2097
2197

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:

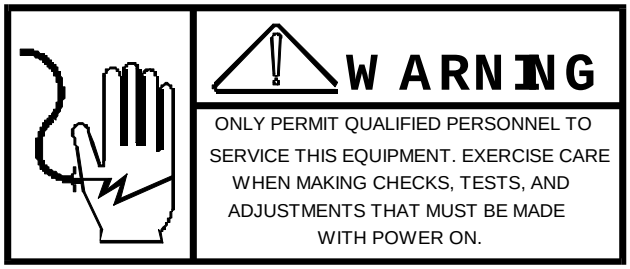
METTLER TOLEDO
Training Center
P.O. Box 1705
Columbus, Ohio 43216
(614) 438-4400

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.

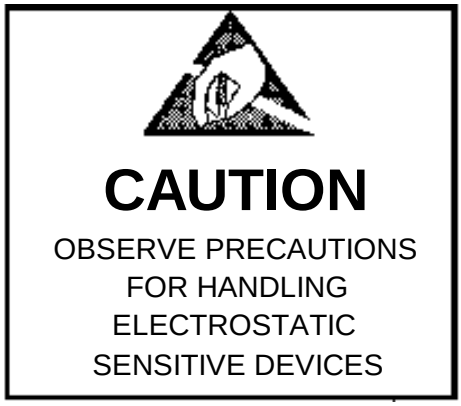
- **ALWAYS** take proper precautions when handling static sensitive devices.



- **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

1. GENERAL DESCRIPTION

The Model 2097 and 2197 are digital scale bases intended for industrial weighing/counting applications requiring washdown capabilities. The Model 2097 is available in 100 lb (60 kg), 250 lb (100 kg), and 400 lb (150 kg) capacities. The Model 2197 is available in 250 lb (100 kg), 500 lb (300 kg), and 1000 lb (600kg) capacities. The Model 2097/2197 digital scale base is intended for use only with the Toledo Models 8510-20XX Panel Mount, 8510-10XX Stainless Steel, 8520, and 8530 Digitol Indicators. The Model 2097/2197 can also be used with the toledo Model 8572 and 8582 parts counters as a remote digital scale for sampling or bulk counting.

2. SPECIFICATIONS

2.1 PHYSICAL SPECIFICATIONS

2.1.1 DIMENSIONS AND SHIPPING WEIGHT

	2097	2197
PLATTER:	450 mm x 600 mm x 110 mm (17.6" x 23.5" x 4.1")	600 mm x 800 mm x 130 mm (23.6" x 31.8" x 5.0")
BASE HEIGHT:	140 mm (5.5") minimum	170 mm (6.6") minimum
FOOT ADJ. RANGE:	+8 mm (3.1")	+8 mm (3.1")
SHIPPING WEIGHT:	25 kg (55 lb)	59 kg (130 lb)

2.1.2 CONSTRUCTION

FRAME: Welded stainless steel

PLATTER: 2097: 14 gauge stainless steel
2197: 12 gauge stainless steel

2.1.3 DIGITAL LOAD CELL

The digital load cell used in the Model 2097/2197 is the hermetically sealed stainless steel version of the Toledo Digitol digital load cell. The digital load cell module utilizes a moment insensitive counter-force combined with analog and digital electronics. The A/D conversion is completed at the load cell allowing digital weight data to be sent directly to the indicator. Resolution is 700,000 counts at 2.35 mV/V. The update rate is fixed at 8.8 per second.

2.2 ELECTRICAL SPECIFICATIONS

The power to operate the digital locad cell in the Model 2097/2197 is provided by the digital indicator or parts counter used with the base. The supplied power must be between 18 to 24 volts DC at 33 milliamps maximum. The maximum allowable cable length between the Model 2097/2197 base and the indicator is 50 feet (16 m).

2.3 ENVIRONMENTAL SPECIFICATIONS

2.3.1 OPERATING TEMPERATURE

The Model 2097/2197 is designed to meet specifications over temperature range between -10 degrees C to 45 degrees C (14 degrees F to 113 degrees F) with relative humidity ranging between 10 to 95% non-condensing.

2.3.2 STORAGE TEMPERATURE

The Model 2097/2197 is designed to withstand storage temperature ranges between -40 degrees C to 70 degrees C (-40 degrees F to 158 degrees F) with relative humidity ranging between 10 to 95% non-condensing.

2.3.3 APPLICATION

The Model 2097/2197 is rated NEMA 6P, where dust, lint, splashing or external condensation of non-corrosive liquids, and falling or hose-directed water may be present. Typical examples of **misapplication** include, but are not limited to:

-- Immersions
-- Corrosive chemical or acid environments

2.3.4 HAZARDOUS AREAS

DO NOT USE THE 2097/2197 IN LOCATIONS CLASSIFIED HAZARDOUS BY THE NATIONAL ELECTRICAL CODE (NEC) BECAUSE OF COMBUSTIBLE OR EXPLOSIVE ATMOSPHERSES OR DUSTS.

2.4 FACTORY NUMBER GUIDE

FACTORY NUMBER	LOAD CELL CAPACITY	RECOMMENDED SCALE INDICATION
2097-0001	100 kg	100 lb X 0.02 or 50 kg X 0.01
2097-0002	300 kg	250 lb X 0.05 or 100 kg X 0.02 400 lb X 0.10 or 200 kg X 0.05
2197-0001	500 kg	250 lb X 0.05 or 100 kg X 0.02
2197-0002	1000kg	500 lb X 0.10 or 250 kg X 0.05 1000 lb X 0.20 or 500 kg X 0.10

2.5 AGENCY APPROVALS

The Model 2097/2197 neets or exceeds the NIST H44 5000 d or Canada OIML 3000 d specifications. The 2097/2197 meets or exceeds FCC docket 80-284 for radiated and conducted RFI emissions and meets Canadian and U.K. specifications for RFI susceptibility.

3. INSTALLATION PROCEDURE

3.1 UNPACKING

3.1.1 Examine the shippping container for any signs of damage. **IF SHIPPING DAMAGE IS FOUND, MAKE A CLAIM WITH THE CARRIER IMMEDIATELY.**

3.1.2 Open the shipping carton, remove the packing material, and lift the platter from the carton.

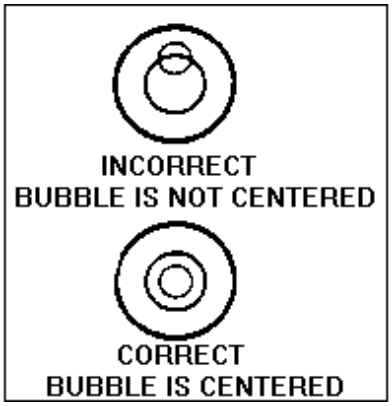
3.1.3 Next, lift the Model scale base from the container.

CAUTION! EXERCISE CARE TO AVOID DAMAGING THE METAL BELLOWS ON THE LOAD CELL ASSEMBLY.

3.1.4 Place the scale base on a level, firm surface. Retain the shipping container for future transport of the scale.

3.2 SETUP

3.2.1 Place the Model 2097/2197 on a level, firm surface where it will be used. Level the scale by turning the adjustable feet on the base in or out while using the level bubble as a guide (Figure 1). The scale must be adjusted so it is stable and does not rock. When the scale is level and stable, tighten the jam nuts on the feet ot lock them in place.



Level Indicator
Figure 1

3.2.2 Refer to Section 4, Input/Output Connections, for load cell cabel connection instructions. After connecting the load cell cable to the digital indicator, apply power to the indicator and allow a 30 minute warmup period with power applied before calibrating the scale. Refer to the appropriate indicator technical manual for calibration instructions. Refer to Section 2.4 for recommended capacity and increment configurations for 2097/2197 digital scale base.

4. INPUT/OUTPUT CONNECTIONS

CAUTION! THE 2097/2197 IS A DIGITAL SCALE BASE INTENDED FOR USE ONLY WITH CERTAIN TOLEDO DIGITAL INDICATORS. BEFORE CONNECTING THE BASE TO A DIGITAL INDICATOR, VERIFY THE LOAD CELL PORT IS SETUP FOR A DIGITAL SCALE BASE. REFER TO THE APPROPRIATE INDICATOR TECHNICAL MANUAL FOR DETAILS. FAILURE TO DO SO MAY RESULT IN DAMAGE TO THE LOAD CELL, INDICATOR OR BOTH.

The Model 2097/2197 is shipped with a standard 10; six conductor 20 gauge load cell cable attached and hermetically sealed to the digital load cell. Connection to a digital indicator is made by soldering the DB-9 Male 9-pin connector supplied with the indicator to the 2097/2197 cable, or by wiring the cable directly to a terminal block as used in the 8510 SS and 8520 Digital Indicators. Use the wire color code in Table 1 to match the correct wire to the DB-9 connector or to the terminal block.

The Model 2097/2197 is powered by the indicator. The load cell cable carries power for the scale base and data to and from the scale base. The digital load cell uses an RS422 voltage level to communicate with the indicator. The RS422 output may be utilized as either RS422 or TTL depending upon the indicator used. The input is single using RxD A only. The 2097/2197 does not use RxD B. The load cell cable must be wired as follows for the following indicators, (use the wire color codes to match to the connector):

Table 1
2097/2197 Load Cell Cable Wiring Guide

Signal Desc.	2097/2197 Wire Color	*8510 -20XX	*8510 -10XX** TB1	8520 J2	8530 Desk/Rack	8530 Wall	8582 Desk/Wall
RxD A	RED	1	2	RxD A	1	A	1
*** BATT	WHITE	NC	NC	NC	NC	NC	nc
+20VDC IN	GREEN	5	1	+20V	5	E	5
TxD B	YELLOW	NC	NC	TxD B	6	F	6
GND	BLUE	7	4	NGD	7	G	7
TxD A	BLACK	8	3	TxD A	8	H	8

NC = Not Connected

*NOTE: The Model 8510-20XX is the panel mount version of the 8510 which must have the digital load cell harness, part number 13356700A, installed to operate the 2097/2197 base. The 8510-20XX is shipped with a DB-9 connector which must be soldered onto the 2097/2197 load cell cable. The Model 8510-10XX is the stainless steel version of the 8510 which includes the over/under feature. The 8510-10XX SS indicator uses a terminal strip, TB1 on the Power Supply PCB, for load cell connections.

**NOTE: The 8520 Digital Indicator has screw terminal blocks for connecting the digital load cell. The terminal blocks are located inside of the 8520 and are labeled with the same terminology as the 2097/2197 signal description as shown above. To connect the 2097/2197 to the 8520, match the signal descriptions. For example, RxD A at the 8520 terminal block would be connected to RxD aA on the 2097/2197 cable.

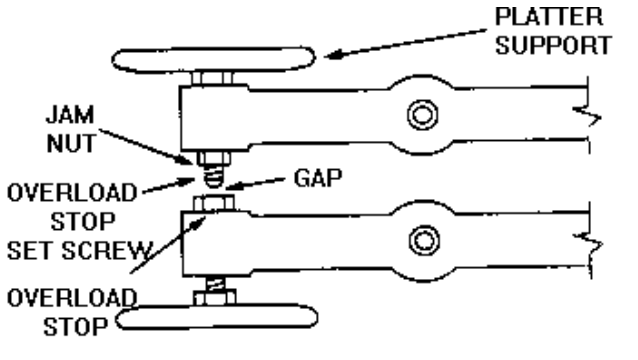
***NOTE: All wires will not be used for all applications. Tape the unused wire ends back with insulating tape to prevent shorting to each other or to other components. The white wire is not used for this application. Tape the wire end back with insulating tape to prevent shorting on other components.

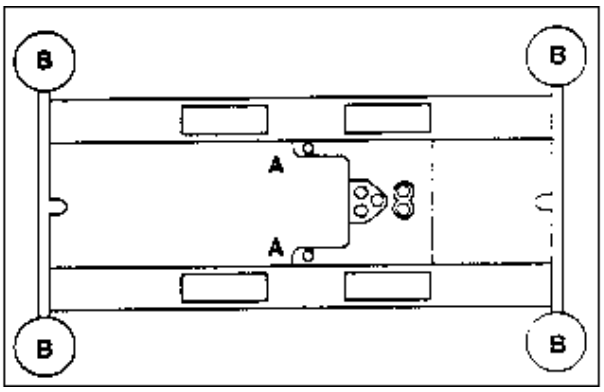
5. MECHANICAL ADJUSTMENTS

5.1 OVERLOAD STOP ADJUSTMENTS

The overload stop gaps must be checked and reset if the top or bottom frame or load cell is replaced. To set the gaps, insert the proper size gap gauge between the screw and post, (refer to Figure 2) then turn the screw until the proper gap is measured. Refer to Figure 3 for the location of the overload stops and Table 2 for the gap settings per Factory Number.

Overload Stop Parts
Figure 2





Overload Stop Locations

Figure 3

Table 2
Overload Gap Specifications for Figure 3

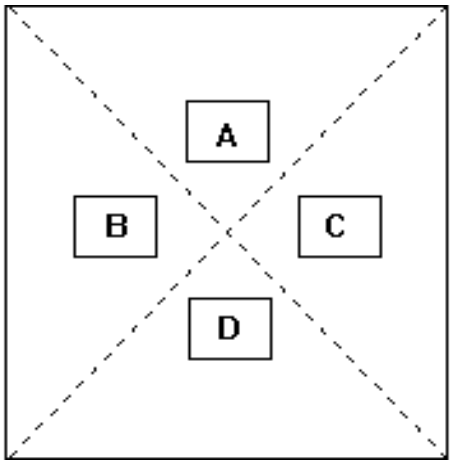
Position	Overload Gap In Inches				Tolerance
	2097-0001	2097-0002	2197-0001	2197-0002	
A	0.016	0.025	0.033	0.043	+0.001
B	0.082	0.191	0.222	0.340	+0.005

5.2 SHIFT TEST

A shift test verifies that all sections of the scale platter weigh within tolerance. If the 2097/2197 does not pass the shift test, verify overload stop settings before replacing the load cell. No adjustment for shift is possible.

Place test weights equal to one-half scale capacity sequentially at each of the positions A, B, C, and D, as shown in Figure 4. Note the indicator reading at each position.

Positions A, B, C, and D are centered halfway between the center and the edges of the scale platter. The following Table 3 shows the tolerances in d (divisions) for the shift test.



Platter Diagram for Shift Test

Figure 4

Table 3
Tolerance Table for Shift Test

Scale Capacity	Test Weight	Acceptance (New Scale) Tolerance	Maintenance (In Service) Tolerance
5,000 d	2,500 d	+/- 1.5 d	+/- 3 d
3,000 d	1,500 d	+/- 1.0 d	+/- 2 D

5.3 DIGITAL LOAD CELL REPLACEMENT

CAUTION! BEFORE CONNECTING OR DISCONNECTING THE LOAD CELL CABLE FROM THE INDICATOR, YOU MUST WAIT AT LEAST 30 SECONDS AFTER REMOVING POWER TO THE INDICATOR. FAILURE TO OBSERVE THIS PRECAUTION MAY RESULT IN DAMAGE TO THE LOAD CELL, THE INDICATOR, OR BOTH.

The digital load cell is secured to the top and bottom frame by three hex head bolts on each end. To remove the load cell follow these steps:

5.3.1 Disconnect power to the indicator. After waiting a minimum of 30 seconds, disconnect the load cell cable from the indicator.

5.3.2 Remove the scale platter. Loosen and remove the top load cell mounting bolts that secure the top frame to the load cell. Exercise care to prevent damage to the metal load cell bellows. Set the top frame aside.

5.3.3 Remove the bottom load cell mounting bolts. The load cell assembly can now be removed from the lower base.

5.3.4 When reinstalling a digital load cell, reverse the preceding steps. **CAUTION! LUBRICATE THE BOLT THREADS AND UNDER THE BOLT HEAD BEFORE RE-ASSEMBLY**. Using a torque wrench, tighten the mounting bolts to the following torque specifications:

2097-0001	-	35 Ft/lb
2097-0002	-	35 Ft/lb
2197-0001	-	90 Ft/lb
2197-0002	-	90 Ft/lb

5.3.5 To properly align the top and bottom frames, center the overload set screws at the corners above their respective overload stops. Refer to Figure 2.

5.3.6 The overload stop settings must be checked and adjusted (if needed). Refer to Section 5.1 for Overload Stop adjustments.

5.3.7 Before applying power to the indicator, connect the load cell cable to the indicator. After connection to the indicator has been made, apply power and allow the indicator and base to warm up for 30 minutes. Calibration with test weights will then be required. Refer to the indicator's technical manual for the calibration procedure. After calibration, refer to Section 5.2 for shift test instructions.

6. TROUBLESHOOTING

6.1 GENERAL

Knowledge of what parts in a "system" perform what functions will aid in isolating specific components that may be malfunctioning. The digital load cell receives a raw DC voltage supply for the indicator and serial transmissions from the indicator. In return the digital load cell supplies the indicator with digital transmissions hat represent weight or error messages.

Troubleshooting in this case is determining if the digital load cell is receiving proper supply voltage and serial transmissions from the indicator. If the required voltage and transmissions are sent to the digital load cell, but data is not being transmitted back to the indicator, the digital load cell has an internal malfunction. In this case, the load cell would need to be replaced.

6.2 SEQUENCE OF COMMUNICATION

Following is a short summary of the sequence of communication between the 2097/2197 digital load cell and a Toldeo digital indicator.

6.2.1 When power is applied, the digital indicator provides 20 VDC to the digital load cell.

6.2.2 The digital load cell converts the 20 VDC raw supply to a 5 VDC regulated voltage.

6.2.3 The digital indicator transmits information to the digital load cell once after initial power up.

6.2.4 The digital load cell performs an A to D cycle and begins to transmit weight data to the indicator. If errors are detected, the load cell will send an error message.

6.3 VOLTAGE MEASUREMENTS

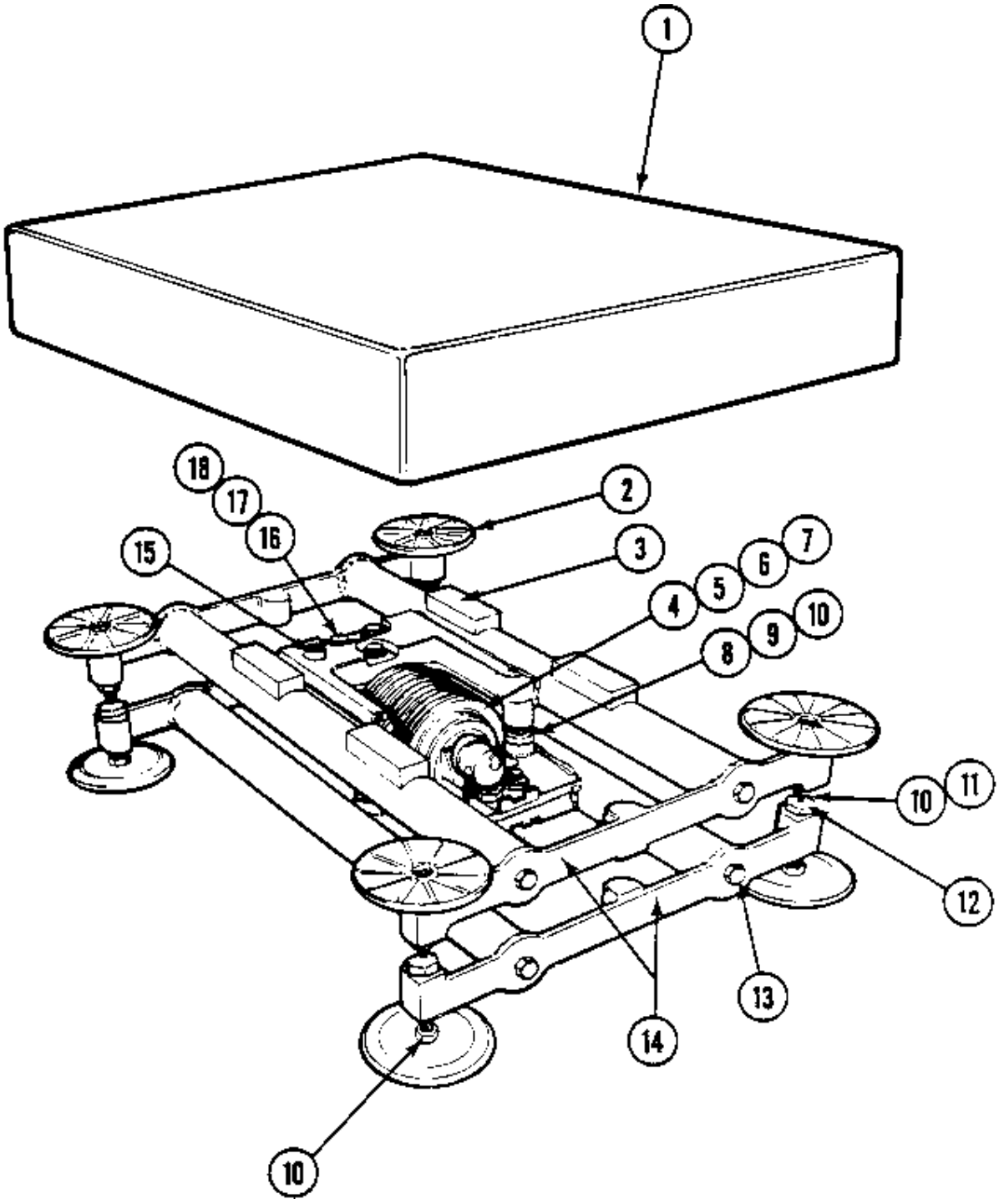
6.3.1 Table 4 shows the voltages that should be observed with a Digital Volt Meter when using the 2097/2197 with the Toledo 8510, 8520, and 8530 indicators, and the 8582 counting scale.

Table 4
Load Cell Voltages

Voltage Range	8510-20XX	8510-10XX	8520	8530	8582
+20 VDC MIN	17.5 VDC	17.2 VDC	17.5 VDC	17.5 VDC	20.7 VDC
+20 VDC MAX	23.0 VDC	23.6 VDC	22.1 VDC	19.9 VDC	24.9 VDC
+20 MAX RIPPLE	100 mV	1-- mV	25 mV	25 mV	75 mV
RxD to GND	4.5-5.0 VDC	4.5-5.0 VDC	4.5-5.0 VDC	4.5-5.0 VDC	4.5-5.0 VDC
TxDA to GND	4.1-4.7 VDC	4.1-5.0 VDC	N/A	N/A	N/A
TxDA to TxDB	N/A	N/A	4.6-4.9 VDC	4.6-4.9 VDC	4.6-4.9 VDC

6.3.2 If the voltages are within the parameters of Table 4, measure RxD to logic ground again while you apply power to the indicator. The voltage should start at 0 VDC then climb to between 3.4 to 3.6 VDC and stay there for about one half second. This confirms the indicator is transmitting the start up data to the load cell when power is applied.

7. REPLACEMENT PARTS



REF. #	2097 PART NUMBER	2197 PART NUMBER	DESCRIPTION	QTY.
1	132554 00A	132555 00A	Platter	1
2	A132541 00A	A132541 00A	Foot/Platter Pad	8
3	132549 00A	132540 00A	Platter Pad	4
4	A130679 00A	N/A	Load Cell, 2097-0001 Digital Herm/Stainless/100 kg	1
5	A130680 00A	N/A	Load Cell, 2097-0002 Digital Herm/Stainless/300 kg	1
6	N/A	A133335 00A	Load Cell, 2197-0001 Digital Herm/Stainless/500 kg	1
7	N/A	A130681 00A	Load Cell, 2197-0002 Digital Herm/Stainless/1000 kg	1
8	A132990 00A	A132990 00A	Overload Stop, Inside	2
9	A133347 00A	133054 00A	Setscrew, Inside	2
10	R03916 00A	R03915 00A	Nut, Hex, 3/8-1/16 x 1/2”	14
11	132587 00A	132580 00A	Setscrew, Outside	4
12	132578 00A	132578 00A	Overload Stop, Outside	4
13	R03928 00A	R03928 00A	Screw, Cap, 3/-1/16 x 1/2”	8
14	135548 00A	135520 00A	Frame, Machined	2
15	102689 00A	102589 00A	Level Indicator	1
16	R03903 00A N/A	N/A R03905 00A	Screw, Hex, 3/8-24 x 2”/SS Screw, Hex, 1/2-20 x 2 1/2”/SS	6
17	R03899 00A N/A	N/A R03901 00A	Washer, Flat, .406” ID/SS Washer, Flat, .531” ID/SS	6
18	R03897 00A	N/A	Nut, Hex, 3/8-24 UNF/SS	6

8. ACCESSORIES

PART	DESCRIPTION	SALES NUMBER
133048 00A	19” Stand-mounted stainless column for mounting 8520, 8530, 8582 wall mount indicators	0924-0038
A134238 00A	Adjustable height stainless stand with casters	0924-0036
135570 00A	Wheel kit for 2197 Stainless Steel Base	0924-0042
135563 00A	Column Mount for mounting Stainless Steel Columns	0924-0046