosure:

Printer Interface PCB	**114657 00A**
Keyboard Overlay	**114667 00A**
Plastic Keyboard Window	**114667 00A**

7. DRAWINGS


RS 232C PRINTER POD
25 PIN CONNECT
8139
TO PRINTER
MAIN PCB
SWITCH MEMBRANE
PRINT
LB/KG.
CLEAR
TARE
TEST
ZERO
NO CONNECTION
+ EXCIT.
+ SENSE
- EXCIT.
- SENSE
N.C.
SHIELD
+ SUPPLY
GND
PRINT FAULT(+)
PRINT FAULT(-)
AC INPUT
50/60 HZ.