8146

Technical Manual
and
Parts Catalog

INTRODUCTION

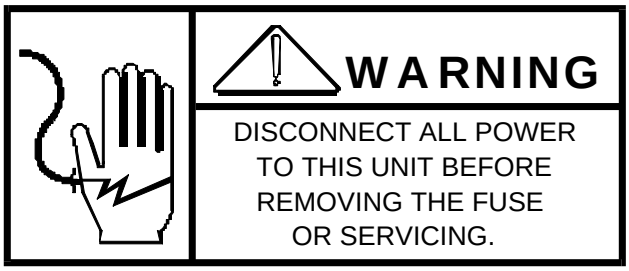
This publication is provided solely as a guide for individuals who have received METTLER TOLEDO Technical Training in servicing the METTLER TOLEDO product.

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

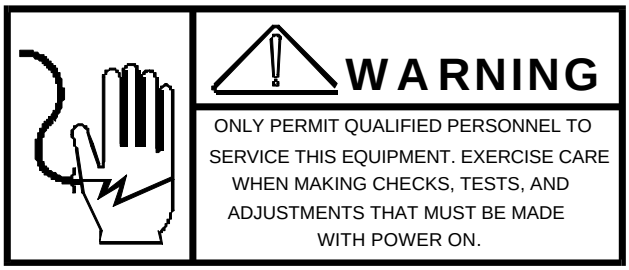
PRECAUTIONS

- **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.**

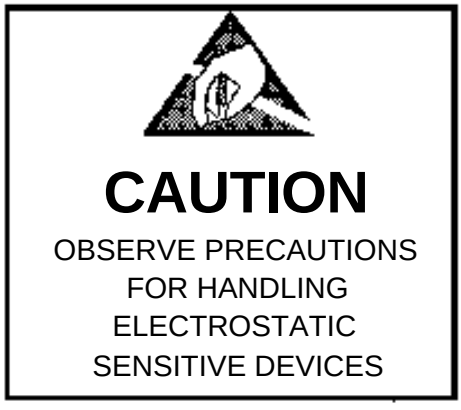
- **ALWAYS take proper precautions when handling static sensitive devices.**



- **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

Reference Drawings 134382 - 8146 Block Diagrams

1.0 GENERAL DESCRIPTION

The Model 8146 Electronic Digital Indicator is intended for use with both strain gauge load cell and DigiTOL ® load cell scales. Units include a sixteen character dot matrix display PCB and up to four weight displays. The 8146 is available in desk and wall mounting enclosures. Weight information is transmitted to a printer or compatible accessory device in a bit serial ASCII code.

1.1 STANDARD FEATURES

- **Selectable full scale number of increments 1000, 1200, 1500, 2000, 2500, 3000, 4000, 5000, 6000, 8000, 10,000, 12,000, 15,000, 16,000, 20,000, 25,000, 30,000, 32,000, 35,000, 40,000, 45,000, 48,000, and 50,000**
- **Available in a desk mount, or a NEMA 4X, stainless steel wall mount enclosure**
- **Automatic zero maintenance**
- **Expanded AZM up to ± 10% of scale capacity**
- **Digital filtering provides the ability to select one of four filtering rates for display and data output**
- **Motion detection sensitivity is selectable from ±0.5 to ±3.0 increments over a period of 1-30 successive A/D updates**
- **Display of pounds and kilograms simultaneously on single scale unit**
- **Three-point linearization capability during scale calibration**
- **Keyboard setup and calibration**
- **Line sync capability**
- **Weight summing, when more than one scale is configured**
- **Operator programmable printer formats**
- **Battery-backed RAM**
- **Expanded zero push button range (2-20%) of full scale capacity**
- **Alphanumeric keyboard with additional function keys**
- **Rate of weight change display**
- **Operator definable weight conversion factors**
- **Non-volatile storage for ID's, Tare Registers and Accumulators**

1.2 OPTIONAL FEATURES

- **Additional scale(s) - Three additional scales may be added**
- **Bar Code interface**
- **Host communications interface**
- **Serial Setpoint output up to 12 Setpoints**

2.0 SYSTEM DESCRIPTION

This section of the manual describes the various operating features available for use in your installation.

2.1 AUTOMATIC ZERO MAINTENANCE (AZM)

The 8146 is equipped with an AZM feature. AZM is used to keep the instrument on zero in spite of small weight changes on the platform. AZM corrections operate at a rate of approximately one minor increment per second. The AZM range is selectable for either 2% or 10% of full scale capacity.

AZM may be disabled lin the setup procedure

2.2 NORMAL AND EXTENDED ZERO CAPTURE

The 8146 has a front mounted zero pushbutton which allows the operator to reset the scale to a zero condition. The normal range of the pushbutton is ±2% of full scale capacity. The 8146 permits increasing this capture range* to ± 20% full scale capacity.

The zero pushbutton may be disabled in the setup procedure.

NOTE: Increasing the zero capture range may conflict with Local and State Weights and Measures laws when the 8146 is installed in a "Legal for Trade" installation.

2.3 LOAD CELL EXCITATION (APPLICABLE WITH ANALOG PCB ONLY)

The 8146 uses gated 15 VDC excitation for normal analog load cell excitation.

Each Analog PCB is capable of powering six 350-ohm load cells; however, the 8146 will power a maximum of eighteen 350-ohm load cells per unit. Refer to the following chart for more information regarding the maximum number of load cells per unit.

The maximum distance between the 8146 and the load cells is 500 ft using 16-gauge or 300 ft using a 20-gauge load cell cable.

Reduced excitation voltage levels are also available for use in hazardous areas. Refer to the following paragraph for a more detailed description of this reduced excitation voltage.

Per Analog PCB	Per System
14-825 ohm cells	42-825 ohm cells
12-700 ohm cell	36-700 ohm cells
6-425 ohm cells	18-425 ohm cells
6-350 ohm cells	18-350 ohm cells
4-240 ohm cells	12-240 ohm cells

2.4 REDUCED EXCITATION VOLTAGE (APPLICABLE WITH ANALOG PCB ONLY)

Reduced excitation output versions of the Model 8146 are available in all models for us with Toledo Intrinsic Safety Barriers. Contact Toledo Fast Factory for additional information. Reduced excitation voltage is limited to +3 volts for plus excitation and -3 volts for minus excitation (6 volts p to p). Also included in the reduced excitation voltage versions are sense-to-excitation-shunting resistors which prevent excitation runaway in the event that these line connections open.

NOTE: The lower excitation voltage must be considered when calculating the microvolt per increment build. This also limits the maximum full scale increments to 40,000 instead of 50,000.

2.5 INITIAL AND SPAN (APPLICABLE WITH ANALOG PCB ONLY)

The initial and span values are calculated during the scale's calibration procedure.

The initial range is from 0 to 27 millivolts.

The span range is from 3 to 45 millivolts, based upon 15-volt load cell excitation.

2.6 OVERCAPACITY

Individual Scales: The weight display will blank and printing is inhibited when the weight on the scale is five or more increments above full scale capacity.

Summed Scales: If any of the individual scales reach an overcapacity condition (as described above), the summed display will show eight asterisks (SUM****** lb). This display will also occur when the summed total is greater than eight digits.**

2.7 DIGITAL FILTERING

The 8146 is equipped with a multi-stage digital filter. By selecting the correct level of filtering required for your installation, changes in weight caused by wind, liquids, or vibration may be filtered out allowing the indication to stabilize.

As with all filtering, the higher the filtering rate the slower the display will respond to weight changes.

2.8 LINE SYNCHRONIZATION (LINE SYNC) (APPLICABLE WITH ANALOG PCB ONLY)

The line sync feature is used to eliminate any "crosstalk" on the load cell signal wires.

This "crosstalk" is typically caused by two or more load cell cables, operating at different frequencies, being run side by side, such as in conduit. This normally results in a slowly changing weight display.

The compensation for this is that all excitation voltages may be sync'd to the AC power source by means of line sync jumpers located on both the Analog PCB's and the Power Supply PCB.

NOTE: Running load cell cable in a conduit with other cabling is not recommended.

2.9 LINEARITY CONNECTION (APPLICABLE WITH ANALOG PCB ONLY)

The 8146 has the ability to compensate for nonlinear weight readings. This is done by taking weight readings at zero, half capacity, and full capacity. (Half capacity is defined as between 30 and 50% of full capacity.) It is important to note that the closer to full scale capacity the test weights are to the actual scale capacity, the more accurate the compensation will be.

Linearity correction may be disabled in the setup procedure.

2.10 ANALOG VERIFICATION

Analog verification is a test routine which is used to verify only the indicator's electronic analog section. It is not usable on scales which have initial weight values greater than 7.5 millivolts. The AV test is performed automatically approximately every four hours with the display reading zero. The indicator will display "AAAAAA" during the test.

The AV process is performed by injecting a known test signal at the output of the pre-amp section. The resulting data is then compared to a value calculated during calibration. If the test data is within the tolerance of the calculated value (show in the chart), the test is passed. If the test fails, the indicator becomes inoperative until corrective action is taken.

Analog verification may be disabled in the setup procedure.

If Full Scale Increments Are:	Acceptable Tolerances are:	If Full Scale Increments are:	Acceptable Tolerances are:
1000	± 1.0 Increment	15000	± 4.5 Increments
1200	± 1.0 Increment	16000	± 4.8 Increments
1500	± 1.0 Increment	20000	± 6.0 Increments
2000	± 1.0 Increment	25000	+ 7.5 Increments
2500	± 1.0 Increment	30000	± 9.0 Increments
3000	± 1.0 Increment	32000	± 9.6 Increments
4000	± 1.2 Increments	35000	± 10.5 Increments
5000	± 1.5 Increments	40000	± 12.0 Increments
6000	± 1.8 Increments	45000	± 13.5 Increments
8000	± 2.4 Increments	48000	± 14.4 Increments
10000	± 3.0 Increments	50000	± 15.0 Increments
12000	± 3.6 Increments		

Figure 2.1 Analog verification (AV) Test Tolerances

2.11 POWER UP SEQUENCE

When the AC power is applied, the 8146 will perform a series of display routines. These routines will check all display segments and inform the operator as to which software version he has and of any options that are installed. The series of display are as follows:

WEIGHT DISPLAY - Will count up, starting at 1 and ending at 0.

DATA DISPLAY - Will show a series of numbers and then flash the unit's configuration.

EXAMPLE - Scales 2

- Host Port

- Software Revision Number

At the end of this routine, the unit will be at the home position and ready to operate.

2.12 DIGITOL ® LOAD CELL CABLE DISTANCES (APPLICABLE TO DWP44 PCB ONLY)

2.12.1 DigiTOL ® Bench Portable

300 ft. Maximum, 8146 to Scale

2.12.2 DigiTOL ® J-Box and Floor Scale

300 ft. Maximum, 8146 to Scale

2.12.3 DigiTOL ® Power Cells

900 ft. Maximum, 8146 to Scale

NOTE: See chart below for maximum distance the auxiliary power supply can be placed from the scale. This chart is based on the use of Toledo Scale load cell cable 8 conductor, 20 gauge with stainless steel sheath for lightning protection.

Cells Per Pit Power Supply	Maximum Distance Scale to Auxiliary Supply	Maximum Distance Auxiliary Supply to 8146
4	900 ft.	6 ft.
6	775 ft.	125 ft.
8	585 ft.	315 ft.
10	470 ft.	430 ft.
12	390 ft.	510 ft.

NOTE: This chart is a reference to maximum distances, dependent on the number of load cells and the gauge of cable used.

3.0 SPECIFICATIONS

3.1 ELECTRICAL AND PHYSICAL SPECIFICATIONS

3.1.1 Environment

The 8146 will operate at temperatures from -10º C (14º F) to +40º C (104º F) with a noncondensing relative humidity of 0 to 95%. The 8146 has a zero temperature coefficient of 0.1 µV/ºC typical., 0.15 µV/ºC maximum and a maximum span temperature coefficient of 6 PPM/º C. (Applicable on unit the Analog PCB installed).

The desk-type enclosure is ventilated and, therefore, restricted to office or light industrial applications.

The wall mount enclosure is rated NEMA 4X and is constructed from stainless steel and designed for washdown environments.

3.1.2 Power Requirements

The 8146 can operate (by selection) at 120V, 220V or 240V AC. The voltage input tolerance is +10% to -15% of the selected AC voltage with a line frequency of from 49 to 61.5 hertz. Maximum power consumption is 65 watts. Isolated power is recommended.

CAUTION!

ALL UNITS ARE SHIPPED FOR 120V AC OPERATION. REFER TO SECTION 4.0 FOR ALTERNATE VOLTAGE OPERATION.

3.1.3 UL and C.S.A. Standard

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

3.1.4 FCC Regulations

The 8146 meets or exceeds the FCC conducted and radiated emissions requirements.

3.1.5 RFI Specifications

In environments where RFI radiation exists, use the stainless steel wall mount enclosure. This model has been designed to greatly reduce the susceptibility to Radio Frequency Interference.

3.1.6 Appearance and Dimensions

Desk Mount - This unit is charcoal black in color with a blue-green display and green display lens. The unit's metal case is 7" (17.8 cm) tall, [8.8" tall (22.4 cm) with legs extended] X 17.25" (43.8 cm) wide X 17.75" (45.1 cm) deep.

Wall Mount - This unit is a stainless steel NEMA 4X enclosure with a blue-green display and green display lens. The enclosure is 14.25" (36.2 cm) tall X 20" (50.8 cm) wide X 10.5" (26.7 cm) deep.

3.1.7 Hazardous Areas

In locations classified as hazardous by the National Electrical Code (NED) because of combustible or explosive atmospheres, special modules are required. Toledo Scale Intrinsic Safety Modules are designed for use in NEC Class I, or Class II, Division I, Groups C, D, E, F, or G. These Intrinsic Safety Modules may be used ONLY with specific versions of the 8146. DO NOT CONNECT INTRINSIC SAFETY MODULE TO ANY OTHER VERSION OF THE 8146. Contact Toledo Fast Factory for additional information.

3.1.8 8146 Wall Mounting Dimensions

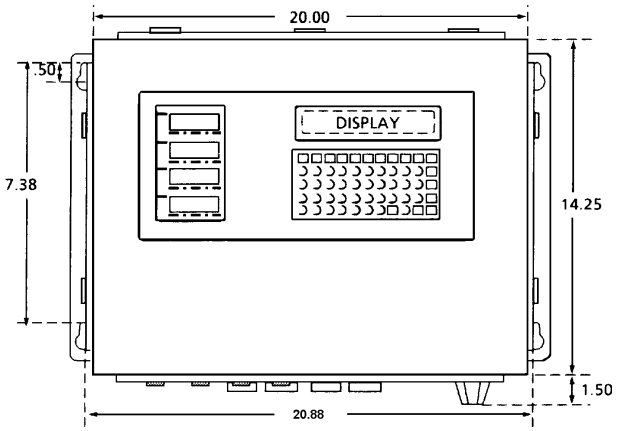


Figure 3.1 Front View

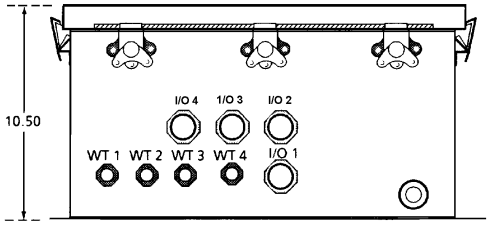


Figure 3.2 Bottom View

3.1.9 8146 Desk/Rack Mounting Dimensions

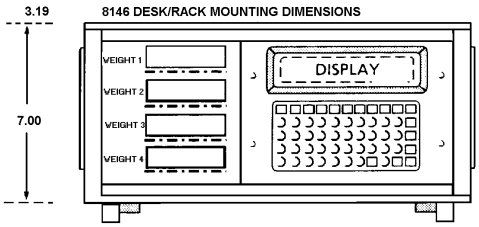


Figure 3.3 Front View

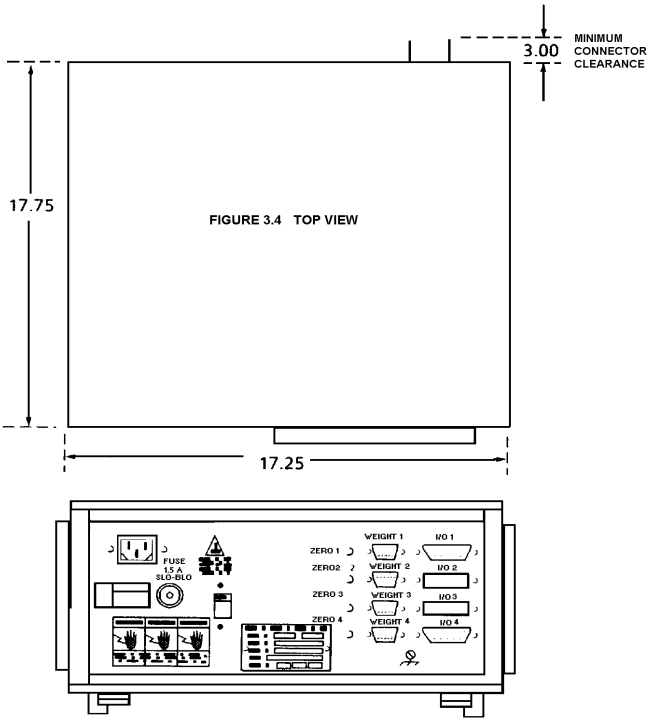


Figure 3.5 Back View

3.2 INTERNAL FUNCTIONS

The 8146 contains the necessary electronics to calculate and display weight as well as the capability to transmit data to a remote device.

3.3 DISPLAY FORMATS

3.3.1 Weight Displays

The weight display is a 7-digit vacuum fluorescent-type, 0.512 inches high with a lighted decimal point. A lighted comma may be selected to replace the decimal point by inserting a jumper plug across two pins located on the Weight Display PCB. (See Section 4.4.6.) The display also includes seven vacuum fluorescent descriptors which are located underneath the digits. These descriptors are ZERO, LB, KG, GROSS, NET, TARE, and SELECT. Their functions are as follows:

ZERO When illuminated, this indicates that the scale is on gross zero.

LB or KG Indicates the unit is in the pounds or kilogram mode.

GROSS When illuminated, this indicates that the displayed value is the gross weight.

Gross = Tare + Net

TARE When illuminated, this indicates that the displayed value is the tare weight.

Tare = Gross - Net

SELECT When illuminated, this indicates which scale has been selected for further operations.

The 8146 may have two Weight Display PCB's installed -- with each Weight Display PCB having two 7-digit displays. This allows the 8146 to display the weight on each of the four possible scales at the same time. With only two scales, it is possible to display the Gross or Net and Tare of each scale.

3.3.2 Data Display

The data display is a 16-character alphanumeric, dot matrix type. The characters are 0.44 inches high. This display is used to prompt the operator throughout the various operating sequences as well as display the results of the operation.

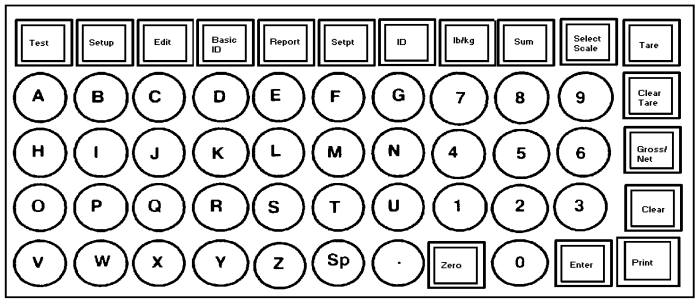


Figure 3.6 Keyboard Layout

3.4 KEYBOARD SPECIFICATIONS

The keyboard is a 55-position, tactile feedback keyboard with the edge of each key raised. The keys are arranged as follows:

A-Z	**Used to enter the appropriate character when prompted for an alphanumeric input.**
0-9	**Used to enter the appropriate digit when prompted for a numeric value.**
Test	**Initiates the internal self-diagnostics. This routine will continue until the second depression of the test key**
Setup	**Used to enter setup mode in conjunction with setup lockout switch(es).**
Edit	**This key is used to view or change the contents of the ID, CN, Time, Date, Stored Tare, Subtotals and Totals data.**
Basic ID	**Used to enter a 16-character identification.**
Report	**Used to initiate report printing sequence**
Setpt	**Used to view or change the value of any of the twelve setpoints.**
ID	**Used to access the tare recall function, for stored weight operation.**
lb/kg	**Used to alternate between the lb and kg display mode. This key may be disabled in the setup procedure.**
Sum	**Used in conjunction with a numeric key (1-4) to select the scales that are to be summed. Also used in conjunction with the Select Scale key to select sum display of previously entered scales.**
Select	**Used in conjunction with a numeric key (1-4) to select a particular scale for subsequent operations. Also used with the Sum key for recalling the summed weight to the alphanumeric display.**
Tare	**Used to initiate an autotare.**
Clear Tare	**Clears the tare applied to the selected scale. The operation of this key is dependent upon the programming of the tare function.**
Gross/Net	**Alternately selects between the gross and net display modes.**
Clear	**Used to clear any erroneous entry of numeric data.**
Print	**Used to initiate a data transmission through the printer interface.**
Enter	**Used to terminate any entry.**
Zero	**Used to zero the selected scale's weight display.**

3.5 FACTORY NUMBER CONFIGURATION AND OPTIONS

3.5.1 Configuration Chart

All factory numbers are configured with one Weight Display PCB. Scale interface kits are ordered as options. (See chart below.)

Factory Number	Mounting
8146-0022	Desk
8146-0032	Wall

Figure 3.7 Factory Number Configuration Chart

3.5.2 Options

Descriptions	Service Part Number	Sales Part Number
Analog Scale KOP, Desk	127480 00A	0917-0126
Analog Scale KOP, Wall	124781 00A	0917-0127
Dual Serial I/O KOP, Desk	127482 00A	0917-0128
Dual Serial I/O KOP, Wall	127483 00A	0917-0129
Rack Mount KOP, Desk ***	127484 00A	0917-0130
Additional Weight Display KOP, Desk	134367 00A	0917-0174
Additional Weight Display KOP, Wall	134369 00A	0917-0175
Tool-Operated Zero Pushbutton KOP	128235 00A	0917-0137
Scale Channel KOP (Analog KOP)	134365 00A	0917-0173
Weight Display Lens KOP, Desk*	134373 00A	0917-0176
Weight Display Lens KOP, Wall *	134374 00A	0917-0177
DigiTOL ® Scale KOP, Desk **	134361 00A	0917-0171
DigiTOL ® Scale KOP, Wall**	134363 00A	0917-0172
DigiTOL ® Scale KOP, Desk **		0917-0179
DigiTOL ® Scale KOP, Wall **		0917-0180

Figure 3.8 Factory Options Chart

NOTE(S):

- ***** Weight 1, Tare 1, Weight 2, Tare 2
- ****** DigiTOL ® Power Cells
- ******* DigiTOL ® Bench Portable and DigiTOL ® J-Box
- ******** Factory Installed Option - Not Available as Field Installed KOP.

3.6 DATA INTERFACE

3.6.1 Printer Output

The 8146 is capable of transmitting bit serial, ASCII coded, data stream at 300 to 9600 baud. 20mA current loop, EIA RS232-C and EIA RS422 are all available as standard circuit types.

3.6.1.1 Demand Operation - 300 to 9600 baud

When a print command is received, either from the print key or an external "Print Demand" signal via the host port, the 8146 will transmit a message which was formatted during the printer output setup procedure. Transmission of a checksum character, as well as expanded print, is selectable in the same setup procedure.

3.6.1.2 Continuous Operation - 300 to 9600 baud

Setpoint status is transmitted via serial port in an ASCII coded format. This format is compatible with a Reliance Electric AUTOMATE 15 TM programmable controller. This allows a standard AUTOMATE 15 to be used as a setpoint output controller. Communications are via a standard ASCII RS232 serial link, at 9600 baud, 8 data bits, 1 stop, no parity into the programming port on the AUTOMATE 15. The first 12 bits in the first I/O rail [0.00 through 0.13 (octal)] are assigned to setpoint outputs 1-12. The last output rail (0.17) is assigned as a toggling watchdog bit, with state complimenting at each I/O update. The other bits in the rail (0.14, 0.15, and 0.16) are allocated, but of indeterminate state. The AUTOMATE 15 may be programmed to use the setpoint bits as internal points, but MUST NOT ALTER THE OUTPUT STATES. All other available I/O points (1.00 through 3.17) are usable to the AUTOMATE 15. Any digital output module usable with the standard AUTOMATE 15 head may be used for setpoint control. Automate head must have an address of 01, i.e., PCID = 1. Refer to Section 6.9 for a detailed description of this output.

3.6.3 Bar Code I/O - Optional

This port provides a bi-directional, bar code interface. 20ma current loop and EIA RS232-C circuit types are supported. Baud rates are selectable from 300 to 9600 baud. Refer to Section 6.8 for a more detailed description. Bar Code output is available for use with the 8860 Thermal Label Printer.

3.6.4 Computer I/O - Optional

This port provides a bi-directional interactive computer interface. EIA RS232-C and 20 mA Current Loop are available at 300 to 9600 baud. Refer to Section 6.7 for message format, content and protocol.

4.0 INSTALLATION INSTRUCTIONS

4.1 PRELIMINARY INSPECTION

4.1.1 Inspection of Outer Case

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

4.1.2 Inspection of Instrument

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

4.1.2.1 The desk unit is opened by removing the four screws (two on the top cover plate and two on the rear panel) and slide the top cover plate towards the rear of the unit.

4.1.2.2 The wall mount is opened by flipping the wing-type handle of each fastener up and turning them 180 degrees counter-clockwise. Loosen the hinge fasteners of the bottom of the unit last.

4.2 OPERATING VOLTAGE SELECTOR

The operating voltage selector is located on the rear panel for the desk mount and inside the enclosure on the wall mount. Locate this selection switch and verify that the correct operating voltage is selected for installation.

! CAUTION

DO NOT APPLY POWER TO UNIT UNTIL VOLTAGE HAS BEEN VERIFIED AND POWER SELECTION HAS BEEN MADE.

! CAUTION

BE CERTAIN POWER IS DISCONNECTED BEFORE MAKING ANY ADJUSTMENT TO THE TRANSFORMER FOR VOLTAGE CHANGES.

4.2.1 To adjust the voltage selection switch, loosen the two screws and slide the locking plate until the correct voltage level is showing. Possible selections are: 120, 220, and 240 volts AC.

! CAUTION

IF THE OPERATING VOLTAGE IS CHANGED, BE SURE THE FUSE IS REPLACED WITH A FUSE OF THE CORRECT RATING.

120 VAC operation requires a 1.5 amp Slo-Blo Fuse
220 VAC operation requires a .75 amp Slo-Blo Fuse
240 VAC operation requires a .75 amp Slo-Blo Fuse

4.3 PRELIMINARY CALCULATIONS (APPLICABLE WITH ANALOG PCB ONLY)

Before connecting the 8146 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 installation of the scale. However, if it is a special build or a conversion of an existing mechanical scale, the microvolt per increment should be calculated. After calculating the microvolt per increment build, refer to the build charts to verify that the 8146 will operate correctly with this build.

4.3.1 To find the microvolt per increment build, you must first find the following items:

- **a) Scale capacity***
- **b) Increment size ***
- **c) Number of load cells or total lever ratio**
- **d) Load cell capacity**
- **e) Load 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.**

4.3.2 Find the total load cell output in millivolts by multiplying the cell output rating* by the 8146 excitation voltage, 6 or 15 volts.*

NOTE: Toledo Scale load cells are 2mV/V. Other manufacturers' load cells may be 1, 1.75, or 3mV/V. Standard excitation is 15 VDC, reduced excitation is 6 VDC.

4.3.3 Use the formula shown to calculate the microvolt per increment ratio.

$$\frac{IncrementSize\ \&\ TotalLoadCellOutput(mV)x1000}{LoadCellCapacityxNumberofCells(orLeverRate)}$$

4.3.4 Divide scale capacity by the increment size to determine the number of increments which will be used.

4.3.5 The following microvolt chart shows the limits, in microvolts, for the number of increments used.

The 8146 Analog PCB's are designed to operate with a maximum microvolt input of either 30 or 45uV*. This selection is determined by the position of the W3 jumper located on the Analog PCB. Verify the position of this jumper on all Analog PCB's installed in your unit. It may be necessary to change this jumper position to reach an acceptable microvolt per increment build on your unit.

*** The maximum microvolt input is found by multiplying the excitation times the millivolt output rating of the load cell.**

Number of Increments***	Minimum µV/INC**	Maximum µ/V/INC*
1,000	3.0	38.0
1,200	2.5	31.7
1,500	2.0	25.3
2,000	1.5	19.0
2,500	1.2	15.2
3,000	1.0	12.7
4,000	0.75	9.5
5,000	0.6	7.6
6,000	0.5	6.4
8,000	0.375	4.8
10,000	0.3	3.8
12,000	0.3	3.2
15,000	0.3	2.5
16,000	0.3	2.4
20,000	0.3	1.9
25,000	0.3	1.5
30,000	0.3	1.3
32,000	0.3	1.2
35,000	0.3	1.1
40,000	0.3	0.95
45,000	0.3	0.84
48,000	0.3	0.80
50,000	0.3	0.76

***** **The 8146 cannot be calibrated on builds that are greater than shown for the maximum µV/Increment.**

****** **The 8146 should never be programmed to less than .3uV/Increment for multiple cell scales (4 or more) and no less than 1.0uV/Increment for single cell scales.**

******* **The number of increments shown are the only selections which should be made. If these limits are exceeded, the scale may not be stable.**

Number of Increments***	Minimum µV/INC**	Maximum µ/V/INC*
1,000	3.0	26.0
1,200	2.5	21.7
1,500	2.0	17.3
2,000	1.5	13.0
2,500	1.2	10.4
3,000	1.0	8.7
4,000	0.75	6.5
5,000	0.6	5.2
6,000	0.5	4.4
8,000	0.375	3.3
10,000	0.3	2.6
12,000	0.3	2.2
15,000	0.3	1.7
16,000	0.3	1.6
20,000	0.3	1,3
25,000	0.3	1.0
30,000	0.3	0.87
32,000	0.3	0.81
35,000	0.3	0.74
40,000	0.3	0.65
45,000	0.3	0.58
48,000	0.3	0.54
50,000	0.3	0.52

Figure 4.2 Microvolt Chart for Analog PCB With Jumper W3 Set Between Pins 2 and 3 (30mV)

***** **The 8146 cannot be calibrated on builds that are greater than shown for the maximum µV/Increment.**

****** **The 8146 should never be programmed to less than .3 µV/Increment for multiple cell scales (4 or more) and not less than 1.0 µV/Increment for single cell scales.**

******* **The number of increments shown are the only selections which should be made. If these limits are exceeded, the scale may not be stable.**

4.3.6 Example of finding the µV/Increment build

Scale Capacity	**5000 lb**
Increment Size	**1 lb**
Number of Cells	**4**
Size of Cells	**2000 lb**
Cell Output Rating	**2 µV/V**
8146 Excitation	**15 V**

MODEL 2155

Step 1 Find the total load cell output in millivolts (mV).

2mV/V x 15V = 30mV

Step 2. Use the formula to find µV/Increment

$$\frac{1\text{ lb x }30\text{mV x }1000}{2000\text{ lb x }4} = 3.75\ \mu\text{V/Inc.}$$

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

$$\frac{5000lb}{1lb} = 5000\text{ Increments}$$

Step 4 Check the Microvolt per Increment Chart to see if this build fits into the 5000 increment range.

If it does, this will be a satisfactory build and you can continue with the installation.

If it does not, do not continue with this installation until the problem is corrected.

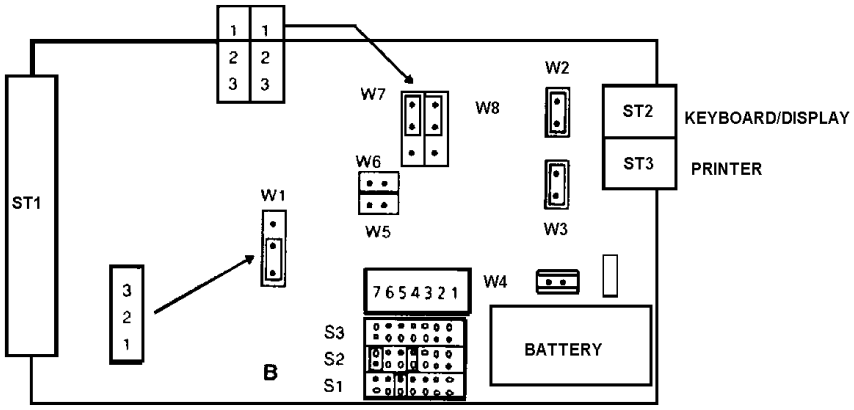
*

select the closest range from the chart, as only the values in the chart are legitimate builds.

4.4 JUMPER DESCRIPTION AND RECOMMENDED SETTINGS

This section of the manual describes the function of the onboard jumpers and program switches as well as their recommended settings for use in the Model 8146. Refer to the following paragraphs by individual PCB to determine how the jumpers or switches are to be positioned. Selections shown are the required settings for correct operation of the 8146 indicator.

4.4.1 CPU PCB



W1 - RAM Size
Pins 1 to 2 = 8K RAM

W2 - CTS Level for Connector ST2
Pins Connected = Inactive CTS

W3 - CTS Level for Connector ST3
Pins Not Connected = Active CTS
***Pins Connected = Inactive CTS**

W4 - Battery Backup
Pins Connected = Battery Active

W5 and W6 - On-board Address Selection
Both of these jumpers must be set so that the pins are not connected.

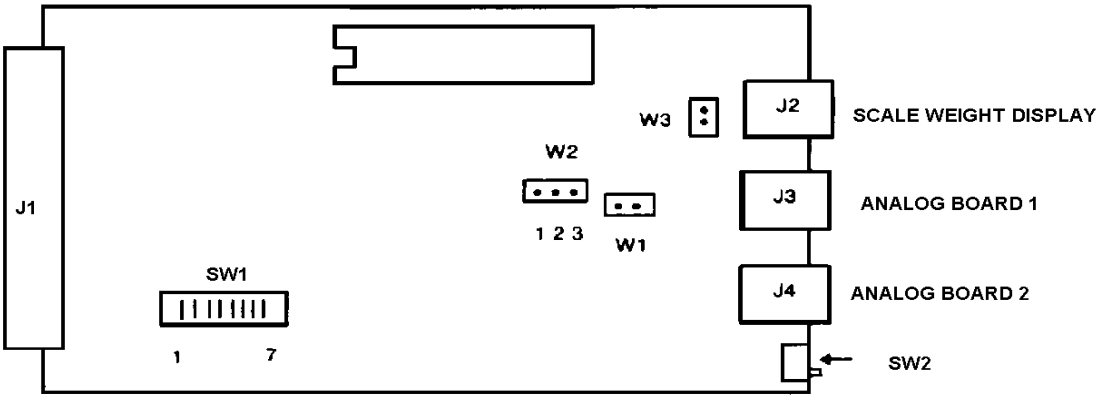
W7 and W8 - Off-board Address Selection
Both of these jumpers should be installed between Pins 1 and 2.

S1-5
Pins connected = Clock Interrupt

S2-4
Pins Connected = Host/Bar Code Serial Receive Interrupt

S2-7
Pins Connected = Printer Serial Receive Interrupt

***Factory Setting**



SWITCH 1-1 ON - For the first Scale Channel PCB in the unit

OFF - For the second Scale Channel PCB in the unit

1-2 MUST BE ON

1-3 MUST BE ON

1-4 MUST BE ON

1-5 MUST BE OFF

1-6 MUST BE ON

1-7 MUST BE OFF

SWITCH 2 ON (towards J4)

This switch on the first Scale Channel PCB will allow the setup procedure to be accessed and calibration of the scales connected to this PCB. This switch on the second Scale Channel PCB must be turned ON to access the calibration procedure of any scales connected to it.

OFF (away from J4)

Prevents access to the setup and calibration procedures.

W1 - PSEN

This jumper must be set so that the pins are connected.

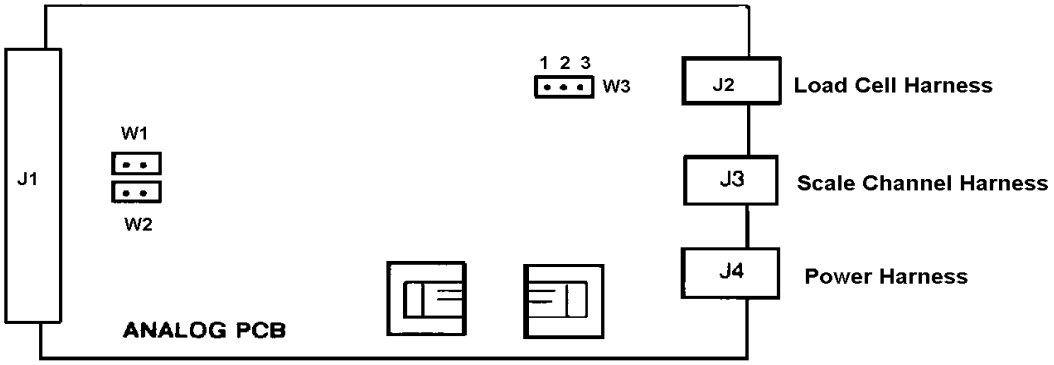
W2 - EPROM Select

Pins 2 to 3 = High Memory Size

W# - CTS Enable

Pins are not connected = CTS Inactive

4.4.3 Analog PCB



W1 and W2 - Line Sync

Pins not connected = Internal Sync
*** Pins Connected = AC Line Sync**

NOTE: These jumpers must be positioned the same as Jumper W1 located on the Power Supply PCB.

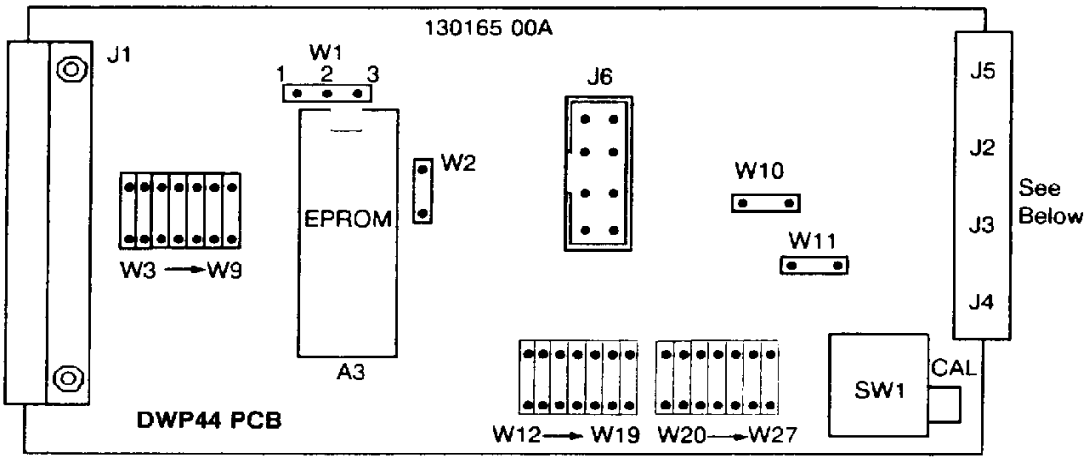
W3 - Load Cell Output Selection

3mV/V - For use with 3mV/V load cell(s). This jumper must connect Pins 1 and 2.

2mV/V - For use with 2mV/V load cell(s). This jumper must connect Pins 2 and 3.

*** Factory Setting**

4.4.4 DWP44 PCB



Jumpers installed as follows:

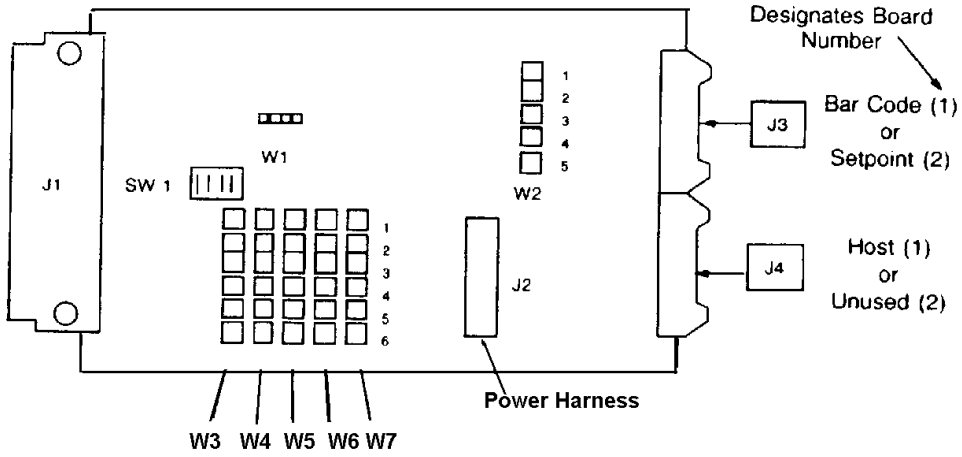
W1 = OVER Pins 2 & 3
W2 = IN (shorting pins together)
W3 = IN for DWP44 #1
W3 = OUT for DWP44 #2
W4, W5, W6 & W8 = IN

<u>NO</u> Jumpers installed

W7, W9 thru W17 = OUT
W19 thru W27 = OU

Connector	Usage	Internal Harness Part Numbers
J1	32 Pin TSM Bus Interface	TSM Back Plane
J2	T-LAN & High Speed Multidrop DLC	134360 00A Desk 134375 00A Wall
J3	Single DLC or DigiTOL ® J-Box	134383 00A Desk 134384 00A Wall
J4	Single DLC or DigiTOL ® J-Box	134383 00A Desk 134384 00A Wall
J5	Dual Weight Display	128236 00A
J6	Auxiliary Power Input	118521 00A

4.4.5 Serial I/O PCB



W3 = Not Used
W4 = 1-2 All Options
W5 = 1-2 Host/Bar Code Only
W6 = Not Used
W7 = Not Used

Switch 1 for the Host and Bar Code Option (1), set switches as follows:

SW1- 1 OFF
SW1- 2 ON
SW1- 3 OFF
SW1-4 ON

For the Setpoint Option (2), set switches as follows:

SW1- 1 ON
SW1- 2 OFF
SW1- 3 OFF
SW1-4 ON

W1 - Timing Clock

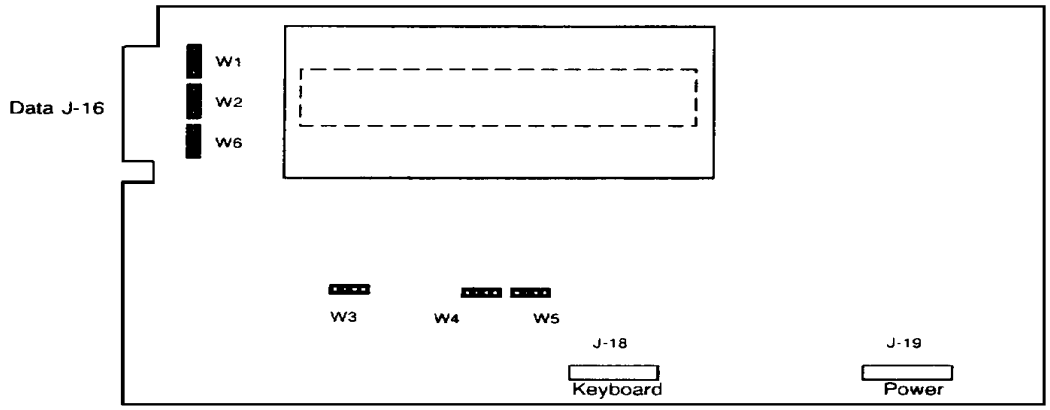
This jumper should be installed between Pins 2 and 3.

W2 - External Device Interfacing (CTS and DSR)

For normal operation this should have two jumpers installed. These jumpers should be installed across pins 1 and 2, and pins 4 and 5. Pin number 3 should not be connected.

NOTE: 8146's may contain 0, 1, or 2 Serial I/O PCB's. Board (1) is used for the Host and Bar Code options. Board (2) is used for the Setpoint option. Both are ordered as - 917-0128 KOP, for desk units, or 0917-0129, for wall units, then configured using SW1 as shown.

4.4.6 Dot Matrix Display PCB



W1 - Data Output Circuit Type
Pins 2 to 3 = RS232-C Output

W2 - CTS Circuit Type
Pins 2 to 3 = RS232-C Output

W3 - Test

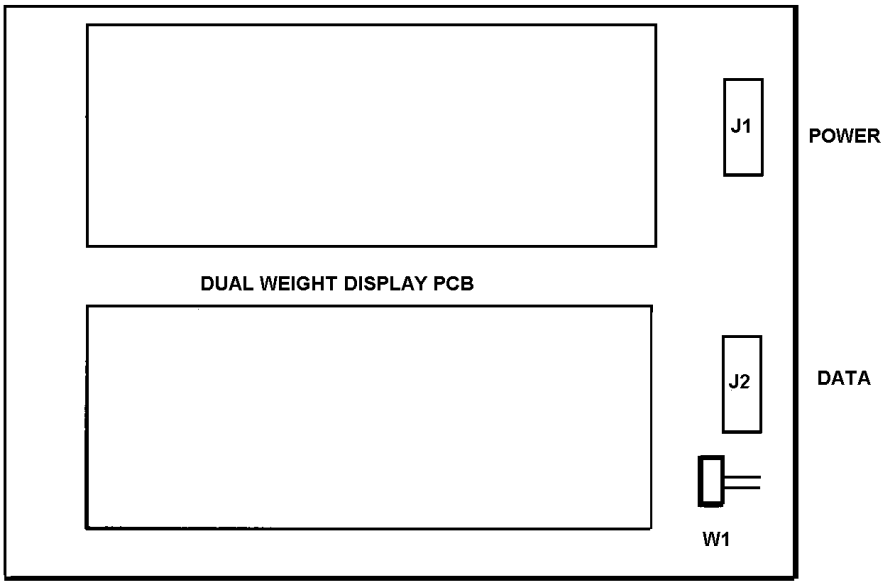
Used to start the self test of the Display PCB. During this test any key pressed will advance across the display. The pins should not be connected for normal operation.

W4 - On-board ROM Enable
Pins Not Connected = On-board ROM

W5 - Chip Select
These pins must be connected

W6 - DSR Circuit Type
Pins 2 to 3 = RS232-C Input

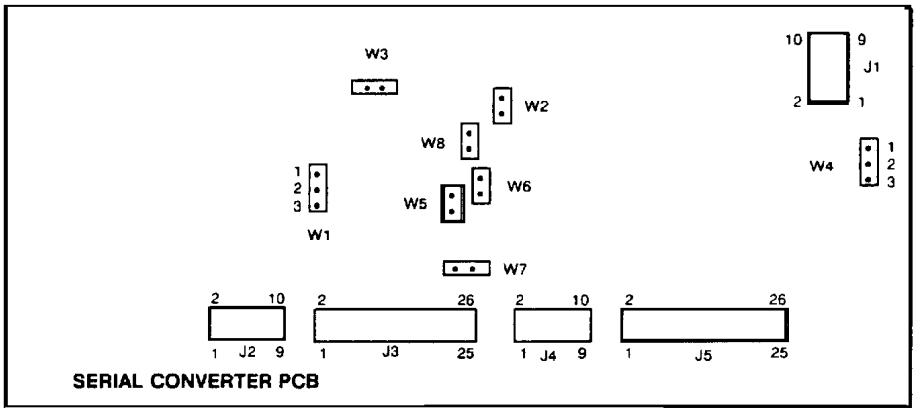
4.4.7 Dual Weight Display PCB



W1 - Comma

Pins not connected = Decimal point on the display
Pins connected = Comma on the display
(Later versions have solder pads only).

4.4.8 Dual Serial Converter PCB



W1 - Data Input Circuit Type (Keyboard/Display)
Pins 2 to 3 = RS232-C Input

W2 and W3 - Data Handling Selection

Both of these jumpers must have the pins not connected.

W4 - Data Input Circuit Type (Printer)
Pins 1 to 2 = RS422 Input
*** Pins 2 to 3 = RS232C Input**

W5 Through W8 - Data Handling Selection

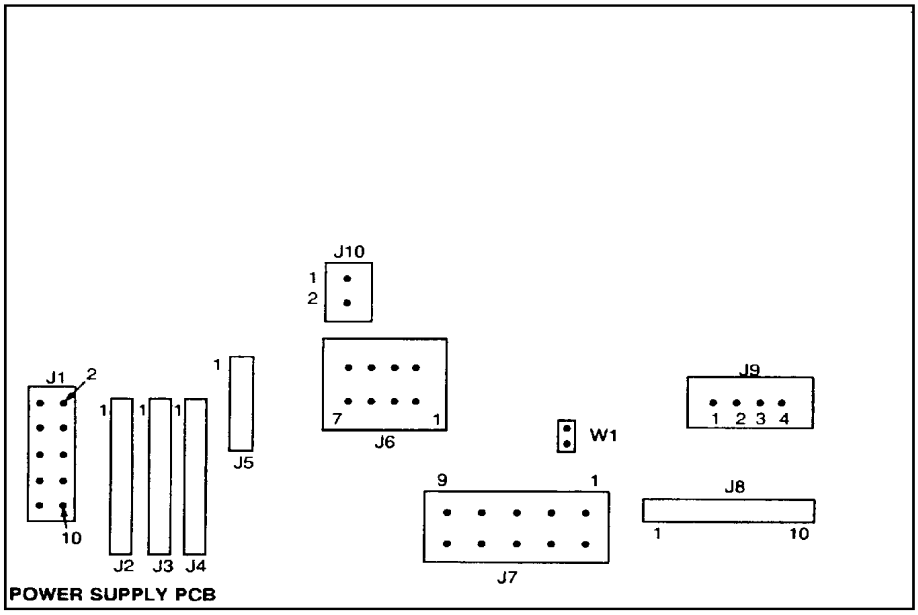
All of these jumpers must not have the pins connected.

*** Factory Setting**

4.4.9 Power Supply PCB

W1 - Line Sync
Pins not connected = Internal Sync
Pins Connected = AC Line Sync

NOTE: This jumper must be positioned the same as Jumpers W1 and W2 located on the Analog PCB's.



POWER SUPPLY PCB

!WARNING

THE POWER SUPPLY PCB CONTAINS VOLTAGES IN EXCESS OF 400 VOLTS. USE CARE WHEN TESTING VOLTAGES.

5.0 PROGRAMMING PROCEDURE

This section of the manual describes the programming of the indicators' operating modes and features as well as the self-calibrating procedure.

The procedure consists of two major groups which deal with the overall setup and calibration of the indicator. Each major group contains a description of the setup and calibration procedure. Section 5.1 details the procedure for the analog type units and Sections 5.2 thru 5.6 detail the procedure for the DigiTOL ® type units.

All question prompts and their current status, which affect the overall operation of the indicator, are displayed on the 16-character alphanumeric display. Questions which deal with the operation of a specific scale will be displayed on the associated scale's weight display.

Five front panel keys are used throughout this procedure. The keys' names and their functions are as follows:

KEY NAME	DESCRIPTION
SETUP	This key is used to enter into the setup procedure. It is also used to exit this procedure at any point in the procedure except during calibration.
ZERO	This key is used to back up to the previous question.
ENTER	This is used to accept the currently displayed answer to the question prompt.
1	This key is used as a "YES" response to the question prompt and will enable the displayed function.
0	This key is used as a "NO" response to the question prompt and will disable the displayed function. It is also used to increment to the next possible selection if the question consists of several possible choices.

TO ENTER INTO THE SETUP PROCEDURE YOU MUST FIRST TURN "ON" THE SETUP LOCKOUT SWITCH(ES) -- (SWITCH "2" ON THE ADP-51, SWITCH "1" ON THE DWP-44) LOCATED ON THE SCALE CHANNEL PCB(S) OR THE DWP44 PCB(S). If there are two PCB's installed in your unit, both switches must be turned "ON" to access the setup prompts. The ON position is when the switch handle is toward the J4 connector. (Switch "2" on the ADP-51, Switch "1" on the DWP-44).

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 of initial setup. Verify each selection to be certain that it is correct for actual usage.

5.1 ANALOG SETUP AND CALIBRATION PROCEDURE

(for use with Analog type load cells)

8146 PROGRAM FUNCTIONS

STEP	DESCRIPTION	INITIAL SETUP
	SETUP/CALIBRATE SCALES	
F2.0 TARE FUNCTIONS		
F2.1	TARE ACTIVE	1
F2.2	TARE INTERLOCK	0
F2.3	AUTO CLEAR TARE	0
F2.4	TARE DISPLAY ACTIVE	1
F3.0 POWER-UP FUNCTIONS		
F3.1	POWER-UP TIME	0
F3.2	POWER-UP POUNDS	1
F3.3	LB/KG SWITCHING	1
F3.4	EXPAND MODE	0
F3.5	SPAN ADJUST	0
F4.0 AVERAGING, ZERO, AND AZM FUNCTIONS		
F4.1	AUTO ZERO MAINTENANCE	3
F4.2	EXPANDED ZERO CAPTURE	0
F4.3	PUSHBUTTON ZERO	1
F4.4	ZERO CAPTURE RANGE	2
F4.5	MOTION SENSITIVITY	07
F4.6	MOTION DETECTION	03
F4.7	DIGITAL FILTERING	1
F4.8	ANALOG VERIFICATION	0
CAL ACCESS CALIBRATION		

5.1 ANALOG SETUP AND CALIBRATION PROCEDURE
(FOR USE WITH ANALOG TYPE LOAD CELLS)(CONTINUED)

Displayed Prompts **Descriptions**

[Setup Scale X] SETUP/CALIBRATE SCALES?

This is the first prompt after entering the setup procedure and is displayed on the alphanumeric display. If you want to setup, calibrate or make any changes which deal with any one of the four possible scales connected, simply enter that scale's number (1-4) and the routine will advance to F2.0. All prompts which deal with the selected scale will be displayed on that scale's weight display. If you do not want to enter into this routine, enter a 0 and the procedure will skip to F5.0.

NOTE: This prompt will remain on the display throughout this routine. At the end of each scale's setup, the weight display will return to normal. At this time, the unit is asking for the next scale number or a 0 to continue. The routines that deal with each scale are: F2.0, F3.0, F4.0, and CAL.

[F2.0] ACCESS TARE FUNCTIONS? Press:

1 To enter into the setup of all tare functions.
0 To skip the tare setup. The procedure will advance to step F3.0.

[F2.1 ?] TARE ACTIVE. Press:

1 To enable both the hand entered and auto tare function.

0 To disable the tare function.

[F2.2 ?] TARE INTERLOCK. Press:

1 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 a second tare may be entered. This also disables a weight display on power up. The display will flash EEE until zero is captured.

0 The tare value may be cleared or changed at any weight indication. Multiple tare will be accepted. The indication will power up with a non-flashing weight display.

[F2.3 ?] AUTO CLEAR TARE. Press:

1 The tare value will automatically clear when the indication returns to zero after settling to a no-motion condition at a weight greater than 10 minor increments.

0 Tare must be cleared manually by using the Clear key.

[F2.4 ?] TARE DISPLAY ACTIVE. Press:

1 The tare value will be displayed on the lower weight display. This is only usable when the 8146 is configured as a dual display unit.

0 The tare value will not be displayed.

[F3.0] ACCESS POWER UP AND lb/kg SELECTION? Press

1 To enter into the setup of the power up and lb/kg selections

0 To skip these setup selections. The procedure will advance to step F4.0.

[F3.1 ?] POWER UP TIMER (Approx. 30 seconds). Press:

1 The weight display(s) will remain blank and the legend indicators will blink until the time-out period has elapsed.

0 The weight display(s) will illuminate as soon as power is applied.

[F3.2 ?] POWER UP POUNDS. Press:

1 The 8146 will power up in the lb mode.

0 The 8146 will power up in the kg mode.

[F3.3 ?] lb/kg SWITCHING. Press:

1 To enable the switching between the lb and kg modes via the keyboard.

0 To disable lb/kg switching. The unit will operate in the selected power up mode.

[F3.4 ?] EXPAND MODE. Press:

1 The weight display will be expanded (showing minor increments).

0 The weight display will not be expanded (showing major increments).

NOTE: The 8146 should not be left in the expand mode for weighing. This mode is for installation evaluation and troubleshooting only. The Print, AZM, and Zero keys are disabled in this mode.

[F3.5] SPAN ADJUST. Press:

1 To enter into the span adjust. The standard calibration must be completed to provide a reference point before attempting to use this step. Refer to section 5.1.1 for a detailed description of the span adjustment feature.

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

[F4.0] ACCESS SCALE PARAMETER SELECTIONS: Press:

1 To enter into the setup of the scale parameter selections.

0 To skip the scale parameter selections. The procedure will advance to step CAL.

[F4.1 ?] AUTO ZERO MAINTENANCE

This selection allows for different AZM band and rate selections. The band size is the maximum amount of increments which can be adjusted for, and the rate is the amount of adjustment per cycle. Key in the appropriate selection from the chart below and then press "ENTER".

AZM Selection	AZM Range
0	AZM Disabled
1	± 0.5 increment with 0.1 rate
2	± 1.0 increment with a 0.2 rate
3	± 3.0 increments with a 0.4 rate

[F4.2 ?] EXPANDED AZM CAPTURE RANGE. Press:

1 To increase the AZM range from ± 2% up to ± 10% of the scale capacity.

0 The AZM range will not be increased.

[F4.3 ?] PUSHBUTTON ZERO. Press:

1 To enable the front panel Zero pushbutton.

0 To disable the front panel Zero pushbutton.

[F4.4 ?} PUSHBUTTON ZERO CAPTURE RANGE

This prompt is requesting the percent of the scale capacity that can be captured by using the Zero pushbutton. This entry is selectable from 2 to 20% of scale capacity.

[F4.5 07] MOTION SENSITIVITY SELECTION

The detection of motion disables printing, tare, and pushbutton zeroing. Steps F4.5 and F4.6 program the sensitivity of motion detection. Changes in weight greater than F4.5 (minor increments) over the time required to perform F4.6 (A/D cycles) are detected as motion. The "in motion" signal is provided as a status bit in the output data when the continuous output mode is selected.

Sensitivity of motion is the amount of change in weight allowed before motion is detected.

The sensitivity can be programmed in a range from 0.1 to 3 major increments in steps 0.1 increment.

To determine what number to enter in this step, use the following procedure. Valid selections are 0* through 30 with 07 recommended as a beginning value.

*** Determine the number of increments (or part of an increment) that the sensitivity should be. For example, 0.5, 1 or 0.7 increment. Multiply this number by 10. Example: If the number selected is 0.7, multiply this by 10 to get 7. This result (7) is the number to be entered for step F4.5.**

NOTE: If a value of "0" is entered there will be no motion detection and prompt F4.6 will be skipped.

[F4.6 03] MOTION DETECTION RANGE

This step programs the number of A/.D cycles over which the 8146 will monitor weight changes. The changes in weight must be less than the value programmed in step F4.5 to obtain a "no motion" signal. Numeric values between 1 and 20 A/D cycles are selectable with a beginning value of 3 recommended. The "ENTER" key must be pressed to proceed to step F4.7.

NOTE(S):

1 The update rate of the 8146 (A/D cycles per second) is dependent upon the number of full scale increments and the amount of initial weight. It varies from approximately 11 (at 1,000 total increments) to 4 (at 50,000 total increments).

2 The smaller this number is, the greater the probability will be for detecting "no motion" since it checks for motion over a shorter length of time.

[F4.7 1] DIGITAL FILTERING SELECTION

This allows selection of different quantities of A/D cycles to be filtered before a display update. The higher the number, the slower the update. Key in the appropriate selection from the chart below and then press "ENTER".

FILTERING SELECTION	FILTERING RATE
0	NONE
1	LIGHT
2	MEDIUM
3	HEAVY
4	VERY HEAVY

[f4.8 ?] ANALOG VERIFICATION. Press:

1 To enable analog verification.

0 To disable analog verification.

[CAL] ACCESS CALIBRATION MODE? Press:

1 To enter the calibration mode.

0 To skip the calibration mode. (The procedure will return to the Setup Scale prompt.)

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

[C1] FULL SCALE CAPACITY
[XXXXXX]

This display is showing yhou the programmed scale capacity. If this capacity is correct, press the "ENTER" Key.

If the displayed capacity is not correct for your scale, enter the desired scale capacity and press the "ENTER" Key.

[C2] INCREMENT SIZE
[XXXXXX]

At this time the unit is asking you to enter the displayed increment size.

If the displayed increment size is not correct for your scale, enter the desired size and press the "ENTER" key. This entry must include the decimal point or trailing zero if required. Maximum increment size is 500.

[C3 X] LINEARITY CORRECTION. Press:

1 To select the two-stage linearity correction

0 To disable the two-stage linearity correction.

NOTE: This step will normally not be required. If after calibration, the indication appears to be nonlinear, this step may be used to correct this. The use of this step requires that test weights of 60% of the scale's capacity be available for calibration.

[SC] CALIBRATION SHORT CUT

This allows bypassing the actual test weight calibration by entering in previously calculated initial and span values. These values are determined AFTER the actual test weight calibration has been completed. To obtain these values, answer YES to the PRINT SETUP prompt at the end of the setup procedure. The initial and span values needed will be included in the printout of the setup parameters. Press:

1 If the short cut initial and span values are to be used for calibration, the standard test weight calibration will be bypassed.

2 If the initial and span values are not to be used, the 8146 will proceed with the standard test weight calibration procedure.

NOTE: At this time the calibration sequence will follow one of four possible procedures. The procedure this sequence takes depends on how you answered the "Linearity Correction" and "Calibration Short Cut" prompts. Use the following chart to determine which procedure you should follow.

Linearity Correction	Calibration Shortcut	Follow
NO	NO	Procedure A
YES	NO	Procedure B
NO	YES	Procedure C
YES	YES	Procedure D

<u>PROCEDURE A: Normal Calibration without linearity correction</u>

[EP SCL] EMPTY SCALE	**Remove all weight from the scale platform. Press the "ENTER" key to continue.**
[15 CAL] TIME OUT	**The display will count down from 15 to 0 while initial is being set.**
[Add Ld] ADD LOAD	**Place the selected test weights on the scale platform. This should be at least 10% of the scale's capacity. Press the "ENTER" key to continue.**
[XXXXXX] TEST WEIGHT	**The value of the test weights used must be entered. Fractional or decimal values are not acceptable - only whole numbers. Press the "ENTER" key to continue.**
[15 CAL] TIME OUT	**The display will count down from 15 to 0 while span is being set.**
[EP SCL] EMPTY SCALE	**Remove all weight from the scale platform. Press the "ENTER" key to continue.**

[15 CAL] TIME OUT	**The display will count down from 15 to 0 while initial is being reset.**
[CAL A] CALIBRATION COMPLETE	**This display will appear after calibration is complete and will be displayed for approximately three seconds. At the end of this time the display will show S FILE for approximately two seconds. The weight display will then return to normal.**

PROCEDURE B: Normal Calibration with linearity correction

[EP SCL] EMPTY SCALE	**Remove all weight from the scale platform. Press the "ENTER" key to continue.**
[15 CAL] TIME OUT	**The display will count down from 15 to 0 while initial is being set.**
[Add A] ADD HIGH WEIGHT	**Place the selected test weights on the platform. This MUST be greater than 60%, but less than 100% of scale capacity. Press the "ENTER" key to continue.**
[XXXXXX] TEST WEIGHT	**The value of the test weights must be entered. Fractional or decimal weights are not acceptable - only whole numbers. Press the "ENTER" key to continue.**
[15 CAL] TIME OUT	**The display will count down from 15 to 0 while high span is being set.**
[Add B] ADD LOW WEIGHT	**Place the selected test weights on the platform. This MUST be greater than 30%, but less than 50% of scale capacity. Press the "ENTER" key to continue.**
[XXXXXX] TEST WEIGHT	**The value of the test weights must be entered. Fractional or decimal weights are not acceptable - only whole numbers. Press the "ENTER" key to continue.**
[15 CAL] TIME OUT	**The display will count down from 15 to 0 while low span is being set.**
[EP SCL] EMPTY SCALE	**Remove all weight from the scale platform. Press the "ENTER" key to continue.**
[15 CAL] TIME OUT	**The display will count down from 15 to 0 while initial is being reset.**
[CAL A] CALIBRATION COMPLETE	**This display will appear after calibration is complete and will be displayed for approximately three seconds. At the end of this time the display will show S FILE for approximately two seconds. The weight display will then return to normal.**

PROCEDURE C: Shortcut Calibration without linearity correction

[0] "TO" ENTRY	**Enter the time value obtained for "TO"**
[1] "T1" ENTRY	**Enter the time value obtained for "T1"**
[FS A] FINE SPAN - HIGH	**Enter the value obtained for the high order of the fine**

	span adjustment
[FS b] FINE SPAN - LOW	**Enter the value obtained for the low order of the fine span adjustment**
[F0 A] FINE ZERO - HIGH	**Enter the value obtained for the low order of the fine zero adjustment**
[F0 b] FINE ZERO - LOW	**Enter the value obtained for the low order of the fine zero adjustment**
[CAL A] CALIBRATION COMPLETE	**This display will appear after calibration is complete and will be displayed for approximately three seconds. At the end of this time the display will show S FILE for approximately two seconds. The weight display will then return to normal.**

PROCEDURE D: Shortcut Calibration with linearity correction

[0] "TO" ENTRY	**Enter the time value obtained for "TO"**
[1] "T1" ENTRY	**Enter the time value obtained for "T1"**
[FS A] FINE SPAN - HIGH	**Enter the value obtained for the high order of the fine span adjustment**
[FS b] FINE SPAN - LOW	**Enter the value obtained for the low order of the fine span adjustment.**
[F0 A] FINE ZERO - HIGH	**Enter the value obtained for the high order of the fine zero adjustment**
[F0 b] FINE ZERO - LOW	**Enter the value obtained for the low order of the fine zero adjustment**
[LF - ?] LINEARITY	**This prompt is asking you in which direction the linearity factor should be. Enter the value obtained from the printout:** **1 A negative linearity factor** **0 A positive linearity factor**
[LF A] LINEARITY FACTOR - HIGH	**Enter the value obtained for the high order of the linearity factor**
[LF b] LINEARITY FACTOR - LOW	**Enter the value obtained for the low order of the linearity factor**
[SF A] SPAN FACTOR - HIGH	**Enter the value obtained for the high order of the span factor**
[SF b] SPAN FACTOR - LOW	**Enter the value obtained for the low order of the span factor**
[S FILE]	**The display will show S FILE for approximately two seconds. The weight display will then return to normal.**

5.1.1 Span Adjustment

The span adjust feature of the 8146 is used to make adjustments to the span 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 adjust feature is as follows.

5.1.2

Before span adjust can be used, the standard calibration, as specified in the setup section, must be performed. It is suggested that as much weight as is practical be used for calibration.

5.1.3

Apply known test weights to the scale. If any adjustment is necessary proceed to the next step.

5.1.4

Enter the setup procedure. Select the correct scale and advance to prompt F3.5. Change the setting of this prompt to a 1 (yes).

5.1.5

Exit the setup procedure.

5.1.6

Enter the setup procedure and select the correct scale. The data display will now show [Cal Adj 000000].

5.1.7

To make a span adjustment, enter the correct test weight value. Enter all digits including those to the right of the decimal point. (See Note c below.) Press the “ENTER” key and the normal setup procedure will begin.

5.1.8

Exit the setup procedure. The weight display should now show the correct weight value. This procedure may be repeated several times during a “build-up” calibration.

5.1.9

After all adjustments are completed. reenter the setup procedure and change prompt F3.5 to a 0 (NO). Exit the setup procedure. The indicator is now ready for normal operation.

NOTES OF INTEREST:

a. 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 and then reentered if required again.

b. Weights that are entered in values other than multiples of the increment size will not be accepted. For example, entering the 103 pounds when the increment size is 2 lbs.

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

5.2 DIGITOL ® SETUP AND CALIBRATION PROCEDURE

(For Use With DigiTOL® J-Boxes)

00 CELL SELECTION

- **01 Select Cell Type**
- **02 Load Cell Operation (T-LAN Only)**
- **03 Number of Cells (T-LAN/DigiTOL ® J-Box)**
- **04 Load Cell Address (T-LAN Only)**
- **05 Second Scale Select (T-LAN Only)**
- **06 Reset DigiTOL ® J-Box Shift Constants (DigiTOL ® J-Box Only)**

10 CALIBRATION SELECT

- **11 Calibrate in lb/kg**
- **12 Future**
- **13 Future**
- **14 Scale Capacity**
- **15 Increment Size**
- **16 Future**
- **17 Future**
- **18 Shift Compensation (T-LAN/DigiTOL ® J-Box)**
- **19 Zero and Span Calibration**

20 FILTERING AND AZM (All DigiTOL ® types)

- **21 Zero Adjust**
- **22 Span Adjust**
- **23 AZM Range**
- **24 Auto Zero Capture at Power-Up**
- **25 Push Button Zero**
- **26 Motion Detection**
- **27 Filter Selection**
- **28 Overload Blanking**

30 TARE SELECTION (All DigiTOL ® types)

- **31 Tare Enable**
- **32 Tare Interlock**
- **33 Future**
- **34 Auto Clear Tare**
- **35 Gross/Net Switching**
- **36 Tare Display Active**

80 POWER UP AND UNIT SWITCHING (All DigiTOL ® types)

- **81 Analog Verify**
- **82 lb/kg Switching**
- **83 lb/kg Power Up**

90 LOAD CELL REPLACEMENT (T-LAN Only)

- **91 Re-Addressing A Load Cell**
- **92 Replacing a Load Cell**
- **93 Shift Adjustment**
- **94 Set Shift Constants**
- **95 Expanded Display Mode**
- **96 Manual Shift Adjust**
- **97 Span/Zero Shift Constants**
- **99 Display Load Cell Output**

5.3 SETUP AND CALIBRATION PROCEDURE FOR SINGLE CELL DIGITAL LOAD CELL SYSTEMS

This procedure describes the setup and calibration for digital load cells used in single cell scales. For setup and calibration for multiple digital load cell systems, proceed to Section 5.4 (Calibration of multiple digital load cell systems) or Section 5.5 for DigiTOL ® J-Box.

NOTE: To enter the setup mode when the main display is showing [SCL 1 TR 000000] (8146 Standard Mode) first move SW1 on the DWP44 PCB toward connector J4. If two DWP44 PCB(s) are installed, both SW1(s) must be moved to gain entry to all setup parameters for all scales being used. Press the "SETUP" key. The display will now show [SETUP SCALE?] key in the scale number to be setup (1 thru 4). The weight display for the scale chosen will show [- -]. Calibration groups for that scale can now be assessed.

5.3.1 Access Load Cell Type Selection Group 00

[00]

With the display prompt at [--], enter "00" followed by pressing the "ENTER" key to select GROUP 00 setup parameters. The display will increment to parameter 01.

[01]

Press "0" to select the Single, High Resolution DLC mode.

NOTE: If this parameter is being changed from 1 to 0, the indicator must be powered down then back up before continuing with calibration so that the DWP44 card gets initialized properly for the type of operation selected.

[01] DLC TYPE SELECTION

0 - Single DLC
1 - Power Cells
2 - DigiTOL ® J-Box

The selection entered for scale One will be forced into the scale Two parameters and this step will be skipped when setting up scale Two.

Press "0" to select the Single DLC configuration.

The display will return to the [--], prompt.

5.3.2 Access Calibration Sequence Group 10

[10]

With the display prompt at [--], enter "10" followed by pressing the "ENTER" key to select GROUP 10 calibration parameters. Parameters 11 - 19 will be prompted in sequence.

[11] CALIBRATE IN LB/KG

Enter the units in which the scale is to be calibrated in.

0 - To calibrate in kg.
1 - To calibrate in lb.

[14] ENTER FULL SCALE CAPACITY

The display will show the currently entered full scale capacity. If the capacity is correct, press the "ENTER" key.

If the displayed capacity is not correct for your application, enter the desired full scale capacity followed by the "ENTER" key.

[15] ENTER INCREMENT SIZE

The display will show the currently entered increment size. If the increment size is correct, press the "ENTER" key.

If the increment size is not correct, press the "0" key. The display will display zeros. Continue pressing the "0" key until the decimal point is in the correct position or until the correct number of fixed zeros ar displayed. Now press the "1", "2" or "5" key to select the proper increment size. This entry will replace the "-" character on the display.

[19] ZERO AND SPAN CALIBRATION

Press "0" to return to [--], prompt, or press "1" to proceed.

The display will show [Add Ld]. Press the "ENTER" key. The display will blank. Place test weight on the scale and enter this value using the keyboard followed by the "ENTER" key. The display will count down from
[16 CAL] to [09 CAL]. A check is now made to see if enough counts are received from the DLC.. If not, new T0 and T1 values are calculated and sent to the DLC. The display will then continue to count down to [01 CAL].

If new T0 and T1 counts were sent, then the display will show [E SCL], otherwise it will proceed to calibration done. Remove the test weight from the scale and press the "ENTER" key. The display will count down from

[16 CAL] to [01 CAL].

When calibration is completed, the display will show {CAL] for two seconds indicating the zero and span calibration has been successfully completed. The display will then return to the [--] prompt.

The remainder of the setup parameters may be directly addressed by entering their two digit code. However, by entering the group number first, the unit will automatically increment through some or all of the parameters in that group.

5.3.3 Access Load Cell Replacement Group 90

[90]

With the display prompt at [--], enter the parameter number and press the "ENTER" key to select the parameter.

[97] DISPLAY AND ENTRY OF SPAN AND ZERO CONSTANTS

With the display at [--], enter "97" followed by pressing "ENTER" key to select this parameter. This parameter allows the operator to view or alter the values stored for span and zero.

0 = To return to [--] prompt.
1 = To proceed with the display of these values.

A) The display will show [97A] for a 1/2 second then display the current span value. Press the "ENTER" key to retain the current value or enter a new value followed by pressing the "ENTER" key.

B) The display will show [97b] for a 1/2 second then display the current zero value. Press the "ENTER" key to retain the current value or enter a new value followed by pressing the "ENTER" key.

C) The display will show [SA] to save the new values permanently. If you want to save the new values permanently, press the "1" key. The original values will be replaced by the new ones. If you want to return to the original values, press the "0" key. The display will return to the [--] prompt.

5.4 SETUP AND CALIBRATION PROCEDURE FOR T-LAN MULTIPLE DIGITAL LOAD CELL SYSTEMS

This procedure describes the setup and calibration for digital load cell(s) which are interfaced to the 8146 via a T-LAN network.

5.4.1 Access Load Type Selection Group 00

[00]

With the display prompt at [--], enter 00 followed by pressing the "ENTER" key to select GROUP 00 setup parameters. The display will increment to parameter 01.

[01] DLC TYPE SELECTION

0 - Single DLC
1 - Power Cells
2 - DigiTOL ®

The selection entered for scale One will be forced into the scale Two parameters and this step will be skipped when setting up scale Two.

Press "1" to select the T-LAN network configuration.

NOTE: If this parameter is being changed from 0 to 1, the indicator must be powered down then back up after group 00 parameters have been set before continuing with calibration so DWP44 card and the 8146 CPU will get initialized properly for the type of operation selected.

[02] LOAD CELL OPERATION

This parameter selects whether the load cells are to operate independently or in sectional pairs. The independent mode is intended for applications such as tank or hopper scales where there is an odd number of load cells connected, or floor scales where corner adjustments will be made. The sectional pair mode is intended for applications such as floor and truck scales where section adjustments are made. For the load cells to operate in the sectional pair mode, an even number of load cells must be used.

0 - Independent cell operation
1 - Sectional pair operation

[03] NUMBER OF LOAD CELLS

Enter the number of load cells to be addressed for the scale being calibrated. (i.e., if calibrating scale 1, enter the number of load cells in scale 1.) If independent cell operation was selected, then only numbers from 1 to 16 will be accepted. If sectional pair operation was selected, then only even numbers from 2 to 24 will be accepted.

[04] LOAD CELL ADDRESS ASSIGNMENT

This parameter is used to access the auto addressing procedure. The auto addressing procedure. The auto addressing procedure is used at initial installation to assign individual addresses to each load cell. If a load cell is being replaced, or a load cell is being added to or removed from a scale, use the procedure outlined in parameter group 90.

0 - Skip to parameter 05
1 - Proceed with auto addressing of load cells

NOTE: If scale 2 is being addressed, the system starts the addressing at address 25 minus the number of load cells in scale 2. This forces the last address to be 24, allowing modifications to scale 1 without having to reassign addresses to scale 2.

If addressing scale 1, disconnect the interface cable to scale 2 from the auxiliary power supply. Leaving the cable connected without proper termination will cause communications interference with scale 1. If addressing scale 2, the interface cable to scale 1 does not need to be disconnected if scale 1 has been addressed already.

For the auto addressing procedure to work properly, all of the load cells must have an address of 240 (factory setting). For scales operating in the sectional pair mode, addressing must be arranged with odd addresses on one side, and even addresses on the other side as show below.

1	3	5	7	9	11
2	4	6	8	10	12

A) When the auto addressing procedure is selected, the power to the load cells is turned off, the display will show [04 XX], where XX is the number of the load cell already addressed and then [Add XX], where XX is the address to be assigned to the next load cell. Connect the load cell to be addressed, then press the "ENTER" key. Power to the load cells will be turned back on and the address will be sent to the load cell. Power to the load cells will then be turned off.

B) Connect the next load cell to be addressed, then repeat Step A.

If the auto addressing is successful, the display will keep advancing to the next address. If the last load cell has been addressed, the display will advance to parameter [05] (if addressing scale 1) or return to the [--] prompt.

If a communications error occurs during the attempt to auto address, an [E8 XX] error code will be displayed. If a communications error occurs, check the following:

1) Make sure address XX is the address of the load cell the operator was addressing. If not, the "ENTER" key may have been pressed more than once. The DWP44 card may have successfully addressed the load cell, then proceeded to address the next load cell. Press the "CLEAR" key to acknowledge the error. The display will return to the [04 XX] prompt. Connect the load cell to be addressed, then proceed to step A.

2) The load cell may not be set to the factory address (240). If this is the case, press the "ZERO" key until you are back to the [--] prompt. Then proceed to group 90 to manually readdress the load cells.

3) There could be a wiring problem between the pit power supply and the load cell.

4) The load cell being addressed may be bad.

5) If no communications are successful to any of the load cells, the auxiliary power supply or the pit supply may be bad. Also check for wiring problems. Refer to the troubleshooting section for more details.

NOTE: If this parameter is changed, the indicator must be powered down then back up after group 00 parameters have been set before continuing with calibration so the DWP44 card and the 8146 CPU get initialized properly for the type of operation selected.

5.4.2 Access Calibration Sequence Group 10

[10]

With the display prompt at [..], enter "10" followed by pressing the "ENTER" key to select GROUP 10 calibration parameters. Parameters 11 - 19 will be prompted in sequence.

[11] CALIBRATE IN LB/KG

Enter the units in which the scale is to be calibrated in.

0 - To calibrate in kg
1 - To calibrate in lb

[14] ENTER FULL SCALE CAPACITY

The display will show the currently entered full scale capacity. If the capacity is correct, press the "ENTER" key.

If the displayed capacity is not correct for your application, enter the desired full scale capacity followed by the "ENTER" key.

[15] ENTER INCREMENT SIZE

The display will show the currently entered increment size. If the increment size is correct, press the "ENTER" key.

If the increment size is not correct, press the "0" key. The display will display zeros. Continue pressing the "0" key until the decimal point is in the correct position or until the correct number of fixed zeros are displayed. Now press the "1", "2" or "5" key to select the proper increment size. This entry will replace the "-" character on the display.

[18] SHIFT COMPENSATION

NOTE: This step must be performed before step [19] calibration can be completed on initial startup.

Press "0" to return to [--] prompt, or press "1" to proceed.

The display will show [E SCL]. Empty the scale and press the "ENTER" key. The display will count down from [16 CAL] to [01 CAL].

The display will show [CELL XX] if an independent cell was selected in step 02 or [SEC XX] if sectional pairs was selected in step 02.

Place the test load as near to the cell or <u>center</u> of the section as possible then press the "ENTER" key.

The display will count down from [16 CAL] TO [01 CAL].

The display will then prompt for the next cell or sectional pair to be adjusted. Move the test load as required and repeat these steps until all cells or sections are completed. The display will then proceed to the [19] prompt.

[19] ZERO AND SPAN CALIBRATION

Press "0" to return to the [--] prompt, or press "1" to proceed.

The display will show [E SCL]. Empty the scale and press the "ENTER" key. The display will count down from [16 CAL] to [01 CAL].

The display will show [Add Ld]. Press the "ENTER" key. The display will blank. Place test weight on the scale and enter this value using the keyboard followed by the "ENTER" key. The display will count down from [16 CAL] to [09 CAL]. A check is now made to see if enough counts are received from the DLC. If not, new T0 and T1 values are calculated and sent to the DLC. The display will then continue to count down to [01 CAL].

If new T0 and T1 counts where sent, then the display will show [E SCL], otherwise it will proceed to calibration done. Remove the test weight from the scale and press the "ENTER" key. The display will count down from [16 CAL] to [01 CAL].

When calibration is completed, the display will show [CAL d] for two seconds indicating that the zero and span calibration has been successfully completed. The display will then return to the [--] prompt.

The remainder of the setup parameters may be directly addressed by entering their two digit code. However, by entering the group number first, the unit will automatically increment through some or all of the parameters in that group.

5.4.3 Access Load Cell Replacement Group 90

[90]

With the display prompt at [--], enter "90" followed by pressing the "ENTER" key to select Group 90 calibration parameters. Parameters 91 - 93 will be prompted in sequence. All other parameters in this group must be accessed individually.

[91] RE-ADDRESSING OF A LOAD CELL

This parameter allows you to readdress or manually address a load cell. This procedure may be required if replacing a load cell in an existing scale, or if the auto addressing procedure fails due to a load cell not having the factory address of 240.

It is important to note that only one cell at a time may be connected to the network when using parameter 91 to readdress a load cell. When two scale platforms are connected to one DWP44 card the cells share the same network; therefore, all cells on both scales must be disconnected, except for the single cell that is being readdressed.

0 - Skip re-addressing procedure.
1 - Access re-addressing procedure

A) The display will show [LC OFF] indicating that power to the load cells has been turned off. Disconnect all of the load cells from the pit power supply except for the load cell to be re-addressed.

B) Enter the desired address followed by the "ENTER" key. Entering an address of 00 will set the load cells address to the factory setting of 240.

C) If the re-addressing is successful, the display will show [LC OFF] indicating that the power supplies to the load cells have been turned off. Reconnect the other load cells then press the "ENTER" key. Power to the load cells will be turned back on.

If a communications error occurs during the attempt to re-address the load cell, an [E8 XX] error code will be displayed. Pressing the "CLEAR" key will return you to the [--] prompt. Refer to the troubleshooting section for more details.

[92] REPLACING A LOAD CELL

This parameter allows for the replacement of a bad load cell with a new one. For this procedure to work, the load cell being installed must have the factory set address of 240. The DWP44 card will look for a response from each of the load cells it is set up to address to determine which load cell is missing. It will then look for the new load cell by addressing the load cell address 240. The missing address will be given to the new load cell. The new cell or section that the new cell was placed in must now be shift adjusted via Parameter 93 or by performing a complete calibration procedure. The scale must also be re-zeroed and re-spanned.

0 - To skip to Parameter 93
1 - to proceed with load cell replacement

A) The display will show [LC OFF] indicating that power to the load cells has been turned off. Disconnect the load cell being replaced and connect the new one on.

B) Press the "ENTER" key. Power to the load cells will be turned on and the DWP44 will automatically identify the missing load cell, then re-assign that address to the new load cell.

If this procedure doesn't work, the load cell may need to be re-addressed to the factory address of 240 as detailed in Parameter 91.

[93] SHIFT ADJUSTMENT OF A CELL OR SECTION

This parameter allows for shift adjustment of a single load cell or section without having to perform the shift adjustment for the entire scale.

0 - To skip the Parameter 94
1 - To proceed with manual shift adjustment

A) The display will show [CELL] if operating in the independent mode, or [SEC] if operating in the sectional pair mode. Enter the cell or section to be adjusted followed by the "ENTER" key.

B) The display will show [LOAD XX] where the XX is the cell or section number. Place the test load on the scale as close to the cell or section as possible then press the "ENTER" key. The display will count down from [16 CAL] to [01 CAL].

C) The display will show [LOAD XX] where XX is the cell or section number. Place the test load on the scale as close to the cell or section as possible then press the "ENTER" key. The display will count down from [16 CAL] to [01 CAL].

D) The display will show [LOAD XX]. Move the test load as close to the cell or section as possible then press the "ENTER" key. The display will count down from [16 CAL] to [01 CAL].

E) The display will advance to Parameter 94 or return to the [--] prompt.

[94] SET SHIFT CONSTANTS TO 1

This parameter allows you to temporarily set all of the shift constants to 1. This allows you to see what the weight readings from individual cell or sections are without any compensation. When this parameter is set to 1, the shift constants will be set to 1 only until the unit is powered down. Once powered down then back up, the stored shift constants will be used. This parameter is automatically set to 0 upon entry into calibration (Parameter 19).

0 - Use shift constants calculated during calibration

1 - Set shift constants to 1 until power down or until re-entry into calibration mode.

[95] EXPANDED DISPLAY MODE

This parameter selects whether the weight will be displayed in normal calibrated increments or minor increments.

0 - Display weight in calibrated increments

1 - Display weight in minor increments

[96] MANUAL SHIFT ADJUST

This parameter allows for manual shift adjustment of individual load cells or sections. This parameter differs from Parameter 93 in that this procedure allows you to adjust the cell or section to a specific weight value. When performing the manual shift adjustment, the weight will be displayed in an expanded mode to provide for finer adjustment to the shift constant.

0 - To return to [--] prompt
1 - To proceed with manual shift adjustment

A) Put the test load over the cell or section to be adjusted.

B) The display will show the weight in an expanded mode. Record this number as it will be entered for [LOAD b] later in this procedure. Press the "ENTER" key.

C) The display will show [CELL] or [SEC], depending on how parameter 02 has been set (independent cell or sectional pair operation). Key in the number of the cell or section to be adjusted and then press the "ENTER:" key

D) The display will show [LOAD A] for approximately one second and then go blank. Key in the weight value of the test load, then press the "ENTER" key.

E) The display will show [LOAD b] for approximately one second and then go blank. Key in the number recorded in Step B, then press the "ENTER" key.

F) The display will now show the adjusted expanded weight value. If the number shown was higher or lower than the desired weight, it will be necessary to make another pass at the adjustment. Press the "ENTER" key to return to the [CELL] O R [SEC] prompt, step C.

If the number shown represents the correct weight, press the "CLEAR" key to advance to the [SA] prompt. Pressing the "1" key will save the new shift constants. Pressing the "0" key will leave the shift constants unchanged. If the number shown is incorrect, another pass at the adjustment will be necessary. See the below listed example for details.

NOTE: Entering a "1" in response to the [SA] prompt will erase the original shift constants and store the new shift constants. <u>The scale MUST be re-calibrated using parameter 19</u>.

EXAMPLE:

The following example illustrates parameter 96 being used to adjust a two section truck scale platform that has a 40 lb shift error between sections. Section one being the lighter section, and using a 10000 lb test load.

A) Insure a good Zero and then place the 10000 lb test load as close to the center of section one as possible. Enable parameter 96 [96 1].

B) The display will show the weight in an expanded mode. For example [9962]. Record this number and then press the "ENTER" key.

C) The display will show [SEC]. Key in the number "1" for section one.

D) The display will show [LOAD A] for approximately one second and then go blank. Key in "10000" for the test load weight value, and then press the "ENTER" key.

E) The display will show [LOAD b] for approximately one second then go blank. Key in the number recorded in step B, "9962" and then press the "ENTER" key.

F) The display will now show the adjusted expanded weight. For this example let us say that

this value is [9988]. Since section one is still weighing light, another pass at the adjustment will be necessary.

Pressing the "ENTER" key will return the display to the [SEC] prompt. Key in a "1" for section one, and then press the "ENTER" key. On this pass a higher value must be entered for [LOAD A]. Key in "10010", for example, and press the "ENTER" key. Since [LOAD b] was entered previously it is not necessary to enter is again, simply press the "ENTER" key after the [LOAD b] prompt is displayed. This time let us say the displayed weight value is correct, [10000]. Press the "CLEAR" key to advance to the [SA] prompt. Press the "1" key to save the new shift constant.

Several iterations may be required to attain the desired weight value. Remember that re-calibration must be performed whenever the shift constants are changed.

If an error is made while making an entry for [LOAD A] or [LOAD b], pressing the "CLEAR" key will clear the display, to allow re-entry of data. To return to the previous prompt, press the ZERO" key. Pressing the "CLEAR" key while at the expand weight display will advance to the [SA] prompt.

[97] DISPLAY AND ENTRY OF SPAN, ZERO AND SHIFT CONSTANTS

This parameter allows the operator to view or alter the values stored for span, zero and shift constant for each load cell or section.

0 - To return to [--] prompt
1 - To proceed with display of these values

A) The display will show [97A] for 1/2 second, then display the current span value. Press the "ENTER" key to retain the current value or enter a new value followed by pressing the "ENTER" key.

B) The display will show [97b] for 1/2 second, then display the current zero value. Press the "ENTER" key to retain the current value or enter a new value followed by pressing the "ENTER" key.

C) The display will show [CELL XX] or [SEC XX] for 1/2 second, then display the current shift constant for cell or section XX. Press the "ENTER" key to retain the current value or enter a new value followed by the "ENTER" key.

D) Press the "ENTER" key to display the next cell or section values. If the last cell or section was just displayed, the display will show [SA]. If you want to save the new values permanently, press the "1" key. The original values will be replaced by the new ones. If you want to return to the original values, press the "0" key. The display will return to the [--] prompt.

[99] DISPLAY LOAD CELL OUTPUT

This parameter allows the operator to see the raw count output from each load cell. This value does not directly correspond to the displayed weight.

0 - To return to the [--] prompt
1 - To proceed with viewing the load cell output

A) The display will show [99]. Enter the address of the load cell that you want to view followed by the "ENTER" key. The raw counts for that load cell will be displayed.

B) Press the "ENTER" key. The display will show the address of the next load cell for 2 seconds, then display the raw counts for it.

C) Step B will be repeated for all cells. Press the "CLEAR" key to return to the [--] prompt.

5.5 SETUP AND CALIBRATION PROCEDURE FOR DIGITOL ® J-BOX

This procedure describes the calibration for analog load cell(s) which are interfaced to the 8146 via a DigiTOL ® J-Box.

5.5.1 Access Load Type Selection Group 00

[00]

With the display prompt at [--], enter 00 followed by pressing the "ENTER" key to select GROUP 00 setup parameters. The display will increment to parameter 01.

[01] DLC TYPE SELECTION

0 - Single DLC
1 - Power Cells
2 - DigiTOL ® J-Box

The selection entered for scale One will be forced into the scale Two parameters and this step will be skipped when setting up scale Two.

Press "2" to select the DigiTOL ® J-Box network configuration.

NOTE: If this parameter is being changed from a 0 to a 1 or a 2, the indicator must be powered down then back up after group 00 parameters have been set before continuing with calibration so the DWP44 card and the 8146 CPU will get initialized properly for the type of operation selected.

[03] NUMBER OF LOAD CELLS

Enter the number of load cells to be addressed for the scale being calibrated. (i.e., if calibrating scale 1, enter the number of load cells in scale 1.)

[06] RESET DIGITAL J-BOX SHIFT CONSTANTS?

Press "1" key to proceed with reset or "0" key to return to "--".

5.5.2 Access Calibration Sequence Group 10

[10]

With the display prompt at [--],enter "10" followed by pressing the "ENTER" key to select GROUP 10 calibration parameters. Parameters 11 - 19 will be prompted in sequence.

[11] CALIBRATE IN LB/KG

Enter the units in which the scale is to be calibrated in.

0 - To calibrate in kg
1 - To calibrate in lb

[14] ENTER FULL SCALE CAPACITY

The display will show the currently entered full scale capacity. If the capacity is correct, press the "ENTER" key.

If the displayed capacity is not correct for your application, enter the desired full scale capacity followed by the "ENTER" key.

[15] ENTER INCREMENT SIZE

The display will show the currently entered increment size. If the increment size is correct, please press the "ENTER" key.

If the increment size is not correct, press the "0" key. The display will display zeros. Continue pressing the "0" key until the decimal point is in the correct position or until the correct number of fixed zeros are displayed. Now press the "1", "2" or "5" key to select the proper increment size. This entry will replace the "-" character on the display.

[18] SHIFT COMPENSATION

NOTE: This setup must be performed before step [19] calibration can be completed on initial setup.

Press "0" to return to [--] prompt, or press "1" to proceed.
The display will show [E SCL]. Empty the scale and press the "ENTER" key. The display will count down from [16 CAL] to [01 CAL]..

The display will show [CELL XX].

Place the test load as near to the cell as possible then press the "ENTER" key.

The display will count down from [16 CAL] to [01 CAL].

The display will then prompt for the next cell to be adjusted. Move the test load as required and repeat these steps until all cells are emptied. The display will then proceed to the [19] prompt.

[19] ZERO AND SPAN CALIBRATION

Press "0" and return to [--] prompt, or press "1" to proceed.

The display will show [E SCL]. Empty the scale and press the "ENTER" key. The display will count down from [16 CAL] to [01 CAL].

The display will show [Add Ld]. Press the "ENTER" key. The display will blank. Place test weight on the scale and enter this value using the keyboard followed by the "ENTER" key. The display will count down from [16 CAL] to [09 CAL]. A check is now made to see if enough counts are received from the DLC. If not, new T0 and T1 values are calculated and sent to the DLC. The display will then continue to count down to [01 CAL].

If new T0 and T1 counts were sent, then the display will show [E SCL], otherwise it will proceed to calibration done. Remove the test weight from the scale and press the "ENTER" key. The display will count down from [16 CAL] to [01 CAL].

When calibration is completed, the display will show [CAL d] for two seconds indicating the zero and span calibration has been successfully completed. The display will then return to the [--] prompt.

The remainder of the setup parameters may be directly addressed by entering their two digit code. However, by entering the group number first, the unit will automatically increment through some or all of the parameters in that group.

5.5.3 Access Load Cell Replacement Group 90

[90]

With the display prompt at [--], enter the parameter number and press the "ENTER" key to select the parameter.

[97] DISPLAY AND ENTRY OF SPAN AND ZERO CONSTANTS

With the display at [--], enter "97" followed by pressing the "ENTER" key to select this parameter. This parameter allows the operator to view or alter the values stored for span and zero.

1 = To return to [--] prompt.
0 = To proceed with the display of these values.

A) The display will show [97A] for a 1/2 second then display the current span value. Press the "ENTER" key to retain the current value or enter a new value followed by pressing the "ENTER" key.

B) The display will show [97b] for a 1/2 second then display the current zero value. Press the "ENTER" key to retain the current value or enter a new value followed by pressing the "ENTER" key.

C) The display will show [SA] to save the new values permanently. If you want to save the new values permanently, press the "1" key. The original values will be replaced by the new ones. If you want to return to the original values, press the "0" key. The display will return to the [--] prompt.

5.6 DWP44 GENERAL SETUP FOR ALL LOAD CELL TYPES

5.6.1 Access Filtering and Zero Maintenance Group 20

[20]

With the display prompt at [--], enter "20" followed by pressing the "ENTER" key to select GROUP 20 calibration parameters. Parameters 21 - 28 will be prompted in sequence.

[21] ZERO ADJUST

This parameter allows for changing the calibrated zero of the scale without affecting the span calibration.

Press "1" to enter current gross weight value as the new calibrated zero value. Once a group or parameter number has been entered, no weight readings are taken. Therefore, make sure that the weight is removed from the platform while the display is at the [--] prompt. Then enter parameter 21 to set zero.

[22] SPAN ADJUST

This parameter allows for changing the span calibration without affecting the zero calibration.

Press "0" to return to the [--] prompt or press "1" to proceed with the Span Adjust. Once a group or parameter number has been entered, no weight readings are taken. Therefore, make sure that the test weight is on the scale while the display is at the [--] prompt.

After pressing "1", the display will blank except for a decimal point (if applicable). Enter the desired weight value followed by the "ENTER" key. The entered value must be divisible by the increment size.

[23] AUTO ZERO MAINTENANCE

This parameter selects the auto zero capture range. If no auto zero maintenance is required, it may be disabled.

0 - To disable AZM
1 - ± 0.5d AZM
2 - ± 1.0d AZM
3 - ± 3.0d AZM

[24] AUTO ZERO CAPTURE AT POWER UP

This parameter selects the auto zero capture range at power up. If the scale reading is within the selected range upon power up, the scale will automatically be zeroed. If no auto zero capture is required, it may be disabled.

0 - No auto zero capture
1 - Enable 2% auto zero capture range
2 - Enable 20% auto zero capture range

NOTE: Upon power up, the WEIGHT DISPLAY will show [-EEE] (below zero) or [EEE] (above zero) until zero is captured. This feature can be disabled by setting parameter 24 to "0" and cycling power. If the scale connected is not out of the indicators display range, a weight value will now be shown on the WEIGHT DISPLAY.

[25] PUSHBUTTON ZERO RANGE

This parameter selects the capture range of the pushbutton zero. If the weight reading is within the selected range when the ZERO" pushbutton is pressed, the scale will be zeroed. If required, the ZERO" pushbutton may be disabled.

[26] MOTION DETECTION

This parameter selects the motion detection threshold. The motion detect threshold determines the maximum number of display increments that the weight reading may change before a motion condition is registered. If required, the motion detector may be disabled.

0 - Motion detector disabled
1 - 0.5d
2 - 1.0d
3 - 2.0d
4 - 3.0d

[27] FILTER SELECTION

This parameter selects the amount of digital filtering applied to the weight readings received from the load cell. If no filtering is required, the filter may be disabled. The higher the value entered, the heavier the filtering.

0 - No Filter
1 - Lightest Filter
2 - Light Filter
3 - Medium filter
4 - Heavy Filter
5 - Heaviest Filter

[28] OVERLOAD BLANKING

This parameter selects the overcapacity blanking point. Enter the weight value at which the unit is to indicate over capacity. This value may be greater than the scale capacity.

5.6.2 Access Tare Functions Group 30

[30]

With the display prompt at [--], enter 30 followed by pressing the "ENTER" key to select GROUP 30 calibration parameters. Parameter 31 - 35 will be prompted in sequence.

[31] TARE ENABLE

This parameter selectively enables auto tare or auto tare and keyboard tare. If required, tare entry may be inhibited.

0 - Tare entry inhibited
1 - Auto tare entry enabled
2 - Auto tare and keyboard tare enabled

[32] TARE INTERLOCK

This parameter enables or disables the tare interlock feature. When enabled, the tare value will automatically be cleared when the weight returns to zero after settling to a no motion condition at a weight greater than 10 minor increments. If disabled, the tare must be manually cleared by using the Clear key.

0 - Auto clear tare disabled
1 - Auto clear tare enabled

[35] GROSS/NET SWITCHING

This parameter enables or disables Gross/Net switching. When disabled, the Gross/Net key is inoperative. When enabled, the indicator may be switched between the net and the gross mode.

0 - Gross/Net switching disabled
1 - Gross/Net switching enabled

[36] TARE DISPLAY ACTIVE

This parameter enables the tare display on the lower display.

0 - Disable display
1 - Enable display

5.6.3 Access Power Up and Units Switching Group 80

[80]

With the display prompt at [--], enter 80 followed by pressing the "ENTER" key to select GROUP 80 calibration parameters. Parameters 81 - 83 will be prompted in sequence.

[81] ANALOG VERIFY

This parameter enables or disables the analog verification feature. If enabled, analog verification is automatically performed approximately once very 4 hours by injecting a signal at the DLC that generates an output value equal to about 30 to 40% of full load. The resulting weight reading is compared to a predetermined value loaded during calibration. If the test reading is not within the allowable tolerance, an E6 error will be displayed and the indicator will be inoperative until corrective action is taken. The analog verify tolerance is ± 2d for builds greater than 2000d.

0 - Disable analog verification
1 - Enable analog verification

[82] LB/KG SWITCHING

This parameter enables or disables lb/kg switching. If enabled, lb/kg switching is allowed. If disabled, lb/kg switching will be inhibited.

0 - Lb/kg switching inhibited
1 - Lb/kg switching enabled

[83] LB/KG POWER UP

This parameter selects whether the indicator powers up in the lb or kg mode.

0 - Power up in kg
1 - Power up in lb

5.7 SETUP FOR PRINTER PORT AND 8146 OPTIONS

F5.0 ACCESS PRINTER PORT PARAMETERS

F5.1	**Output Baud Rate**	**300 ****
F5.2	**Checksum**	**0 ****
F5.3	**Minimum Print**	**0 ****
F5.4	**Negative Weight Printing**	**0 ****
F5.5	**Repeat Print**	**0 ****
F5.6	**Time and Date Format**	**4 ****
F5.7	**Demand Mode**	**1 ****
F5.8	**Configure Ticket Print Format**	
F5.9	**Select Scale for Output**	
F5.10	**Data Output Update Rate**	

F6.0 ACCESS EDIT SEQUENCE

F7.0 ACCESS SETPOINT PARAMETERS*

F8.0 ACCESS BAR CODE PARAMETERS*

F9.0 ACCESS HOST PARAMETERS*

F10.0 CONFIGURE MEMORY

F11.0 CONFIGURE SUMMATION MODE

F12.0 CONFIGURE RATE DISPLAY

*** These prompts will only be displayed if you have the options installed.**

**** Factory settings.**

[F5.0 Printer?] ACCESS PRINTER PORT PARAMETERS. Press:

1 To enter into the setup of the printer port parameters
0 To skip the printer setup. The procedure will advance to step F6.0

[F5.1 Baud XXXX] OUTPUT BAUD RATE. Press:

1 To select the currently displayed baud rate.

0 The display will update to the next selectable baud rate. The selections are: 300, 1200, 2400, 4800, and 9600.

[F5.2 Chksum? X] CHECKSUM. Press:

1 To include a checksum character in the data transmission.

0 No checksum character is transmitted.

[F5.3 Min Inc XX] MINIMUM PRINT

This prompt is asking for the number of increments above zero the indication must be before a print command will be accepted.

Enter the two digits, then press the "ENTER" key to proceed.

[F5.4 Neg Pri? X] NEGATIVE WEIGHT PRINTING. Press:

1 To enable printing weight values which are under zero.

0 To disable output when the indication is under zero.

[F5.6 T/D Code X] TIME AND DATE FORMAT. Press:

1 To accept the currently displayed Time and Date format. Refer to the Time and Date Chart.

0 The display will update to the next selectable format. Refer to the Time and Date Chart.

DATE AND TIME CHART

Number	Format
0	MM/DD/YY HH:MM:SS
1	MM DD YY HH:MM:SS
2	DD.MM.YY HH:MM:SS
3	YY MM DD HH:MM:SS
4	MM DD YY HH:MM:PM

MM is the month (numerically)
DD is the day.
YY is the last 2 digits of the year.
HH:MM:SS is the hour, minutes and seconds.
PM can also be AM.

[F5.7 Demand? X] DEMAND MODE. Press:

1 To select the "on demand" data transmission mode.

0 To select the "continuous" data transmission mode.

NOTE: If the demand mode is selected the procedure will proceed to prompt F5.8, and prompts 5.9 and 5.10 will be skipped. If the continuous mode is selected the procedure will proceed to prompt F5.9 and prompt F5.8 will be skipped.

[F5.8 Conf Tickt?] CONFIGURE TICKET PRINT FORMAT

Refer to Section 6, Paragraph 6.5, for a detailed description of all printable weight and data fields.

Press:

1 To enter into the ticket format routine.

0 To skip over this routine. The procedure will advance to F6.0

[Clear Ticket?] CLEAR FORMAT BUFFER. Press:

1 To clear out the existing ticket format.

0 To leave the existing ticket format as is, and permit modifications.

[Field Number XX] TICKET FIELD NUMBER

This prompt is asking you to enter a field number. This number is an arbitrary reference number, from 1 to 30, assigned by the programmer for ease of future editing. If all ticket formatting is complete, press the "ENTER" key when the Field No.? prompt is being displayed. At this time, the procedure will skip to the "Trailing LF's" prompt.

[Delete Field?] DELETE FIELD NUMBER

This prompt is only displayed when a field number is entered which already exists. Press:

1 To delete this field number and its existing data.

0 To leave this field number as is, and allow for modifications to this existing data.

[Line Number XX] PRINTING A LINE NUMBER

Enter the line number (1-99) of the ticket on which you want the selected data printed.

[Column Number XX] STARTING COLUMN NUMBER

Enter the column number where you want the selected data to start printing.

[Data Code XX] DATA CODE SELECTION

This prompt is asking you to enter the data code assigned to the actual data you want printed. Refer to Section 6, Paragraph 6.5, for the complete list of possible data codes.

[Expand Print? X] EXPANDED PRINT. Press:

1 To have this data field printed in the expanded mode, if the printer is capable of doing so. An ASCII 'SO' character is added to the beginning of the data field transmission and an ASCII 'SI' to the end. At this time the display will return to the Field No.? prompt.

0 To have this data field printed in the normal printing mode for the printer used. At this time the display will return to the Field No.? prompt.

[Trailing LFS XX] PAPER FEEDING

This prompt is asking you to enter the number of line feed(s) (ASCII characters CR and LF) that the 8146 should send to the printer after all data printing is complete. This will cause the printer to advance the paper one line for each line feed character it receives. These line feeds are for the ticket only, not for reports.

[F5.9 Scale X] SELECT SCALE FOR OUTPUT. Press:

NOTE: This prompt will be asked only if the continuous mode was selected in F5.7.

1 To accept the currently displayed scale for output. Refer to the Output Selection Chart.

0 The display will update to the next scale selection. Refer to the Output Selection Chart.

[F5.9 Scale X] SELECT SCALE FOR OUTPUT. Press:

NOTE: This prompt will be asked only if the continuous mode was selected in F5.7.

1 To accept the currently displayed scale for output. Refer to the Output Selection Chart.

0 The display will update to the next scale selection. Refer to the Output Selection Chart.

Number	Scale to Output
0	Operator Selected Scale
1	Output Scale 1 Weight Data
2	Output Scale 2 Weight Data
3	Output Scale 3 Weight Data
4	Output Scale 4 Weight Data
5	Output Summed Weight Data
6	Output Rate Data

[F5.10 Upd Rate X] DATA OUTPUT UPDATE RATE

NOTE: This prompt will be asked only if the continuous mode was selected in F5.7. This prompt is asking you the number of data transmissions you want to occur every second. Enter the number 1 through 9 and press the "ENTER" key. A value of 5 is recommended as a starting value.

[F6.0 CONF EDIT ?] ACCESS EDIT SEQUENCE. Press:

1 To enter into the setup of the edit sequence.

0 To skip the edit sequence. The procedure will advance to step F7.0.

[F6.1 CN Reset? X] CN RESET. Press:

1 This will permit the operator to reset the CN back to a preset number.

0 This will not permit the operator to reset the CN.

[F6.2 CN Preset? X] CN PRESETTING. Press:

1 Any nine digits may be preset into consecutive numbering during operator editing.

0 The consecutive number may only be reset to 000000001 during operator setup. Presetting to a specific value is not possible.

[F7.0 CONF SETPT?] ACCESS SETPOINT PARAMETERS (Optional)

These setpoint parameters will only be displayed if the setpoint option is installed in your unit. Press:

1 To enter the setup of the setpoint parameters

0 To skip the setpoint setup. The procedure will advance to step F8.0.

[F7.1 Setpt Ena? X] SETPOINT ENABLE. Press:

1 To enable setpoint operation.

0 To disable the setpoint operation.

[F7.2 Baud XXXX] OUTPUT BAUD RATE. Press:

1 To select the baud rate displayed.

0 The display will update to the next selectable baud rate. The selections are: 300, 1200, 2400, 4800, and 9600. (9600 baud is required by the Automate 15.)

[F7.3 Data Bits X] NUMBER OF DATA BITS. Press:

1 To select the current choice.

0 To update to the next choice. Selections are 7 or 8 data bits. (8 data bits are required by the Automate 15.)

[F7.4 Parity XXXX] OUTPUT PARITY SELECT. Press:

1 To select the parity choice displayed.

0 The disparity will update to the next selectable choice. The selections are: ODD, EVEN, or NONE. (None is required by the Automate 15.)

[F7.5 Stop X] OUTPUT STOP BIT. Press:

1 To select the currently displayed number of stop bits.

0 The display will update to the next choice; the options are 1 or 2. ("1" is required by the Automate 15.)

[F7.6 SP Y SCL X] SETPOINT AND SCALE ASSIGNMENT

This prompt is asking you to assign the setpoints (12 max.) to a scale. The assigned setpoint will then respond to a change to that scale and will be unaffected by changes on the other scales.

When the prompt is displayed, enter the scale number (0-4) to which the displayed setpoint is to be assigned. If the information displayed is correct, press the "ENTER" key. Repeat this procedure until all setpoints are assigned.

NOTE: All setpoints MUST be assigned to a scale. Scale 0 is entered for any setpoint that is not used.

[F8.0 BAR CODE ?] ACCESS BAR CODE PARAMETERS (OPTIONAL)

This section will be displayed only if the bar code option is installed in your unit. For a detailed description of these parameters, refer to Section 6, Paragraph 6.8. Press:

1 To enter into the setup of the bar code parameters

0 To skip the bar code setup. The procedure will advance to step F9.0

[F8.1 Tare Inp? X] BAR CODE TARE INPUT. Press:

1 If tare information will be input from a bar code reader.

0 If no tare information is to be sent from a reader.

[F8.2 ID Input? X] BAR CODE ID INPUT. Press:

1 If ID data will be read by the bar code reader.

0 If no ID data is to be sent from a reader.

[F9.3 Single Ln X] SINGLE LINE INPUT. Press:

1 If the data being sent from the reader is in a single line. If selected, prompts F8.6 and F8.7 will be skipped

0 If the data from the reader is in multi-line format.

[F8.4 Tare Len X] TARE FIELD LENGTH

This prompt is asking the number of digits that will be received as the tare value. This may be from 1 to 6 digits. Enter the number and press the "ENTER" key.

NOTE: The decimal point (if used) is not counted as a digit.

[F8.5 ID Length X] ID FIELD LENGTH

This prompt is asking the number of characters that will be received as the ID field. This may be from 1 to 3 characters. Enter the number of characters and press the "ENTER" key.

[F8.6 Tare Id X] TARE FIELD IDENTIFIER

If step F8.3 is "0", this prompt will be skipped.

This prompt is asking what character is to be used as the tare underlying character. Enter the character and press the "ENTER" key. If a character displayed is correct, you need only to press the "ENTER" key.

[F8.7 ID Idtifr X] ID FIELD IDENTIFIER

If step F8.3 is "0", this prompt will be skipped.

This prompt is asking what character is to be used as the ID identifier. Enter the character and press the "ENTER" key. If the character displayed is correct, you need only to press the "ENTER" key.

[F8.8 XXXX] BAUD RATE Press:

1 To select the currently displayed baud rate.

0 The display will update to the next baud rate selection. The selections are: 300, 1200, 2400, 4800, and 9600.

NOTE: 4800 baud selection is not available on the 8860 Bar Code Printer.

[F8.9 Parity XXXX] PARITY SELECTION. Press:

1 To select the currently displayed parity type.

0 The display will update to the next selectable parity type. The selections are: ODD, EVEN, NONE.

[F8.10 Stop Bits X] STOP BIT SELECTION. Press:

1 To select the currently displayed number of stop bits.

0 To display the next selection. The valid selections are 1 or 2.

[F8.11 Ena Out?] SELECT BAR CODE PRINTER. Press:

1 To enable the bar code printer output

0 To disable the bar code printer output. If selected the procedure will advance to prompt F9.0

[F8.12 conf Out? X] CONFIGURE OUTPUT FORMAT

This prompt is asking if you want to enter into the bar code output formatting routine. Press:

1 To gain access into this routine.

0 To skip the formatting routine. The procedure will advance to step F9.0.

[Clr Fmt Buff?] CLEAR FORMAT BUFFER. Press:

1 To clear the existing output format stored in the buffer.

0 To leave the buffer contents as they are and make any modifications required.

[Line Number X] LABEL/TICKET LINE NUMBER

Enter the line number (1 through 6) of the ticket on which you want the selected data printed.

If the ticket formatting is complete, simply press the "ENTER" key to exit this section.

[Line Type? X] LINE PRINTING TYPE. Press:

0	**If no data is to be printed on this line.**
1 thru 5	**If the selected data is to be human readable. The 1 through 5 keys are used to select the printing font size. (1 = smallest font, 5 = largest font.)**
9	**If the selected data is to be printed in bar code format.**

[Field Number] FIELD NUMBER

This prompt is asking you to enter a field number. This number is an arbitrary reference number 1 through 5 assigned by the programmer for ease of future editing.

If a Line Type of 9 was selected in the previous prompt, no Field Number is required. Simply press the "ENTER" key and the procedure will return to the Line Number prompt.

[Data Code XX] DATA CODE SELECTION

This prompt is asking you to enter the data code assigned to the actual data you want printed. Refer to Section 6, Paragraph 6.5, for the list of possible data codes.

[F9.0 Conf Host ?] ACCESS HOST PARAMETERS (Optional)

This section will be displayed only if the Host Option is installed in your unit. Press:

1 To enter into the setup of the host port parameters

0 To skip the setup of the host port parameters. The procedure will advance to step F10.0.

[F9.1 Host Ena? X] HOST PORT ENABLE. Press:

1 To enable the host port operation.

0 To disable the host port operation.

[F9.2 Baud XXXX] BAUD RATE SELECTION. Press:

1 To select the currently displayed baud rate.

0 The display will update to the next selectable baud rate. The selections are: 300, 1200, 2400, 4800, and 9600.

[F9.3 Data Bits X] NUMBER OF DATA BITS. Press:

1 To select the currently displayed number of data bits.

0 The display will update to the next selectable number of data bits. The selections are: 7 or 8 bits.

[F9.4 Parity XXXX] PARITY SELECTION. Press:

1 To select the currently displayed parity type.

0 The display will update to the next selectable parity type. The selections are: ODD, EVEN, NONE.

[F9.5 Stop Bits X] STOP BIT SELECTION. Press:

1 To select the currently displayed number of stop bits.

0 To display the next selection. The valid selections are 1 or 2.

[F9.6 Chksum? X] CHECKSUM. Press:

1 If a checksum character is to be included in the transmitted and received data.

0 If the checksum character is not used.

[f10.0 conf Mem?] CONFIGURE MEMORY AND ACCUMULATION OPERATION. Press:

1 To enter into the configuration of the memory and accumulation functions.

0 To skip this configuration. The procedure will advance to step F11.0

[F10.1 Stor Wgh X] STORED WEIGH OPERATION. Press:

1 To permit the operator to use the tare storage registers for storage of either a tare or gross weight value.

0 To permit the operator to use tare storage registers for storage of a tare weight value only.

[F10.2 Kbd Gros X] KEYBOARD GROSS WEIGHT ENTRY. Press:

1 To permit the operator to enter a weight value larger than the weight value on the display.

0 To prevent a weight entry larger than the weight value on the display.

[F10.3 Tr St En] TARE WEIGHT MODIFICATION. Press:

1 To permit the operator to modify a stored tare weight value and then save this new value for future use.

0 To permit the operator to modify a stored tare weight value, but not safe this new value in the tare register.

[F10.4 Mem Mode X] SELECT MEMORY AND ACCUMULATION MODE

Enter the desired option from the following chart.

Number	Mode
1	Running Balance
2	Bi-Directional Accumulation
3	Total Accumulation

[F10.5 CW Dec Pt X] CONVERTED WEIGHT DECIMAL POINT LOCATION

This prompt is asking for the decimal point location for all converted weight values. Possible selections are: 0, 1, 2.

Example: If a decimal point location of "1" is entered, all converted weight values will be rounded off to one digit to the right of the decimal point.

[F11.0 Conf Sum ?] CONFIGURE SUMMATION MODE? Press:

1 To configure the summation mode.

0 To skip this configuration. The procedure will advance to F12.0.

[F11.1 Ena sum X] ENABLE SUMMATION? Press:

1 To enter the summation mode.

0 To exit the summation mode setup. The procedure will advance to F12.0.

[F11.2 Sum Only X] SUM ONLY MODE? Press:

1 To cause the unit to operate in the Sum Only Mode.

0 To cause the unit to operate in the Select and Sum Mode.

NOTE: If "0" was selected, the procedure will advance to Step F11.4.

[Sum Scales? XXXX] SCALES TO BE SUMMED

This prompt is asking you to enter the scales that are to be summed. Enter the scale number for all scales to be summed and press the "ENTER" key.

[F11.3 Add Tr ?] ACCUMULATE TARE. Press:

1 To permit multiple tare entries to be made.

0 To permit only one tare entry to be made.

[F11.4 Units lb] POWER UP MODE FOR SUM ONLY. Press:

1 To select the currently displayed unit.

0 To display the next selection. The valid selections are lb or kg.

[F11.5 lb/kg SW X] lb/kg SWITCHING IN SUMMATION

This prompt is asking if you want to permit lb/kg switching while in the sum mode. Press:

1 To enable lb/kg switching in sum.

0 To disable lb/kg switching in sum.

[F12.0 Conf Rate?] CONFIGURE RATE DISPLAY. Press:

1 To configure the rate display value.

0 To skip this configuration. The procedure will advance to the PRINT SETUP prompt.

[F12.1 Rate Ena X] ENABLE RATE DISPLAY. Press:

1 To enter the rate display setup

0 To exit this routine. The procedure will advance the PRINT SETUP prompt.

[F12.2 Rate Sci X] RATE SCALE

This prompt is asking you which scale is to be configured. Enter the scale number of the scale to be configured and press the "ENTER" key.

[F12.3 CF XXXXXXX] CONVERSION FACTOR

At this time enter the multiplier that is to be used to calculate the Rate Value. Press the "ENTER" key to accept the data.

[Print Setup ?] PRINT SETUP PARAMETERS

This is the last prompt displayed before exiting the setup procedure. Press:

1 All of the programmed data will be output to the printer port. At the end of this printout the unit will return to the normal operational mode. Printers not using handshaking may require a slow baud rate to receive all data correctly. (Baud rate F5.1)

0 The setup data will not be printed and the unit will return to the normal operating mode.

At this time the data display will inform you that the Setup Lockout Switch(es) are in the ON position. These switch(es) must be set to the OFF position before you can exit the setup procedure.

After turning the switch(es) OFF, press the "ENTER" key to return the unit to its operating mode.

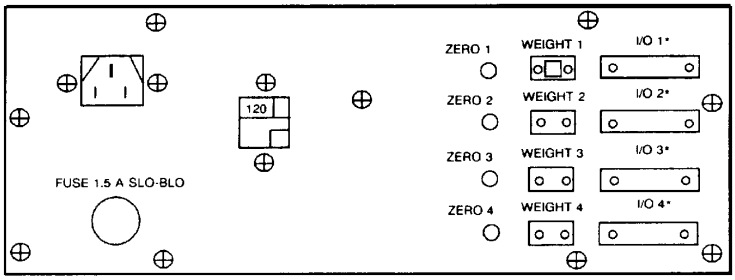
6.0 INPUT/OUTPUT DESCRIPTIONS

6.1 I/O CONNECTIONS

6.1.1 Enclosures

Each of the two enclosure types (desk and wall) have different input and output connector locations. The following diagrams show the location of these connectors.

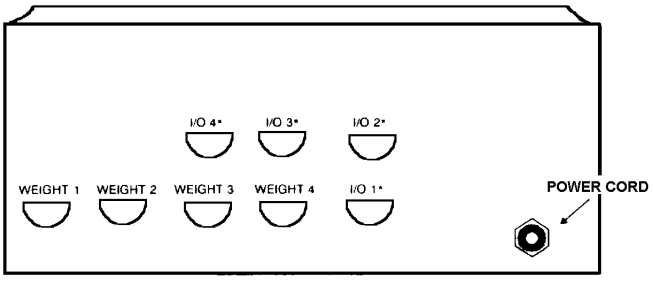
DESK ENCLOSURE (REAR VIEW)



NOTE(S): **For 220/240 VAC Operation fuse Will be .75 Amp Slo-Blo**

*** I/O #1 - Printer Output**
I/O #2 - Bar Code Serial I/O
I/O #3 - Host Serial I/O
I/O #4 - Setpoint Serial I/O

WALL ENCLOSURE (BOTTOM VIEW)

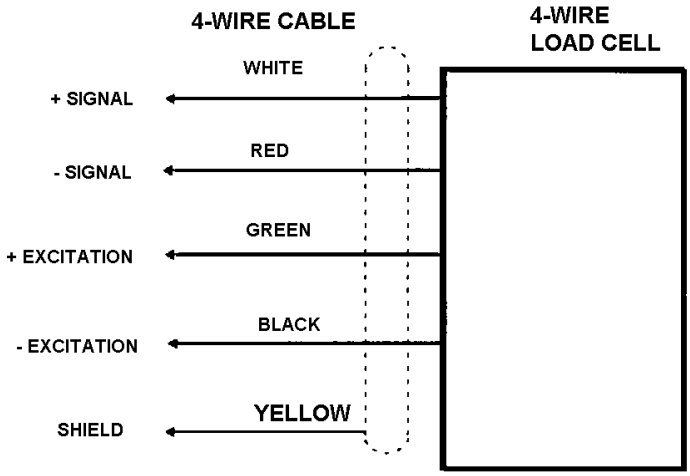


*** I/O #1 - Printer Output**
I/O #2 - Bar Code Serial I/O
I/O #3 - Host Serial I/O
I/O #4 - Setpoint Serial I/O

6.1.2 Load Cell Connections

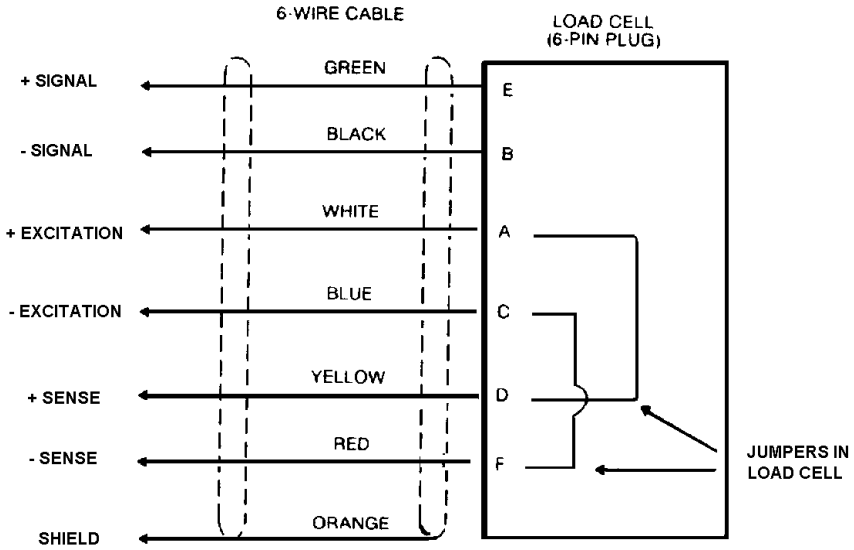
6.1.2.1 When using a Model 951 load cell in tension, reverse the signal wires. That is, the (+) signal will be red, and the (-) signal will be white.

STANDARD LOAD CELL CONNECTOR FOR FOUR-WIRE LOAD CELL(S)



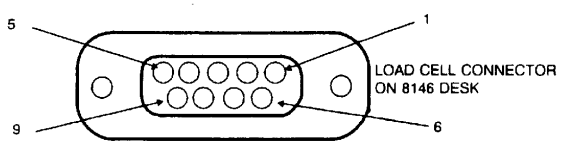
NOTE: When connecting a 4-wire load cell to the 8146, always jumper + excitation to + sense and - excitation to - sense at the junction closest to the load cell.

STANDARD LOAD CELL CONNECTOR FOR SIX-WIRE LOAD CELL(S)



6.1.3 8146 Connections (Analog)

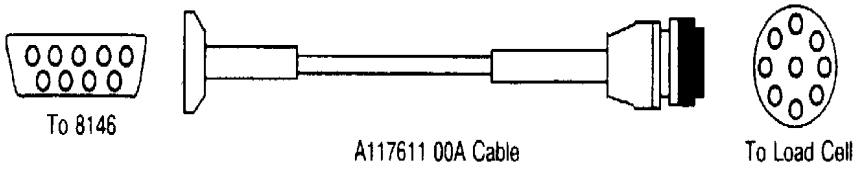
6.1.3.1 Desk Pin Configuration



Pin	Description
1	+ Excitation
2	+ Sense
3	Shield
4	- Sense
5	- Excitation
7	+Signal
8	- Signal

6.1.3.2 Adapter Cable (Part Number A117611 00A)

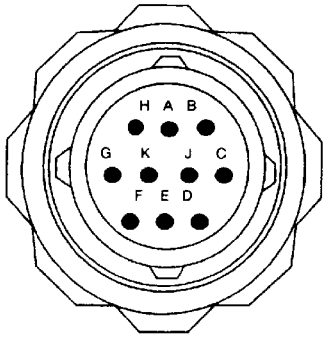
In order to connect the older 7-pin type load cell connector to the 8146 desk mount unit, an adapter cable will be required. If the load cell cable is 20 gauge or smaller, the 7-pin connector may be removed and the load cell cable soldered directly to a 9-pin mating connector using the pin configuration for the 8146 described previously.. The mating connector is listed at the back of this technical manual.



Pin	Description	Pin
1	+ Excitation	C
2	+ Sense	E
3	Shield	G
4	- Sense	F
5	- Excitation	D
7	+Signal	A
8	- Signal	B

6.1.3.3 Wall Mount Pin Configuration:

In order to connect the older 7-pin type load cell connector to the 8146 wall units, an adapter cable will be required.



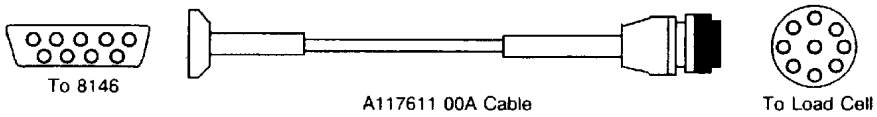
LOAD CELL CONNECTOR
ON 8146 WALL

LOAD CELL CONNECTOR ON 8146 WALL

Pin	Description
A	+Signal
B	- Signal
C	+Excitation
D	- Excitation
E	+Sense
F	- Sense
G	Shield

6.1.3.4 Adapter Cable (Part Number 124130 00A):

In order to connect the older 7-pin type load cell connector to the 8146 wall units, an adapter cable will be required.

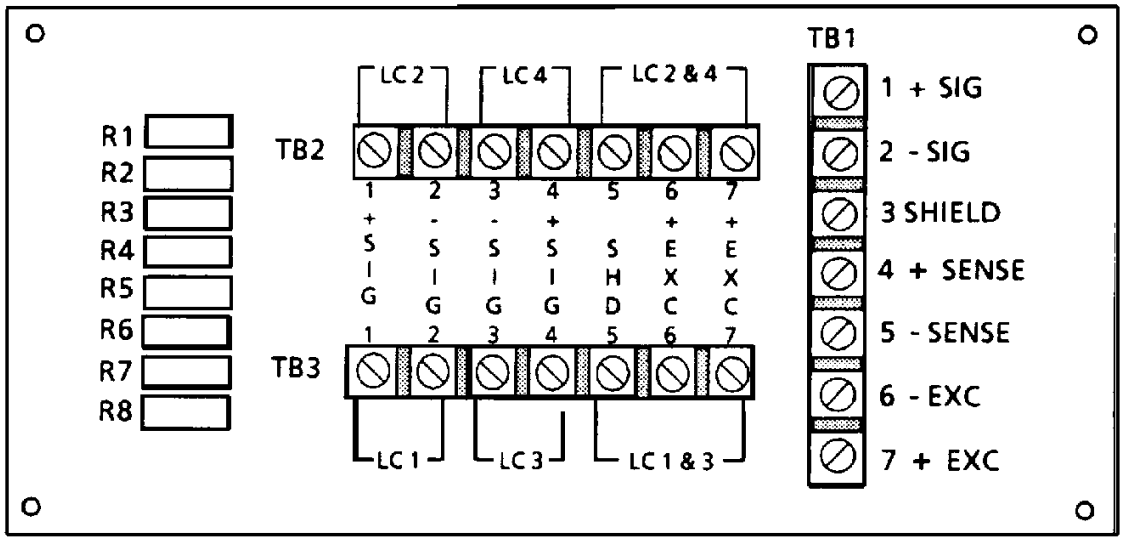


Pin	Description	Pin
A	+Signal	A
B	- Signal	B
C	+Excitation	C
D	- Excitation	D
E	+Sense	E
F	- Sense	F
G	Shield	G

6.1.4 Junction Box Connections (Analog)

6.1.4.1 Low Profile Style:

Terminal strip TB1 is the output terminal strip to the 8146 digital indicator. It should be wired as shown below.



TERMINAL STRIP TB1

Terminal strips TB2 and TB3 are the connections for the load cells. Wire the load cells as described below. See Part 2 of this section for load cell color code.

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

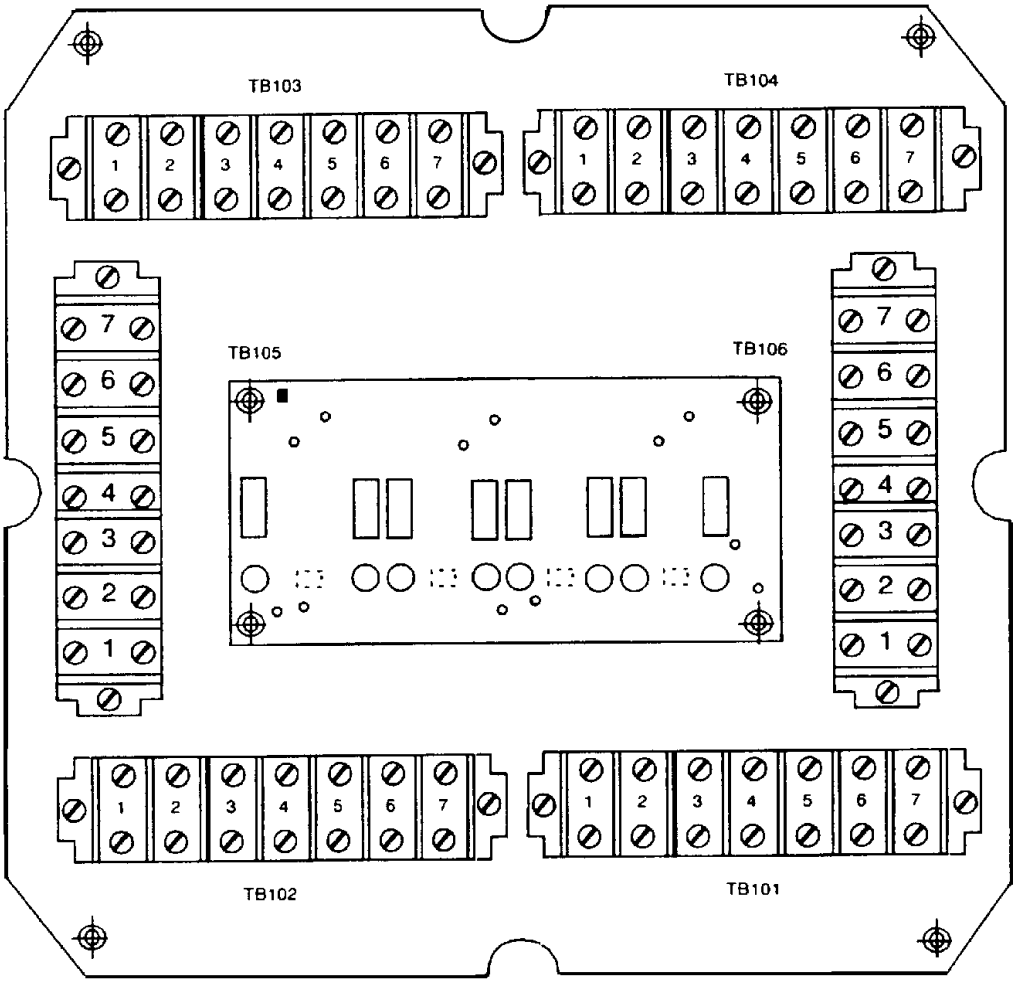
Pin	Description	Pin
1	- Signal L/C 2	- Signal L/C 2
2	+Signal L/C 2	+Signal L/C 2
3	- Signal L/C 2	- Signal L/C 2
4	+Signal L/C 2	+Signal L/C 2
5*	Shields	Shields
6**	+ Excitation L/C 2 & 4	+ Excitation L/C 1 & 3
7**	- Excitation L/C 2 & 4	- Excitation L/C 1 & 3

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

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

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

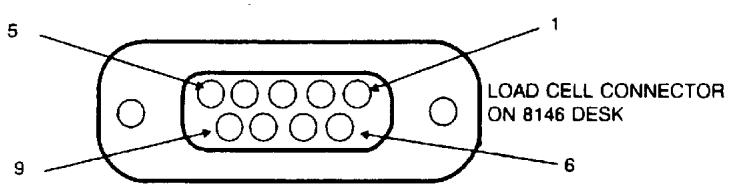
6.1.4.2 Vehicle Style



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.

6.1.5 8146 Connections DigiTOL ® J-Box and Bench Portable

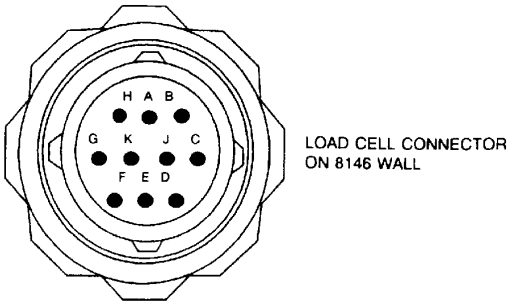
6.1.5.1 Desk Pin Configuration



LOAD CELL CONNECTOR ON 8146 DESK

Pin	Description
1	RxD (A)
2	NC
3	NC
4	RxD (B)
5	+ 20 V
6	T x D (B)
7	GND
8	TxD (A)
9	NC

6.1.5.2 Wall Mount Pin Configuration

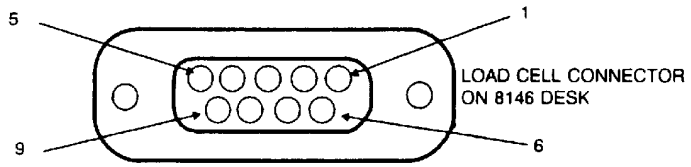


LOAD CELL CONNECTOR ON 8146 WALL

Pin	Description
A	RxD (A)
B	NC
C	NC
D	RxD (B)
E	+ 20 V
F	T x D (B)
G	GND
H	TxD (A)
J	NC

6.1.6 8146 Connections DigiTOL ® Power Cell

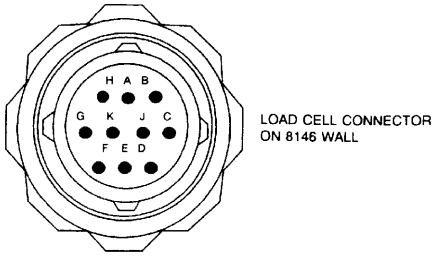
6.1.6.1 Desk Pin Configuration



LOAD CELL CONNECTOR ON 8146 DESK

Pin	Description
1	COM (A)
2	GND
3	KEY
4	COM (B)
5	+24 V
6	NC
7	NC
8	NC
9	NC

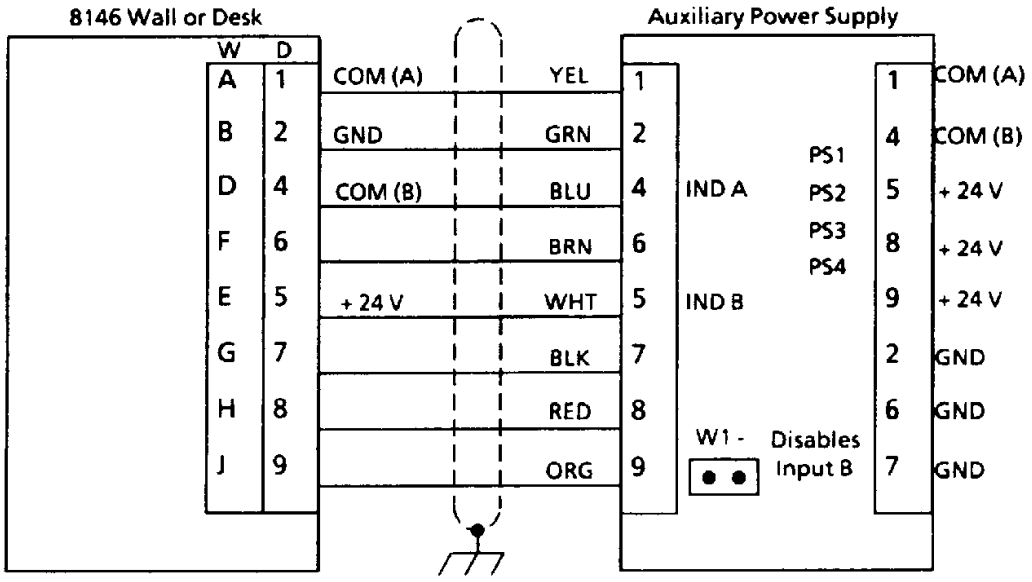
6.1.6.2 Wall Mount Pin Configuration



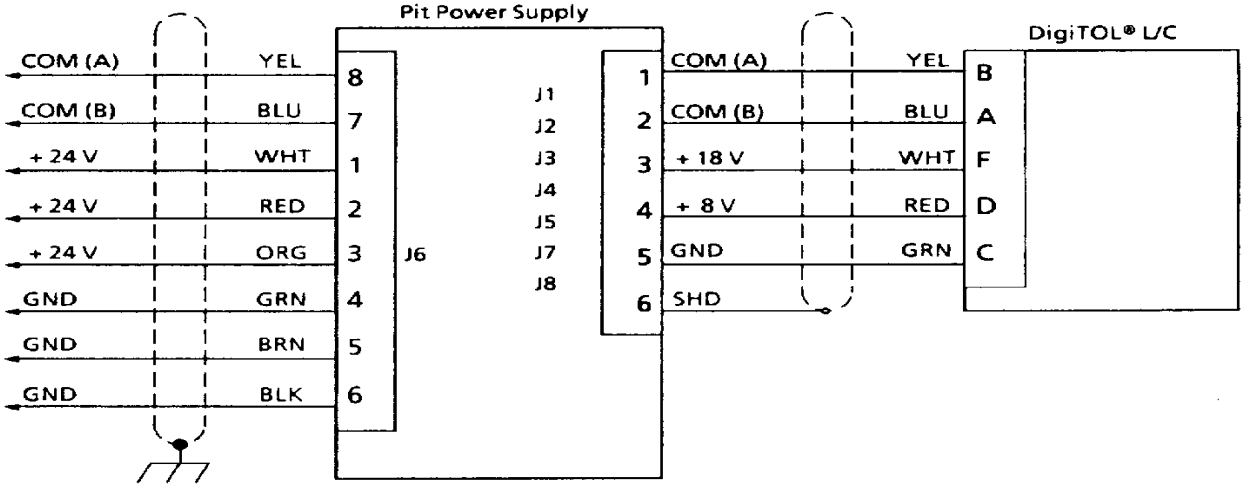
LOAD CELL CONNECTOR ON 8146 WALL

Pin	Description
A	COM (A)
B	GND
C	NC
D	COM (B)
E	+ 24V
F	NC
G	NC
H	NC
J	NC

6.1.7 DigiTOL ® Power Cell Auxiliary Power Supply Wiring

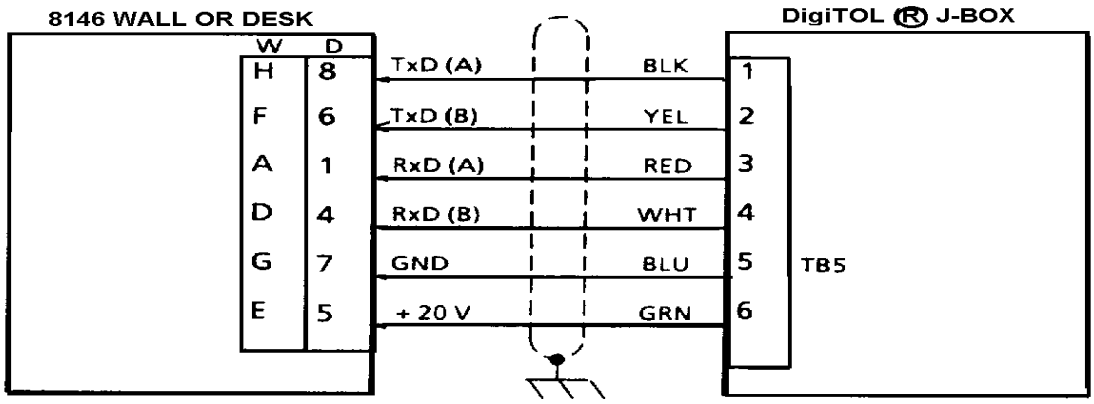


6.1.8 DigiTOL ® Power Cell Pit Power Supply Wiring

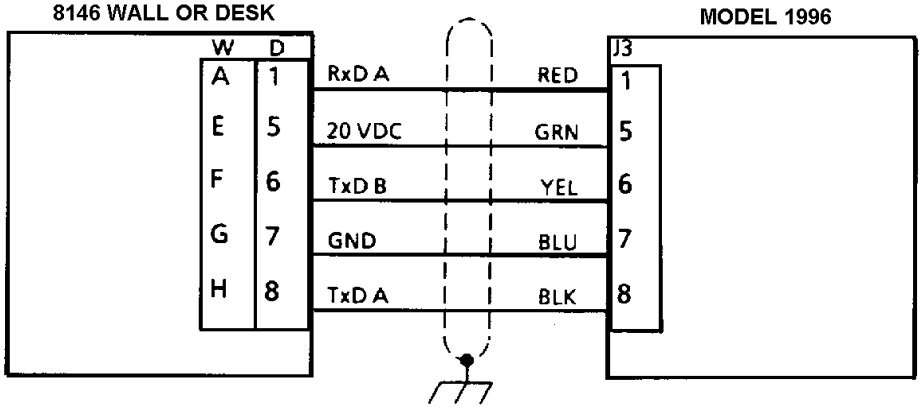


NOTE: Auxiliary power supply jumper "W1" must be IN when indicator B input is not being used.

6.1.9 DigiTOL ® J-Box Wiring



6.1.10 Single DigiTOL ® Load Cell Wiring (Bench, Portable)



! CAUTION

The WHITE WIRE IN THE LOAD CELL CABLE MUST NOT BE CONNECTED TO THE 8146 WHEN USED WITH ANY STANDARD BENCH AND PORTABLE SCALE BASES, MODELS 1996, 1997, 2096, 2097, 2196, OR 2197. ***DAMAGE TO THE LOAD CELL IN THESE BASES MAY RESULT IF THIS WHITE WIRE IS CONNECTED TO THE 8146.*** **FOLD BACK AND TAPE THIS WIRE TO PREVENT SHORTING.**

6.2 PRINTER OUTPUT DESCRIPTION - I/O #1

6.2.1 Channel Characteristics

6.2.1.1 Physical Characteristics:

The printer port supports XON - XOFF protocol on the receive line in 20mA, RS232, or RS422 modes. The RS232-C interface supports a CTS input and a DTR output (always ON). See Section 4.4.1 for Jumper W3 to make CTS active.

6.2.1.2 Data Characteristics:

Each character is ASCII codes (hex) and is 11 bits in length. The character bit frame consists of 1 start bit 7 data bits, 1 even parity bit and 2 stop bits. This character frame is fixed and cannot be changed.

Transmission baud rates (under program control) are selectable for either 300, 1200, 2400, 4800 or 9600.

Data transmissions may operate in either the demand mode, where the unit requires a print command to initiate a single transmission, or in the continuous mode, where a data transmission occurs at a program selected output rate.

A checksum character is selectable (during setup) for output in the transmission. If checksum is selected an STX character, including the STX and CR characters. Bit 8 of this character is parity.

Signal Name	8146 Desk	8146 Wall	8855 J1	8806 J7	8840/8842/ 8843 J1	MP750 J3
Chassis Ground	1	A				
TxD (RS232-C)	2	B			3	
RxD (RS232-C)	3	C			2	
RTS (RS232-C)	4*	D*				
CTS (RS232-C)	5	E				
DSR (RS232-C)	6	F				
Logic Ground	7	G			7	
20mA Receive + (aux)	8	H		11		
20mA Transmit -	9	J	3	16		25
20mA Receive - (aux)	10	K		22		
Not used	11	L				
RS422 (B) ** (RCV)	12	M				
RS422 (A) ** (RCV)	13	N				
20mA Transmit +	14*	P*				
20mA Supply (+ 12 VDC)	15	R				
20mA Receive +	16	S				
20mA Supply (-12 VDC)	17	T				
20mA Receive -	18	U				
Receive Ground	19	V				
DTR (RS232-C)	20	W				
Not Used	21	X				
Transmit Ground	22	Y	22	18		11
Logic Ground	23	Z				
RS422 (B) *** (XMIT)	24	a				
RS422 (A) *** (XMIT)	25	b				
Not Used						
Jumper shown in printer end of interconnecting cable.				12 23		3 20

Figure 6.1 I/O Pin Description I/O #1 (Printer)

***** **Jumper is in 8146 end of interconnecting cable.**

****** **Requires special configuration of the Dual Channel Converter PCB. (W1 jumpered 1 to 2)**

******* **Requires special configuration of the Dual Channel Converter PCB. (W2 and W6 Out)**

NOTE: I/O will NOT support the 8860 Printer. The 8860 requires the barcode option to be installed. 0917-0128 (Desk) or 0917-0129 (Wall) Serial I/O K.O.P.

6.3 DEMAND MODE OUTPUT

This output is used to transmit the operator defined data fields, in the format programmed, one time for each print command received. Refer to Paragraph 6.5 of this section for a detailed description of the user defined format.

6.3.1 Note(s) Of Interest

- **Depression of the print key or a remote print command (from Host Port) causes data from the scale that is currently selected to be transmitted one time.**

- **Scales programmed for lb/kg switching will apply leading zero suppression up to 1 digit to the left of the decimal point. If no decimal point is programmed, it will be assumed to be in the far right position of the weight value. When switched to the lb mode, the symbol "lb" will be printed after the weight value and the decimal point will be printed as ".". When switched to the kg mode, the symbol "kg" will be printed after the weight value and the decimal point will be printed as a comma.**

- **Scales programmed as metric only will not apply leading zero suppression and the symbol "kg" will be printed after the weight value. The decimal point will be printed as a comma. When a tare value is entered, the letter "h" will be printed after the "TR" symbol and the letter "c" will be printed after the "NET" symbol to indicate the hand entered tare value.**

- **The start of text character (STX) is only included in the transmission if checksum is enabled.**

6.4 CONTINUOUS MODE OUTPUT

The output format is designed to transmit all 17 characters (18 checksum is selected) at a program selected output rate.

The format consists of three status bytes, the gross or net weight value and the tare weight value (if a tare has been taken), along with the STX and CR characters. The three status bytes are used to transmit certain setup and operating parameters of the indicator. (Refer to Paragraph 6.4.1 of this section for a more detailed description).

The transmitted weight value may be, depending upon the program selection, either a specific single scale programmed to always be transmitted or the currently selected scale, etc. See printer setup parameter F5.9 for available selections.

6.4.1 Output Format

The following list shows the 18 possible characters in the order in which they are transmitted.

Character Number	Character Description
1	STX (Start of Text)
2	Status Byte A
3	Status Byte B
4	Status Byte C
5	Weight (MSD)*
6	Weight
7	Weight
8	Weight
9	Weight
10	Weight (LSD)
11	Tare Weight (MSD)*
12	Tare Weight
13	Tare Weight
14	Tare Weight
15	Tare Weight
16	Tare Weight (LSD)
17	CR (Carriage Return)
18	Checksum (optional)

*** Non-significant leading weight and tare digits will be transmitted as spaces (20 hex).**

Status Byte A

Bit2 1 0	Decimal Point Location
0 0 0	XXXX00
0 0 1	XXXXX0
0 1 0	XXXXXX
0 1 1	XXXXX.X
1 0 0	XXXX.XX
1 0 1	XXX.XXX
1 1 0	XX.XXXX
1 1 1	X.XXXXX

Bit4 3	Increment Size
0 1	X1
1 0	X2
1 1	X5

BIT 5 Always = 1
BIT 6 Always = 0
BIT 7 Even Parity Bit

Status Byte B

BIT 0	**Gross/Net - Net = 1**
BIT 1	**Negative Sign - Minus = 1**
BIT 2	**Overcapacity - Overcapacity = 1**
BIT 3	**Motion - In Motion = 1**
BIT 4	**lb/kg Mode - kg = 1**
BIT 5	**Always = 1**
BIT 6	**Power Up Flag - In Power Up = 1**
BIT 7	**Even Parity Bit**

Status Byte C

BIT 0	**Always = 0**
BIT 1	**Always = 0**
BIT 2	**Always = 0**
BIT 3	**Print Mode - Print = 1**
BIT 4	**Expand X10 - Expanded = 1**
BIT 5	**Always = 1**
BIT 6	**Keyboard Tare in kg - Tare = 1**
BIT 7	**Even Parity Bit**

6.5 USER DEFINED PRINT FORMAT

The user defined ticket format is designed to permit the user the option of selecting the data field and the location on the ticket at which he wants this field printed.

There are two types of data fields available for selection: (1) Constants - which are predefined text strings, and (2) Variables - which are data fields controlled or changed by the 8146 operation (such as weight values, time, date, consecutive number, selected scale, etc.).

Each of the available constants and variables are assigned a data code. (Refer to the following chart.) These codes are entered during the ticket configuration routine in the setup procedure. The same codes are used for both ticket and Bar Code printer output.

When a print command is received, the printout routine searches for all data fields programmed for printing on the first line. After finding all programmed fields, the data is then sent to the printer along with the necessary control characters for expanded printing, if selected. This procedure is then repeated for all programmed lines. After all lines are printed, the 8146 will then transmit the programmed number of line feed characters, causing the printer to advance the ticket one line for each line feed character is receives.

Data Code Numbers	Description	Data Field Type	Field Length in Characters
1	One Null Character	Constant	1
2	lb	Constant	2
3	kg	Constant	2
4	t	Constant	1
5	g	Constant	1
6	oz	Constant	2
7	Time	Constant	4
8	Date	Constant	4
9	Gross	Constant	5
10	Tare	Constant	4
11	Net	Constant	3
12	Weight	Constant	6
13	Scale	Constant	5
14	Conv. Factor	Constant	12
15	Conv. Weight	Constant	12
16	Commodity	Constant	9
17	ID	Constant	2
18	CN	Constant	2
19	$	Constant	1
20	Reserved for Future Use		
21	Description Line 1	Variable	16
22	Description Line 2	Variable	16
23	Description Line 3	Variable	16
24	Selected Scale Mode (lb/kg)	Variable	2
25	Gross Wt. Value in Selected Mode	Variable	8
26	Gross Wt. Value in lb Mode	Variable	8
27	Gross Wt. Value in kg Mode	Variable	8
28	Tare Wt. Value in Selected Mode	Variable	8
29	Net Wt. Value in lb Mode	Variable	8
30	Net Wt. Value in kg Mode	Variable	8
31	Net Wt Value lin Selected Mode	Variable	8
32	Net Wt. Value in lb Mode	Variable	8
33	Net Wt Value in kg Mode	Variable	8
34	Selected Scale Number	Variable	1
35	Time	Variable	8
36	Date	Variable	8
37	Consecutive Number	Variable	9
38	Commodity or tare ID	Variable	3
39	Commodity Name	Variable	16
40	Conversion Factor	Variable	8
41	Conversion Factor Name	Variable	3
42	Converted Weight Value	Variable	8
43	Tare Weight Type	Variable	1
44	Net Weight Type	Variable	1
45	Basic ID	Variable	16
46	Sum Component a.	Variable	8
47	Sum Component b.	Variable	8
48	Sum Component c.	Variable	8
49	Sum Component d.	Variable	8

Figure 6.2 Data Code Chart

NOTES: **Sum components correspond to the individual summed scale values. These components are operator assigned in the sum mode and may not relate to the scales in a one to one manner.**

Sum components are not printed in the "Sum Only" mode. Sum components are printed in the units that the scale was calibrated in and is not lb/kg switchable.

6.6 REPORT OUTPUT FORMAT

The format of the report transmission is dependent upon the mode of operation that was selected in the setup procedure for the commodity accumulation. The following shows the three possible formats, and are listed by commodity accumulation modes. Use of this format requires an 80 column printer set for 11" paper and printing 6 lines per inch.

Mode 1 - Running Balance

Description Line 1 **Date: XXXXXX**
Description Line 2 **Time: XXXXXX**
Description Line 3

ID	Description	IN	OUT	Subtotal	Total
XXX	XXXXXXXXXXXX	XXXXXXX	XXXXXX	XXXXXXXX	XXXXXXXX
XXX	XXXXXXXXXXXX	XXXXXXX	XXXXXX	XXXXXXXX	XXXXXXXX

Mode 2 - Bi-directional Accumulation

Description Line 1 **Date: XXXXXX**
Description Line 2 **Time: XXXXXX**
Description Line 3

ID	Description	IN Subtotal	IN Total	Out Subtotal	Out Total
XXX	XXXXXXXXXXXX	XXXXXXX	XXXXXX	XXXXXXXX	XXXXXXXX
XXX	XXXXXXXXXXXX	XXXXXXX	XXXXXX	XXXXXXXX	XXXXXXXX

Mode 3 - Total Accumulation

Description Line 1 **Date: XXXXXX**
Description Line 2 **Time: XXXXXX**
Description Line 3

ID	Description	Subtotal	Total
XXX	XXXXXXXXXXXX	XXXXXXX	XXXXXXXX
XXX	XXXXXXXXXXXX	XXXXXXX	XXXXXXXX

6.7 HOST COMMUNICATION INTERFACE DESCRIPTION - I/O #3 (OPTIONAL)

6.7.1 Channel Characteristics

6.7.1.1 Physical Characteristics:

The host interface input/output serial port is designed to support RS232-C (with handshaking) and 20 milliamp current loop types.

6.7.1.2 Characteristics:

Each character is ASCII coded (hex) and is a 9 to 11 bits in length [dependent on parity and stop bit(s) selections]. The character bit frame consists of: 1 start bit, 7 or 8 data bits, 1 or 2 stop bit(s). The parity bit may be programmed as one of the following: (1) Even parity, (2) Odd parity, or (3) No parity bit.

Transmission baud rates are selectable for either 300, 1200, 2400, 4800 or 9600 baud.

A checksum character is selectable (during programming) for output as the last character in the data packet. Checksum is defined as the 2's complement of the sum of bits 0 through 7 of all characters preceding the checksum character, including the STX and CR characters. Bit 8 of this character is parity.

Signal Name	8146 Desk	8146 Wall
Chassis Ground	1	A
TxD (RS232-C)	2	B
RxD (RS232-C)	3	C
RTS (RS232-C)	4	D
CTS (RS232-C) (See Note)	5	E
DSR (RS232-C0	6	F
Logic Ground	7	G
20mA Receive + (aux)	8	H
20mA Transmit -	9	J
20mA Receive - (aux)	10	K
Not Used	11	L
Not Used	12	M
Not Used	13	N
20mA Transmit +	14	P
20mA Supply (+12 VDC)	15	R
20mA Receive +	16	S
20mA Supply (-12 VDC)	17	T
20mA Receive -	18	U
Receive Ground	19	V
DTR (RS232-C)	20	W
20mA Supply - (aux)	21	X
Logic Ground	22	Y
Not Used	23	Z
Not Used	24	a
Not Used	25	b
Not Used		c

Figure 6.3 I/O Pin Descriptions I/O #3 (Host)

NOTE: When not using hardware handshaking, you must install a jumper wire between Pins 5 and 20 of this connector.

6.7.2 Operation Description

The 8146 responds as a polled device (slave) to the host (master) device. Under no circumstances will the 8146 transmit data without a request from the host to do so. Each scale is assigned a unique single digit address number. This number corresponds to the scale's display number and is used to designate one scale from the others in the 8146. The address numbers for the 8146 are 1 through 4, with "0" reserved for non-scale specific functions transmitted by the host.

There are two types of transmitted data packets which may occur between the host and the indicator:

(1) DOWNLOAD. In this type of transmission the host sends a data packet to the indicator with the direction byte of "D" (44H). The indicator will then act on the received data as determined by the function code. The host does not expect a response from the indicator.

(2) UPLOAD. In this type of transmission the host sends a data packet to the indicator with the direction byte of "U" (55H). The indicator will then act on the received data packet as determined by the function code and transmit the requested data to the host.

Each transmission is complete, there is no additional ACK/NAK scheme required. The indicator performs no data checking on the data received (except for checksum validation if selected.) It is the responsibility of the host to ensure that the data is correct. If data checking is required, the host must request back the data which was just downloaded to the indicator.

NOTE: The 8146 host communications interface incorporates a message timer that will timeout if the message terminator (<CR>) is not received within 200 ms after receiving the message start character (<STX>). The message will be ignored on a timeout error.

6.7.3 Data Packet Format

All transmission sent by the host must be in the following format. (All transmission sset by the 8146 will be in this same format.)

<STX> <ADD> <DIR> <FTC> [...data..] <CR> <CKSUM>

Where:

<STX>	**=**	**ASCII Start of Text Character, 1 byte, (2H)**
<ADD>	**=**	**Device address number, 1 byte**
<DIR>	**=**	**Direction of data: "D" = download, (44H) "U" = upload, 1 byte, (55H)**
<FTC>	**=**	**Function Code, Refer to Function Code Chart for listing, 1 byte**
[data]	**=**	**Optional data field, variable length**
<CR>	**=**	**ASCII Carriage Return character, 1 byte, (0DH)**
<CKSUM>	**=**	**Optional Checksum Character, 1 byte**

The function code included in the transmitted data packet determines what action the indicator will take. The various function codes are listed in the following chart. Included in this chart are the directions which each function may take. After determining which function you want, refer to the Function Code Description section for a more detailed description of that function.

EXAMPLE: To request the displayed weight data from scale #1 the following string (checksum disabled) would be sent):

<STX> 1UB <CR> or in hexadecimal
02H, 31H, 55H, 42H, 0DH

The 8146 will respond with:

<STX> 1 UB <SP> 00849 <CR> or in hexadecimal
02H, 31H, 55H, 42H, 20H, 30H, 30H, 38H, 34H, 39H, 0DH

Displayed weight shows [0084.9]

6.7.4 Function Code Descriptions

Certain functions are described in the following pages to help explain how they operate. Unless noted in the description of a particular function code, it may be assumed that either leading spaces or zeros may be used to fill the required character length for that function code data field.

FUNCTION CODE REFERENCE CHART

Function Code	Direction	Description
A-41H	Up	All Functions
B-42H	Up	Displayed Weight (6 bytes)
C-43H	Up	Gross Weight (6 bytes)
D-44H	Up or Down	Tare Weight (6 bytes)
E-45H	Up	Net Weight (6 bytes)
F-46H	Up or Down	Time/Date (16 bytes)
G-47H	Up or Down	Next Consecutive Number (9 bytes)
H-48H	Down	Clear Last Printed Data
I-49H	Up	Status Bytes A/B/C/D/E/F
J-4AH	Up	Setup Bytes A/B/C/D/E/F/G/H/I/J/K/L
K-4BH	Down	Control Byte A (1 byte)
L-4CH	Up or Down	Setpoint 1 Thru 12 (7 bytes)
P-50H	Up or Down	ID Number (3 bytes)
Q-51H	Up	Last Printed Data

NOTE: Function codes are expressed as the hexadecimal representation of the equivalent ASCII character. For example, function code 41H (Hex) would be represented as the ASCII character upper case "A". Refer to section 8.3 for the ASCII code chart. See example under function code 43H.

6.7.4.1 Code 41H (All Functions):

This is used to request all information contained in all function codes at one time. The response from the 8146 will contain this data in the order listed below:

Function 42H, 43H, 44H, 45H, 49H, 4AH, 46H, 47H, 50H, 51H, 4CH

6.7.4.2 Code 42H (Displayed Weight):

This is an upload function only, permitting the host to request the displayed weight from the indicator. Upon receiving this function code, the indicator will respond by sending a complete data packet to the host. This packet will have the displayed weight installed in the data field. No decimal point is included. It is the responsibility of the host to install the decimal point, if needed, into this value.

6.7.4.3 Code 43H (Gross Weight):

This is an upload function only, permitting the host to request the gross weight from the indicator. Upon receiving this function code, the indicator will respond by sending a complete data packet to the host. This packet will have the gross weight installed in the data field. No decimal point is included. It is the responsibility of the host to install the decimal point, if needed, into this value.

EXAMPLE: To request the gross weight data to be sent for scale nmber 1, the following string (checksum disabled) would be sent.

<STX> 1UC <CR>

or in Hexadecimal:
02H, 31H, 55H, 43H, 0DH

6.7.4.4 Code 44H (Tare Weight)

This function can be used in both the upload and download transmission. Its function is to permit the host to request the current tare value or to send a tare value to the indicator. The tare value, sent by the host, must be 6 bytes in length. Leading zeros (30H) must be used to fulfill this 6 byte requirement if the actual tare value is less than 6 digits. The indicator does not send or expect to receive a decimal point in the tare value. In the upload operation it is the responsibility of the host to install the decimal point, if needed, into this value. In the download operation, the decimal point location, if used, is assumed by the setup of the indicator. This function will operate within the indicator's operational parameters selected during setup (i.e., tare interlock, autoclear).

6.7.4.5 Code 45H (Net Weight):

This is an upload function only. Its purpose is to permit the host to request the net weight from the indicator. Upon receiving this function code, the indicator will respond by sending a complete data packet to the host. This packet will have the net weight installed in the data field. No decimal point is included. It is the responsibility of the host to install the decimal point, if needed, into this value.

6.7.4.6 Code 46H (Time and Date):

This information can be requested from or sent to the 8146. The data field must be 16 continuous bytes and in the same format as selected in the setup procedure at prompt F5.6. Except that the time field will proceed the date field in all cases. Spaces will not be accepted; zeros must be used.

6.7.4.7 Code 47H (Next Consecutive Number):

This function can be used in both the upload and download transmissions. Its purpose is to allow the host to send a new, or request the current, 9 digit consecutive number (CN). Leading zeros (30H) are required to fulfill this 9 digit requirement. In a download transmission, the host must include the new CN in the data field. In the upload transmission the host would not send the CN data. Upon receiving this function code, the indicator will respond by sending a complete data packet, including the current CN data, to the host.

6.7.4.8 Code 48H (Clear Last Printed Data):

This command will clear the print buffer (or the I/O printer port) of all data. The buffer will then be filled with all spaces. The last printed data may be requested by using function code 51H.

6.7.4.9 Code 49H (Status Bytes):

This function is an upload only: that is, the host may request certain information from the 8146 such as setup parameters. No data may be changed using this function.

Status Byte A (Decimal Point Location and Increment Size)

BIT 2 1 0	Decimal Point Location
0 0 0	XXXX00
0 0 1	XXXXX0
0 1 0	XXXXXX
0 1 1	XXXXX.X
1 0 0	XXXX.XX
1 0 1	XXX.XXX
1 1 0	XX.XXXX
1 1 1	X.XXXXX

BIT 4 3	Increment Size
0 1	X1
1 0	X2
1 1	X5

BIT 5	Always = 1
BIT 6	Always = 0
BIT 7	Parity Bit

Status Byte B (Current Operational Status)

BIT 0	Gross/Net Mode - Net = 1
BIT 1	Negative Sign - Minus = 1
BIT 2	Overcapacity - Overcapacity = 1
BIT 3	Motion - In Motion = 1
BIT 4	lb/kg Mode - kg = 1
BIT 5	Always = 1
BIT 6	Power Up Flag - Power Up = 1
BIT 7	Parity

Status Byte C (Current Operational Status)

BIT 0	**Always = 0**
BIT 1	**Always = 0**
BIT 2	**Always = 0**
BIT 3	**Print Mode - Print = 1**
BIT 4	**Expand X10 - Expanded = 1**
BIT 5	**Always = 1**
BIT 6	**Keyboard Tare in kg - Gare = 1**
BIT 7	**Parity**

Status Byte D (Number of Selected Increments)

BIT 4	3	2	1	0	Full Scale Increments
0	0	0	0	1	1000
0	0	0	1	0	1200
0	0	0	1	1	1500
0	0	1	0	0	2000
0	0	1	0	1	2500
0	0	1	1	0	3000
0	0	1	1	1	4000
0	1	0	0	0	5000
0	1	0	0	1	6000
0	1	0	1	0	8000
0	1	0	1	1	10000
0	1	1	0	0	12000
0	1	1	0	1	15000
0	1	1	1	0	16000
0	1	1	1	1	20000
1	0	0	0	0	25000
1	0	0	0	1	30000
1	0	0	1	0	32000
1	0	0	1	1	35000
1	0	1	0	0	40000
1	0	1	0	1	45000
1	0	1	1	0	48000
1	0	1	1	1	50000

BIT 5	**Always = 1**
BIT 6	**Always = 0**
BIT 7	**Parity**

Status Byte E (Setpoint Status)

BIT 0 Setpoint	**1**	**-**	**Output True = 1**
BIT 1 Setpoint	**2**	**-**	**Output True = 1**
BIT 2 Setpoint	**3**	**-**	**Output True = 1**
BIT 3 Setpoint	**4**	**-**	**Output True = 1**
BIT 4 Setpoint	**5**	**-**	**Output True = 1**
BIT 5 Setpoint	**6**	**-**	**Output True = 1**

BIT 6 Always = 1
BIT 7 Parity

Status Byte F (Setpoint Status)

BIT 0 Setpoint	**7**	**-**	**Output True = 1**
BIT 1 Setpoint	**8**	**-**	**Output True = 1**
BIT 2 Setpoint	**9**	**-**	**Output True = 1**
BIT 3 Setpoint	**10**	**-**	**Output True = 1**
BIT 4 Setpoint	**11**	**-**	**Output True = 1**
BIT 5 Setpoint	**12**	**-**	**Output True = 1**
BIT 6 Always = 1			
BIT 7 Parity			

NOTE: Status Bytes E and F will not change setpoint status unless an Automate 15 is connected.

6.7.4.10 Code 4AH (Setup Bytes):

This function is an upload only; that is, the host may request this data but may not change any data.

Setup Byte A (Setup Parameter Status)

BIT 0	**lb/kg Power Up Mode kg = 1**
BIT 1	**lb/kg Switching - Enabled = 1**
BIT 2	**Keyboard Tare - Enabled = 1**
BIT 3	**Tare Interlock - Enabled = 1**
BIT 4	**Autoclear Tare - Enabled = 1**
BIT 5	**Analog Verify - Enabled = 1**
BIT 6	**Always = 1**
BIT 7	**Parity**

Setup Bytes B & C (Digital Filtering Status)
Digital Filter Number, two bytes.

Setup Bytes D & E (Motion Sensitivity Status)
Motion Detection Sensitivity Value, two bytes.

Setup Bytes F & G (Display Update Status)
Consecutive Update for No Motion Detection Value, two bytes.

Setup Byte H (Decimal Point Location)

BIT	2	1	0	Full Scale Increments
	0	0	0	XXXX00
	0	0	1	XXXXX0
	0	1	0	XXXXXX
	0	1	1	XXXXX.X
	1	0	0	XXXX.XX
	1	1	0	XX.XXXX
	1	1	1	X.XXXXX

BIT 3	**Always = 1**
BIT 4	**Auto Zero Maintenance - Enabled = 1**
BIT 5	**Always = 0**
BIT 6	**Always = 1**
BIT 7	**Parity**

Setup Byte 1 (Printer Port Information)

BIT	2	1	0	Printer Port Baud Rate
	0	0	0	300
	0	0	1	1200
	0	1	0	2400
	0	1	1	4800
	1	0	0	9600

BIT 3 Parity Bit - Enabled = 1
BIT 4 Parity Bit Select - Even = 1
BIT 5 Checksum Bit - Enabled = 1
BIT 6 Always = 1
BIT 7 Parity

Setup Byte J (Printer Port Information)

BIT 0 Continuous/Demand Mode - Continuous = 1
BIT 1 Always = 0
BIT 2 Always = 0
BIT 3 Always = 0
BIT 4 Always = 0
BIT 5 Always = 0
BIT 6 Always = 1
BIT 7 Parity

Setup Byte K (Minimum Print Status)

BIT	3	2	1	0	Minimum Full Scale Increments for Print
	0	0	0	0	0
	0	0	0	1	1
	0	0	1	0	2
	0	0	1	1	3
	0	1	0	0	4
	0	1	0	1	5
	0	1	1	0	6
	0	1	1	1	7
	1	0	0	0	8
	1	0	0	1	9
	1	0	1	0	10
	1	0	1	1	11
	1	1	0	0	12
	1	1	0	1	13
	1	1	1	0	14
	1	1	1	1	15

BIT 4 Always = 0
BIT 5 Always = 0
BIT 6 Always = 1
BIT 7 Parity

Setup Byte L (Bar Code Port Information)

BIT 2 1 0	Bar Code Port Baud Rate
0 0 0	300
0 0 1	1200
0 1 0	2400
0 1 1	4800
1 0 0	9600

BIT 3 Parity Bit - Enabled = 1
BIT 4 Parity Select - Even = 1
BIT 5 Checksum Bit - Enabled = 1
BIT 6 Always = 1
BIT 7 Parity

6.7.4.11 Code 4BH (Control Byte):

This function code is a download only. Its purpose is to permit the host to transmit a control byte to the indicator. This control byte must be installed in the data field of the transmitted data packet and may be used to initiate one of the six possible commands that the 8146 can act upon. These six commands and their assigned bits are listed below.

BIT 0 Print Command .... ASCII "A" - 41H
BIT 1 Switch to lb Mode ... ASCII "B" - 42H
BIT 2 Switch to kg Mode ... ASCII "D" - 44H
BIT 3 Clear Tare Command . ASCII "H" - 48H
BIT 4 Auto Tare Command ... ASCII "P" - 50H
BIT 5 Zero Command . . . ASCII "`" - 60H
BIT 6 See Note
BIT 7 Parity

NOTE: Bit 6 is not used as a command, but is required to complete the 7 data bits required/. This bit must always be set to 1.

To initiate the command, simply set the appropriate bit to 1, while leaving the remaining five bits at 0. Only one command may be initiated at any one time. If more than one is required the entire function code must be retransmitted. All commands are subject to the indicator's operational parameters (i.e., no printing with motion, lb/kg switching disabled, etc.)

6.7.4.12 Code 4Ch (Setpoint Data):

This function may be used in both the upload and download transmission. Its purpose is to allow the host to send a new, or request the current setpoint number and its numeric value.

For downloads, the transmission format is as follows:

<STX> <ADD> <DIR> <4C> NNSSSSSSS <CR> <CKSUM>

Where:

<STX>	**=**	**ASCII Start of Text Character, 1 byte**
<ADD>	**=**	**Device address number, 1 byte**
<DIR>	**=**	**Direction of data: "D" = download, 1 byte**
<4X>	**=**	**Function code for setpoints**
<NN>	**=**	**Is the two byte setpoint number (01-12)**
<SSSSSSS>	**=**	**SSSSSSS is the right justified setpoint with leading zeros (M.S.D. is a space unless unit is configured as "SUM-ONLY" mode).**
<CR>	**=**	**ASCII Carriage Return Character, 1 byte**
<CKSUM>	**=**	**Optional Checksum Character, 1 byte**

For Uploads, the transmissions format is as follows:

<STX> <ADD> <DIR> <4C> NN <CR> <CKSUM>

Where:

<STX>	**=**	**ASCII Start of Text Character, 1 byte**
<ADD>	**=**	**Device address number, 1 byte**
<DIR>	**=**	**Direction of data: "U" = upload, 1 byte**
<4C>	**=**	**Function code for setpoints**
<NN>	**=**	**Is the two byte setpoint number (01-12)**
<CR>	**=**	**ASCII Carriage Return Character, 1 byte**
<CKSUM>	**=**	**Optional Checksum Character, 1 byte**

6.7.4.13 Code 50H (ID Number):

This function may be used in both the upload and download transmission. Its purpose is to allow the host to send a new, or request the current 3 character ID field. Leading zero's (30H) are required to fulfill this 3 character requirement. In a download transmission, the host must include the new ID in the data field. In the upload transmission, the host would not send this data. Upon receiving this function code, the indicator will respond by sending a complete data packet, including the Current ID in the data field.

6.7.4.14 Code 51H (Last Printed Data):

This function is an upload function only. Its purpose is to permit the host to request the contents of the print buffer. Refer to the following chart for the actual contents of this buffer.

PRINT BUFFER CHART

Buffer Contents	Length in Bytes
Gross Weight	8 Bytes
Tare Weight	8 Bytes
Net Weight	8 Bytes
Time	8 Bytes
Date	8 Bytes
CN	9 Bytes
Commodity or Tare ID	3 Bytes

6.8 BAR CODE INTERFACE DESCRIPTION - I/O #2 (OPTIONAL)

6.8.1 Channel Characteristics

6.8.1.1 Physical Characteristics

The bar code input/output serial port is designed to support the EIA RS232-C (with CTS handshaking) and the 20 milliamp current loop types.

6.8.1.2 Data Characteristics

Each character is ASCII coded and is 9 to 11 bits in length [dependent upon stop bit(s) and parity bit selections]. The character bit frame consists of: 1 start bit, 7 data bits and 1 or 2 stop bit(s). The parity bit may be programmed as one of the following: (1) even parity, (2) odd parity, or (3) no parity bit.

Transmission baud rates are selectable for either 300, 1200, 2400, 4800, or 9600 baud.

Signal Name	8146 Desk	8146 Wall	8860 J7**
Chassis Ground	1	A	
TxD (RS232-C)	2	B	
RxD (RS232-C)	3	C	
RTS (RS232-C)	4*	D*	
CTS (RS232-C)	5	E	
DSR (RS232-C)	6	F	
Logic Ground	7	G	
20mA Receive + (aux)	8	H	11
20mA Transmit -	9	J	16
20mA Receive - (aux)	10	K	22
Not used	11	L	
Not Used	12	M	
Not Used	13	N	
20mA Transmit +	14*	P*	
20mA Supply (+ 12 VDC)	15	R	
20mA Receive +	16	S	
20mA Supply (-12 VDC)	17	T	
20mA Receive -	18	U	
Receive Ground	19	V	
DTR (RS232-C)	20	W	
20mA Supply - (aux)	21	X	18
Logic Ground	23	Z	
Not Used	24	a	
Not Used	25	b	
Not Used		c	

Figure 6.4 I/O Pin Descriptions I/O #2 (Barcode)

* **Jumper is in 8146 end of interconnecting cable.**
** **Adapter plug included with the 8860 must be used.**

6.8.2 Bar Code Input Description

The bar code input interface is a bit serial EIA RS232-C link. This will allow a standalone bar code reader to be connected to the input.

This option allows the entry of bar encoded tare weight and/or numeric ID data.

The use of the bar code input is complementary to, and does not inhibit, the normal keyboard tare and ID entry functions. Once the input data is received, the indicator will treat this data exactly as if it were entered from the keyboard. A decimal point need not be included in this data. If included, the decimal precision may not exceed the decimal precision of the indicator. If no decimal point is included in the data, the programmed decimal point position will be assumed. Tare data must also match the indicator's displayed increment size. Data which does not meet these requirements will be ignored.

Programming selections are used to select whether the input data is to include the tare and/or ID data and also whether this data is in a single or multi-line format. Refer to the following paragraphs for a more detailed description of these two formats.

6.8.2.1 Single Line Format:

This format is used when all data is being sent to the indicator in a single line. The tare and ID fields must be a fixed length. (This length is selectable in the programming setup procedure and must be followed with an ASCII carriage return (CR) character.) Leading zeros are significant. In this format, field identifying characters are not required.

SINGLE LINE FORMAT CHART

	tttttiii		**CR**
Where:			
	ttttt	**=**	**Tare weight data**
	iii	**=**	**ID data**
	CR	**=**	**Carriage Return (ASCII)**

6.8.2.2 Multi-line Format:

This format is used when each data field is transmitted on separate lines. In this mode each line must begin with a single field identifying character (selectable via the programming setup procedure) followed by the data field and ending with an ASCII carriage return (CR) character. In this format the data field length is variable and is limited only by the maximum number of keyboard entries (i.e., tare is 6 digits maximum, and ID 3 characters maximum). A typical example might be:

MULTILINE FORMAT CHART

	pIII		**CR**
	Ttttt		**CR**
Where:			
	P	**=**	**Field Identifier**
	iii	**=**	**ID data**
	T	**=**	**Tare field identifier**
	tttt	**=**	**Tare data**
	CR	**=**	**Carriage Return (ASCII)**

6.8.3 Bar Code Output Description

The bar code output is a bit serial communications link formatted for use with the model 8860 printer. It is designed to transmit up to six lines of operator selected data and font size. No response is expected from the printer at the end of the transmission.

The bar code output format consists of three fixed characters, three possible control characters, and the operator selected data. They are as follows:

FIXED CHARACTERS

1. **STX - ASCII Start of Text. This character is sent at the beginning of every new transmission.**

2. **ETX - ASCII End of Text. This character is sent as the next-to-last character in every transmission.**

3. **BCC - Block Check Character. This is the last character sent in the transmission and is used as a data check. This character is defined as the XOR of all character excluding <STX> but including the <ETX> (ISO1155).**

CONTROL CHARACTERS

1. **DC2 - ASCII Device Control 2. This character is sent at the beginning of the bar code data section of the transmission. The printer will act on this character and print the rest of the data in the selected bar code format.**

2. **SI - ASCII Shift In. This character is used to increment the printing font size of the printer. Each SI character will increment the font size by one. The 8146 will send the required number of SI characters needed to increment to the font size selected during the bar code setup.**

3. **CR - ASCII Carriage Return. This is used to terminate the current printing line and start a new line. It is also used to return the printing font size to the programmed default size if the font size had been incremented.**

The following examples are actual bar code output formats:

EXAMPLE 1: Three lines of human readable and three lines of bar code with the font size of the last human readable line incremented two sizes.

<STX> line 1, human readable <CR>
line 2, human readable <CR>

<SI><SI> line 3, human readable <CR>

<DC2> line 4, bar code data <CR>
line 5, bar code data <CR>
line 6, bar code data <CR><ETX><BBC>

EXAMPLE 2: Two lines of human readable and one of bar code.

<STX> line 1, human readable <CR>
line 2, human readable <CR>
line 3, bar code data <CR><ETX><BCC>

6.9 SETPOINT INTERFACE DESCRIPTION - I/O #4 (OPTIONAL)

6.9.1 Channel Characteristics

6.9.1.1 Physical Characteristics:

The setpoint output serial port is designed to support the EIA RS232-C or 20mA circuit type.

6.9.1.2 Data Characteristics:

Each character is ASCII coded and is a 9 to 11 bits in length (dependent upon stop bit ad parity bit selections). The character bit frame consists of: 1 start bit, 7 data bits, 1 parity bit and 1 or 2 stop bit(s). The parity bit may be programmed as one of the following: (1) even parity, (2) odd parity, or (3) no parity.

Transmission baud rates are selectable for either 300, 1200, 2400, 4800, or 9600 baud.

Signal Name	8146 Desk	8146 Wall
Chassis Ground	1	A
TxD (RS232-C)	2	B
RxD (RS232-C)	3	C
RTS (RS232-C)	4*	D*
CTS (RS232-C)	5	E
DSR (RS232-C)	6	F
Logic Ground	7	G
20mA Receive + (aux)	8	H
20mA Transmit -	9	J
20mA Receive - (aux)	10	K
Not used	11	L
Not Used	12	M
Not Used	13	N
20mA Transmit +	14*	P*
20mA Supply (+ 12 VDC)	15	R
20mA Receive +	16	S
20mA Supply (-12 VDC)	17	T
20mA Receive -	18	U
Receive Ground	19	V
DTR (RS232-C)	20	W
20mA Supply - (aux)	21	X
Logic Ground	22	Y
Not Used	23	Z
Not Used	24	a
Not Used	25	b
Not Used		c

Figure 6.5 I/O Pin Descriptions I/O #4 (Setpoint)

6.9.2 Setpoint Output Description

The setpoint output is a bit serial communications link designed specifically to interface with an Automate 15 Programmable Controller. This transmission consists of 13 bytes* of information sent as a continuous string. The information contained in this string is updated and transmitted approximately four times each second. The following chart defines each byte of this string.

	Description or Function
1	DLE = Data Link Escape
2	STX = Start of Text
3	01H = Destination Rack Address
4	0FEH = Source Address
5	04H = Command Type
6	2Ch = Command Type
7	00H = High Byte Register Address
8	00H = Low Byte Register Address
9 (See Note)	Status of Setpoints 1 Thru 8
10 (See Note)	Status of Setpoints 9 Thru 12
11	DLE = Data Link Escape
12	ETX = End of Text
13	BCC = Block Check Character

NOTE: Bytes 9 and 10 are used to indicate the current operational status of the various setpoints. When the indicated weight is below the entered setpoint value, the associated bit will setpoint value, the associated bit will be set to a logic "1".

6.9.2.1 Byte 9, Format * (SP = setpoint)

Bit 0 = SP1 Status
1 = SP2 Status
2 = SP3 Status
3 = SP4 Status
4 = SP5 Status
5 = SP6 Status
6 = SP7 Status
7 = SP8 Status

6.9.2.2 Byte 10, Format * (SP = setpoint)

Bit 0 = SP9 Status
1 = SP10 Status
2 = SP11 Status
3 = SP12 Status
4 = Random State
5 = Random State
6 = Watchdog Timer Toggle
7 = Watchdog Timer Toggle

*** The data string length may be increased to 14 or 15 bytes. If one or both of the setpoint status bytes (byte 9 or 10) equal a DLE character; then an additional DLE character is inserted ahead of the status byte to denote it as a data byte.**

6.9.3 Error Detection

Error detection or testing is the responsibility of the receiving device. No response from the receiving device is accepted or acknowledged.

7.0 PREVENTIVE MAINTENANCE

The Model 8146 is designed to require a minimum of maintenance and service. This section provides instructions and procedures for the maintenance of the indicator, as well as a troubleshooting guide to aid in problem analysis.

7.1 REQUIRED TOOLS AND SUPPLIES

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

Volt Ohm Meter
Load Cell Simulator (Part No. 100865 00A)
Cleaning Cloth
Static Bags
Static Wrist Strap or Static Work Station

7.2 MAINTENANCE SCHEDULE

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

7.3 CLEANING

Clean the keyboard and enclosure with a soft clean cloth dampened with a mild cleaner. DO NOT USE ANY TYPE OF INDUSTRIAL SOLVENT. DO NOT SPRAY CLEANER DIRECTLY ONTO THE UNIT.

7.4 TROUBLESHOOTING

7.4.1 Procedure

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

7.4.1.2 Check fuses, primary power lines, external circuit elements and related wiring for possible faults. Failures and malfunctions often can be traced to simple causes such as improper AC power, power supply connections, or fuse failure.

7.4.1.3 Use the electrical interconnecting diagram and the power supply testing section as an aid to locating trouble causes. These sections contain various voltage measurements that are average for normal operation. Use instrument probes carefully to avoid causing short circuits and damaging circuit components.

7.4.1.4 Malfunctions in the 8146 are best located by substitution. A PCB believed to be defective may be checked by replacing it with a known good PCB, and then observing whether the problem is corrected. WHEN HANDLING A PCB, USE AN ANTI-STATIC BAG FOR BOTH THE NEW AND DEFECTIVE PCB.

7.4.1.5 To verify the problem as being in the removed PCB, replace 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 scanning. Do not automatically program the replacement PCB like the suspected faulty PCB as the problem may be a programming error. Exchange PCB's, or subassemblies, are available from your authorized Toledo Scale representative.

7.5 ERROR CODES

The 8146 has included in the operation two separate types of error detection routines. These two types are: (1) Instrument Errors, and (2) Calibration Errors. Refer to the following paragraphs for a more detailed description of these errors.

7.5.1 Instrument Error Codes:

These error codes represent a problem which has been detected in the operation of the unit. The error codes, their descriptions, and the recommended corrective actions follow:

E1 - Programmed Memory Error

This error shows that a problem was detected in the programmed memory portion of the Scale Channel PCB. The corrective actions are:

1. **Power down. Wait several minutes, and power up.**
2. **Replace Scale Channel PCB.**

E2 - Data Retention Error

This error occurs when a failure is detected in the data handling and storage section of the Scale Channel PCB. The corrective actions are:

1. **Power down. Wait several minutes, and power up.**
2. **Replace Scale Channel PCB.**

E3 - Programmable Memory Error

This error is displayed when a problem has been detected in the programmable memory section of the Scale Channel PCB. The corrective actions are:

1. **Power down. Wait several minutes, and power up.**
2. **Replace Scale Channel PCB.**

E6 - Analog Verify Error

This code represents an error in the scale's calibration detected during an analog verify cycle.

The corrective actions are:

1. **Recalibrate the scale.**
2. **Replace the Analog PCB.**

E7 - A/D Missing

This error code is displayed when a problem is detected in the scale's analog to digital section.

The corrective actions are:

1. **Check for bad or improperly wired load cell(s).**
2. **Check for improperly connected or miswired harnesses.**
3. **Replace the Scale Channel or Analog PCB.**

[- - - - - - -]

The display designates a "No Load Cell" connected error or a calibration error.

BLANK DISPLAY

The display blanks on over-capacity.

[SUM ERROR]

All scales being summed are not in the same mode, i.e., lb/kg or have different graduation sizes.

7.5.2 Analog Calibration Error Codes:

These error codes, when displayed, represent an error that has been detected during the calibration sequence of the scale. The error codes, their descriptions, and the recommended corrective actions follow.

CAL E1 - Scale in Motion

A change in the millivolt signal from the load cell(s) was detected during calibration.

CAL E2 - Analog Malfunction

A problem has occurred in the analog section during the calibration procedure.

1. **Check for a missed wired load cell cable.**
2. **Replace the Analog PCB.**

CAL E3 - Calibration Error

A problem was detected during calibration.

1. **Check selected increment size.**
2. **Replace the Analog or Channel Scale PCB.**

CAL E4 - Scale Over Capacity

This error is displayed when an over capacity condition is detected during calibration. The corrective actions are:

1. **Check programmed scale capacity and correct if necessary.**
2. **Reduce the amount of test weights used.**

CAL E5 - Invalid Scale Capacity

This error represents a microvolt build problem. The microvolt per increment build is either too small or too large for the unit to operate correctly. The corrective actions are:

1. **Check programmed capacity and increment size. Are they correct for the scale base used?**
2. **Calculate the microvolt per increment build and use the chart in Section 4.0 to determine if this build will operate correctly.**
3. **Unit must be powered down to clear this error after correction.**

CAL E6 - Insufficient Test Weights

This error is displayed when the amount of test weights used to calibrate the scale is not sufficient to obtain a proper calibration. The corrective actions are:

1, **Use a larger amount of test weights.**
2. **Check the millivolt output signal from the load cell(s). This signal should increase as weight is applied to the scale.**

CAL E8 - Illegal Test Weight Value Entered

This error code is displayed when an invalid number is entered when the unit is asking for the amount of test weights used. Possible causes for this error are:

1. **The least significant digit does not correspond to the increment size.**
2. **The amount of test weights used is over the 105% limit of programmed scale capacity.**

CAL EEE - Invalid Full Scale Increments

This error is displayed when the selected scale capacity divided by the increment size does not equal one of the available number of increments. Refer to Section 4.0, Paragraph 4.1, for available numbers.

1. **Increase or decrease increment size or scale capacity.**

7.5.3 Digital Calibration Error Codes:

E1 - Program Memory Error

1. **Fatal error, non recoverable.**

E2 - Internal RAM Memory Error

1. **Fatal error, non recoverable**

E3 - EEPROM Memory Error

1. **Occurrence at Power-up can be recovered going into Calibration. If it does not recover there is a problem with the EEPROM's**

E4 - External RAM Memory Error

1. **Fatal error, non recoverable.**

E5 - EErom Belongs to the Opposite Scale Number

1. **Can recover by entering setup and check all setup parameters and leaving setup Recalibration may be required.**

For error codes E6, E8-E10, E11, and E13 "XX" indicates DLC no.

E6 - Analog Verification Error

1. **Fatal error, non recoverable.**

E7 - Digital Load Cell Format Error (default T1 in use)

1. **Automatically recoverable.**

E8 - No Digital Load Cell Data Error

1. **Automatically recoverable, pressing the "CLEAR" key while this error is displayed will cycle load cell power.**

E9 - Digital Load Cell Out of Range Error

1. **Automatically recoverable.**

E10 - Digital Load Cell RAM Memory Error

1. **Automatically recoverable.**

E11 - Digital Load Cell ROM Memory Error

1. **Automatically recoverable.**

E13 - Digital Load Cell Novram Error

1. **Automatically recoverable.**

E14 - The calibration switch is in the wrong position.

E16 - Math Overflow Error

1. **Press the "ENTER" key to display the alphanumeric value. Record the values. Press the "CLEAR" key to reset the scale. Contact Toledo Scale Service since this indicates a shift adjust or calibration error.**

E21 - Illegal Scale Capacity Value

1..Press the "CLEAR" key and enter the proper calibration constants.

E26 - Illegal Increment Value

1. **Press "CLEAR" key and enter proper increment value.**

E27 - Illegal Overcapacity Value Selected

1. **Press "CLEAR" key and re-enter value.**

E32 - Insufficient Calibration Weight

1. **Press "CLEAR" key and enter legal load cell capacity value.**

E34 - Calibration Weight Too Large

1. **Press "CLEAR" key and use calibration weight less than 105% of scale capacity.**

E35 - Illegal Test Weight Build Entry

1. **Press "CLEAR" key and use a test weight that matches the scale increment value.**

E36 - DLC cannot accept new parameters, because too little of load cell capacity si being used.

1. **Press "CLEAR" key to restart whole calibration procedure.**

E37 - Number of Cell Nodes Checksum Error

1. **Insert "CAL" jumper and press "CLEAR" key. Re-calibration is required.**

E E E - Scale Not Zeroed Error

Tare interlock and/or auto zero scale, or turn off tare interlock.

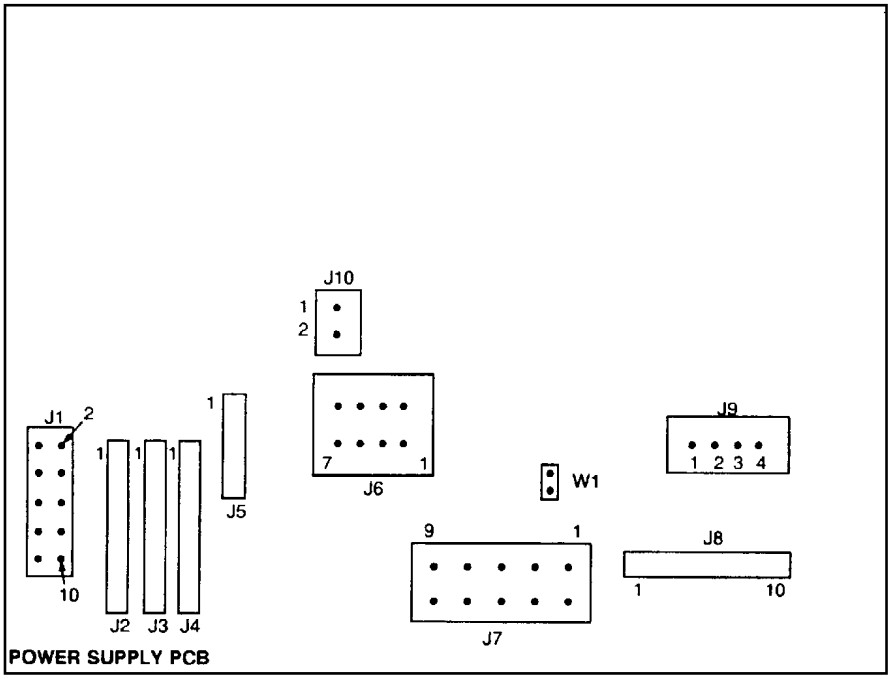
-E E E - Scale Not Zeroed Error

Tare interlock and/or auto zero on power-up is enabled and weight is less than zero.

1. **Press "ZERO" key to zero scale or turn off tare interlock.**

7.5.4 Testing Power Supply Voltages

The 8146 uses a switching power supply to create the DC voltages necessary for correct operation. All voltages are generated on the Power Supply PCB. The following sections explain what voltages are present and where they can be tested. These voltages are limits for a 120 VAC power line. They will vary with the AC input and are acceptable from -15% to +10% corresponding to a 102 VAC up to a 132 VAC power line.



POWER SUPPLY PCB

! WARNING

THE POWER SUPPLY PCB CONTAINS VOLTAGES IN EXCESS OF 400 VOLTS. USE CARE WHEN TESTING VOLTAGES.

7.5.4.1 5VDC REGULATED SUPPLY

MEASURE		DC VOLTAGE	
From	To	Minimum	Maximum
J2 Pin 2	J2 Pin 8	+ 4.9	+ 5.2

The AC ripple voltage should be less than 0.1 V RMS.

7.5.4.2 REGULATED PLUS AND MINUS 11 VOLT SUPPLY

MEASURE		DC VOLTAGE	
From	To	Minimum	Maximum
J4 Pin 5	J4 Pin 4	-10.5	- 13.00
J4 Pin 6	J4 Pin 4	+10.5	+13.00

The AC ripple voltage should be less than 0.1 V RMS.

7.5.4.3 REGULATED +12 VOLT SUPPLY

MEASURE		DC VOLTAGE	
From	To	Minimum	Maximum
J3 Pin 6	J3 Pin 8	+ 11.5	+ 12.5

The AC ripple voltage should be less than 0.1 V RMS.

7.5.4.4 Analog Load Cell Excitation

This voltage can be measured at the rear of the load cell connector mounted on the rear or bottom panel. The voltage is measured between pin 1 and pin 5 of this external connector. The actual voltage measured depends upon the unit that you have. The two possibilities are:

7.5.4.4.1 6 Volt Excitation:

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

Meter Reading Without Line Sync	Meter Reading With Line Sync
3.0 VDC	4.2 VDC

7.5.4.4.2 15 Volts Excitation:

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

Meter Reading Without Line Sync	Meter Reading With Line Sync
7.5 VDC	10.5 VDC

NOTE: The W1 and W2 Line Sync Jumpers on the Analog PCB must be in the same position as the W1 Line Sync Jumper on the power supply PCB.

7.5.4.5 Test Point for DigiTOL ® Load Cell Systems

7.5.4.5.1 Test Points for Single DLC Channels A & B

DESK UNIT	WALL UNIT	DESIGNATION
1	A	Receive Data A
2	B	Key
3	C	N.C.
4	D	Receive Data B
5	E	+ 18 VDC
6	F	Transmit Data B
7	G	Ground
8	H	Transmit Data A
9	J	N.C.

The tolerance for the 18 volt supply is +1/-0.8 VDC.
AC ripple should not exceed 30 millivolts.

7.5.4.5.2 Test Points for Multiple (T-LAN) Network

NOTE: To check power supply voltages, the 8146 must be in the weight display mode so that power to the load cells is turned on.

D WP-44 J2 (10 Pin Connector)	8146 9 PIN SUB-D CONNECTOR WEIGHT 1 Thru 4	AUXILIARY POWER SUPPLY INDICATOR A & B	DESIGNATION
1			
2			
3	2 (Desk) B (Wall)	2	Ground
4			
5	4 (Desk) D (Wall)	4	Com B
6	1 (Desk) A (Wall)	1	Com A
7			
8			
9	5 (Desk) E (Wall)	5	+ 24 VDC
10	3 (Desk)(Key) C (Wall)	3 (Key)	Key

AUXILIARY POWER SUPPLY PS1, PS2, PS3, PS4	PIT POWER SUPPLY J6 CONNECTOR PINS	DESIGNATION
1	8	Com A
2	4	Ground
3	- -	Key
4	7	Com B
5	1	+ 24 VDC
6	5	Ground
7	6	Ground
8	2	+ 24 VDC
9	3	+ 24 VDC

The tolerance for the 24 VDC supply is + 16 VDC to 30 VDC.
AC ripple should not exceed 30 millivolts

PIT POWER SUPPLY J1, J2, J3, J4, J5, J7, J8	DESIGNATION
1	Com A
2	Com B
3	+ 18 VDC
4	+ 8 VDC
5	Ground
6	Chassis Ground

7.5.4.5.3 System Voltages

	FROM TERMINAL OR PIN NO.	TO TERMINAL OR PIN NO.	MINIMUM VOLTAGE	MAXIMUM VOLTAGE
8146 9 Pin Sub-D Weight 1 & 2 Connector	2 (Desk) B(Wall)	5 (Desk) E (Wall)	16 VDC	30 VDC
	2 (Desk) B(Wall)	1 (Desk) A (Wall)	1.9 VDC*	2.7 VDC*
	2 (Desk) B(Wall)	4 (Desk) D (Wall)	1.9 VDC*	2.7 VDC
Power Supply J-box, J6	4, 5, or 6	1,2, or 3	16 VDC	30 VDC
	4, 5, or 6	7	1.9 VDC*	2.7 VDC*
	4, 5, or 6	8	1.9 VDC*	2.7 VDC*
Power Supply	5	1	1.9 VDC*	2.7 VDC*
and Expander	5	2	1.9 VDC*	2.7 VDC*
J-Boxes J1-J5, J7, J8	5	3	17.2 VDC	19.0 VDC
	5	4	7.5 VDC	9.0 VDC
Power Cell	C	A	1.9 VDC*	2.7 VDC*
Cable, Connector	C	B	1.9 VDC*	2.7 VDC*
	C	F	17.2 VDC	19.0 VDC
	C	D	7.5 VDC	9.0 VDC

NOTE: These voltage measurements result in a rough approximation of an actual, tested reading. In order to totally test the communication line voltage, proceed as follows (at power supply or expander J-box, J1-J5, J7, J8):

1. **Connect one (1) 50 ohm resistor from Terminal 1 to Terminal 5, and one (1) 50 ohm resistor from Terminal 2 to Terminal 5. Resistor wattage is not important.**

2. **Using a V.O.M. check as follows:**

   Terminal 1 (red meter lead) to Terminal 5 (black meter lead), and

   Terminal 2 (red meter lead) to Terminal 5 (black meter lead).

   MINIMUM = 2.4 VDC. MAXIMUM = 2.7 VDC.

8.0 GENERAL INFORMATION

8.1 RECOMMENDED SPARE PARTS

It is recommended that spare parts be kept in stock in order to keep equipment downtime to a minimum. It is also recommended that a parts catalog be on hand so that items may be properly identified for correct and prompt delivery. The Parts Catalog number is PC 008146 100. All items are available through your local Authorized Toledo Scale Service Representative.

Part Number	Description
(*) 124654 00A	Fuse, 1.5 Amp, Slo Blo
(*) 128126 00A	Keyboard Assembly
(*) 125270 00A	Dot Matrix Display PCB
(*) 125252 00A	Dual Weight Display PCB
(*) 125262 00A	Dual Serial Converter PCB
(*) 125268 00A	Power Supply PCB
(*) 126060 00A	CPU PCB
(*) 120731 00A	Scale Channel PCB**
(*) 123018 00A	Analog PCB**
(*) 125258 00A	Motherboard PCB
(*) 125502 00A	Serial I/O PCB**
(*) 130165 00A	Scale DWP (DigiTOL ®) PCB**

*** Part numbers may have a revision level.**

**** Optional boards are required by system configuration.**

8.2 CABLES AND MATING CONNECTORS

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

PRINTER INTERCONNECT CABLES

Printer	8146	Length	Part Number	Sales Number
8804*	DESK	6’	A115544 00A	0900-1036-0000
		20’	A115545 00A	0900-1307-0000
&				
		6’	A115574 00A	0900-0188-0000
8806	WALL	20’	A115575 00A	0900-0189-0000
8840	DESK	6’	A128220 00A	0900-0214-0000
8842				
&	WALL	20’	A128221 00A	0900-0215-0000
8843				
8860	WALL	20’	130163 00A	0900-0250-0000
8855	DESK	6’	B119722 00A	0900-0197-000
	WALL	20’	A122579 00A	0900-0187-000

*** Adapter plug included with the 8804 and 8860 must be used.**
**** Contact Fast Factory for ordering information.**

DESK ENCLOSURE

8146 Connector	Description	Mating Part Numbers	Sales Number
Load Cell*	Male Plug and Clamp KOP	125819 00A	0917-0117
Serial I/O (All)	Male Plug Cable Clamp Contact Pins Grommet	107187 00A 125389 00A 107189 00A 125842 00A	- - - - - - -

*** An adapter cable part number B117611 00A may be used to adapt the older 7-pin load cell connector to the new 9-pin D-type. The maximum cable gauge that can be soldered to the 9-pin connector is a #20 gauge. If a #16 gauge cable is used, the B117611 00A adapter cable is required.**

WALL ENCLOSURE

8146 Connector	Description	Mating Part Numbers	Sales Number
Load Cell*	Connector KOP	125820 00A	0917-0118
Serial I/O #1 #2 & #4 #3	Connector KOP Connector KOP Connector KOP	126232 00A 128860 00A 123482 00A	0917-0121 0917-0138

*** An adapter cable part number 124130 00A may be used to adapt the older 7-pin load cell connector to the newer 10-pin type. The maximum cable gauge that can be soldered to the 10-pin connector is a #20 gauge. If a #16 gauge cable is used, the 124130 00A adapter cable is required.**

NOTE: Potting and Cleaning KOP's are required.

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