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MODEL
CD-11 INDICATOR

SERVICE MANUAL

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OHAUS® Model CD-11 Indicator

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TABLE OF CONTENTS

CHAPTER 4 TROUBLESHOOTING

CHAPTER 5 MAINTENANCE PROCEDURES

TABLE OF CONTENTS (Cont.)

LIST OF TABLES

LIST OF ILLUSTRATIONS

CHAPTER 1 INTRODUCTION

1.1 INTRODUCTION

This service manual contains the information needed to perform routine maintenance and service on the Ohaus Indicator, Model CD-11. The contents of this manual is contained in five chapters.

Chapter 1 Introduction - contains information regarding service facilities, tools and test equipment, and specifications.

Chapter 2 Theory of Operation - contains information on the electronic functions of the Indicator.

Chapter 3 Initial Operating Tests - contains inspection procedures, connection to a scale base or simulator and setting up Indicator to the scale base.

Chapter 4 Troubleshooting - contains a diagnosis/diagnostics chart and error message table.

Chapter 5 Maintenance Procedures - contains preventive maintenance procedures, performance tests, disassembly/replacement procedures, exploded view of the Indicator identifying all major components, component drawing of the PC board, and schematic diagram of the Indicator.

Before servicing the Indicator, you should be familiar with the Instruction Manual which is packed with every Indicator.

1.2 SERVICE AREA

To service the Indicator, the service area should meet the following requirements:

- Must be protected from electrostatic discharge.
- Should be temperature controlled and meet the Indicator specifications for temperature environmental requirements. See specifications for temperature range.
- Must be free of vibrations such as fork lift trucks close by, large motors, etc.
- Must be free of air currents or drafts from air conditioning/heating ducts, open windows, people walking by, fans, etc.
- Area must be clean and air must not contain excessive dust particles.
- Work surface must be stable and level.
- Work surface must not be exposed to direct sunlight or radiating heat sources.

1.3 TOOLS AND TEST EQUIPMENT REQUIRED

In order to properly service the Indicator, certain special tools and test items are required in addition to standard electronic tool kits. These items are listed as follows:

1.3.1 Special Tools and Test Equipment List

1. Ohaus Scale Base or Load Cell Simulator.

2. Load Cell Simulator (Measurements Group Model 1550A or equivalent) - optional.

3. Computer with RS232 Interface or Data Printer for optional RS232 Interface.

4. RS232 Interface cable.

TABLE 1-1. COMPUTER INTERFACE CABLES

PART #	DESCRIPTION
80500431	IBM®-PC 25 Pin
80500433	IBM®-PC 9 Pin

5. Data Printer AS142 for use with RS232 communications.

TABLE 1-2. DATA INTERFACE CABLES

PART #	DESCRIPTION
80500432	Cable for Indicator

6. ESD work station or mat.

1.3.2 Standard Tools and Test Equipment List

1. Standard Electronics Tool Kit

2. Digital Voltmeter (DVM), with clip on probes. Input impedance of at least 10 megohms in the 1 Volt dc position.

3. Soldering Iron, solder and flux remover.

1.4 SPECIFICATIONS

Complete specificatons for the Ohaus Indicator, Model CD-11 are listed in Table 1-3. When an Indicator has been serviced, it must meet the specifications listed in the table. Before servicing the Indicator, determine what specifications are not met.

Ambient conditions

The technical data are valid under the following ambient conditions:

- Operating temperature -10°C to 40°C/14°F to113°F
- Storage temperature -40°C to 70°C/-40°F to158°F
- Relative humidity 10%.....95%, noncondensing
- Height above sea level up to 4000m

TABLE 1-3. SPECIFICATIONS

Capacity(lborkg)	5to20,000*
Graduation(readability)lborkg	0.001to5*
DisplayedResolution	1:5000LFTor1:20,000NonLFT*
Weighingmodes	lb,kg,g*
Functions	Partscounting
Overrangecapacity	Capacityplus9d
Stabilizationtime	<3seconds
Auto-zerotrackingcapturerange	0.5,1,or3divisions*
Zeroingrange	2%,18%,or100%ofcapacity*
Spancalibration	push-button(selectablefrom20%to100%ofscalebasecapacity)
Weighingsystem	Analogstraingaugeloadcell
Loadcellexcitationvoltage	5V dc
Loadcellinputsensitivity	Upto3mV/V
Loadcelldrive	60mAat5Vdc(drivesupto4x350ohmloadcells)
Display(in/cm)	LCD(1.0/25.4)
Power	ACAdapter:100,120,220,240Vac,50/60Hzor6alkalineC-typebatteries
Typicalbatterylife	250hourswithone350ohmloadcell
Keyboard	4functionmembraneswitches
Dimensions(WxDxH)(in/cm)	8.25x6.75x3/20.0x17.2x7.7
Shippingpackingdimensions(in/cm)	13x9x5/32x22.5x12.5
Netweight(lb/kg)	1.3/0.6
Shippingweight(lb/kg)	3/1.5

* User selectable

CHAPTER 2 THEORY OF OPERATION

2.1 CD-11 THEORY OF OPERATION

This chapter contains information on the basic operation of the Indicator and circuit descriptions of the printed circuit board. An exploded view drawing is included in Chapter 5 which identifies all components of the indicator. The descriptions in this manual refer to the name of the components identified in the exploded view drawing with the numbered callout. All component items are shown in all caps followed by the callout number.

2.1.1 Power Supply Circuit U13

Power to the indicator is supplied by a 9 V dc, 500mA Power Adapter to connector J7 or by 6 "C" size Alkaline batteries. Power is regulated through U13 (3-terminal positive voltage regulator) to output a regulated +5 V dc which supplies the board.

2.1.2 Power Monitor Circuit U11

Battery voltage is monitored by a power monitor circuit U11. When the battery voltage goes low to a preset point, a reset signal (Low Bat) is sent from the power monitor circuit to the microprocessor U3. The microprocessor activates the display which indicates a low battery voltage condition.

2.2.3 Microprocessor U3

The microprocessor U13 contains a built in RAM, ROM and an LCD driver. Crystal Y1 operates at a frequency of approximately 8 MHz and is used to control the frequency of the microprocessor. The microprocessor provides serial data to the LCD display as well as parameter storage to EEPROM U2. A TTL level signal is also provided to U1 (Max 202) for RS232 communications.

2.2.4 MELSI U5

The MELSI is a digital controller used in conjunction with the A/D Converter. It provides all digital functions required to run two independent A/D channels. The oscillator of the MELSI works with an external crystal (Y2) which operates at a frequency of 11.0592MHz.

2.2.5 Memory Storage

The EEPROM U2 is the user memory storage device for the indicator. It contains 1024 bits of memory and stores the calibration data and the selected units which are enabled and disabled. When the indicator is turned off, all previous settings are retained.

2.2.6 LCD Display Information

The display information for the LCD comes directly from microprocessor U3 and is decoded with it's internal circuits.

2.2.7 Display ON/OFF

The unit contains an ON/OFF button. There is a power-save mode in the software. When this feature is enabled, the indicator will automatically turn off after 5 minutes after last keypad operation.

2.2.8 A/D Converter

The A/D converter takes the analog input voltage from the load cells and produces a

digital output code which represents the analog input. This is derived through U6, U7 and U10 circuitry. A RFI Shield is installed over the A/D circuitry to reduce noise. The SEN line is to compensate for temperature influence. Two jumpers may shorten the SEN and EXC for a four wire system.

2.2.9 Load Cell Excitation Voltage

A six (6) wire interface for analog load cells is provided at J4 located on the bottom of the unit. Excitation voltage for the load cells is +5 Vdc. The indicator is capable of driving up to four (4) 350 ohm cells.

2.2.10 RS232 Operation

The RS232 half-duplex operation is controlled by the microcontroller U3. Signals supported are RXD, TXD and GND. There is no handshake interface. The serial port may receive the external Tare, Zero and Print command in ASCII code.

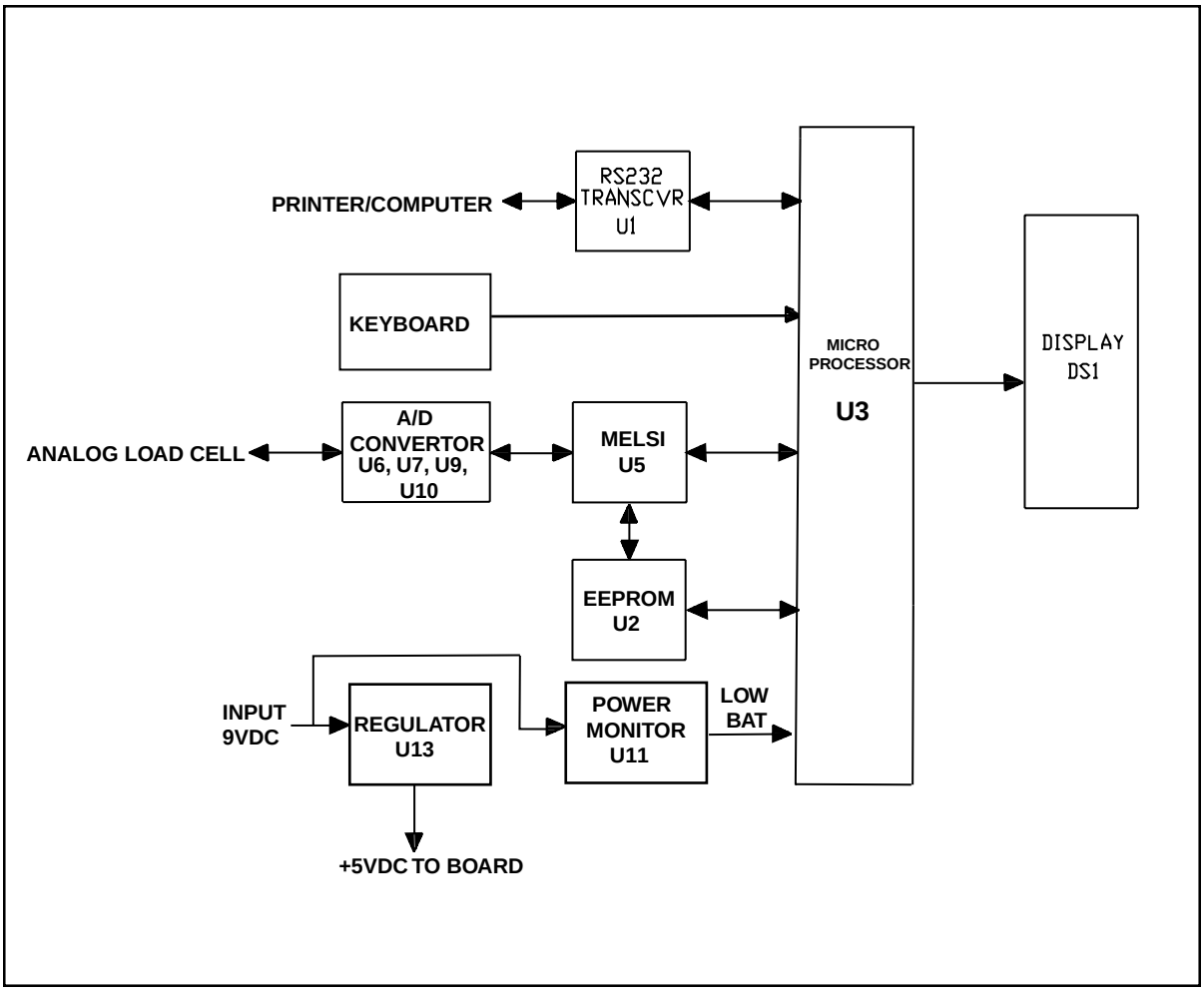


Figure 2-1. CD-11 Indicator, Block Diagram.

3.1 INTRODUCTION

This section of the manual covers the visual inspection of the Indicator, connection to either a known good base or simulator, connecting power to the Indicator, setting up the requirements for the base being used and calibration of the indicator. Follow all directions step by step. Make certain that the work area is clean and use care when handling components of the Indicator.

3.2 VISUAL INSPECTION

Upon receipt of an Indicator, carefully remove the unit from the packing container and remove any packing material which may be fastened to the unit. Note all items which were supplied with the unit such as ac power supply, cables, instruction manual, weights, etc... Keep a record of all items and note their condition.

1. Examine the Indicator for signs of abuse such as a cracked top cover or base, damage from liquids, cracks on corners of Indicator suggesting unit was dropped. ***All of these above conditions will void the warranty.***

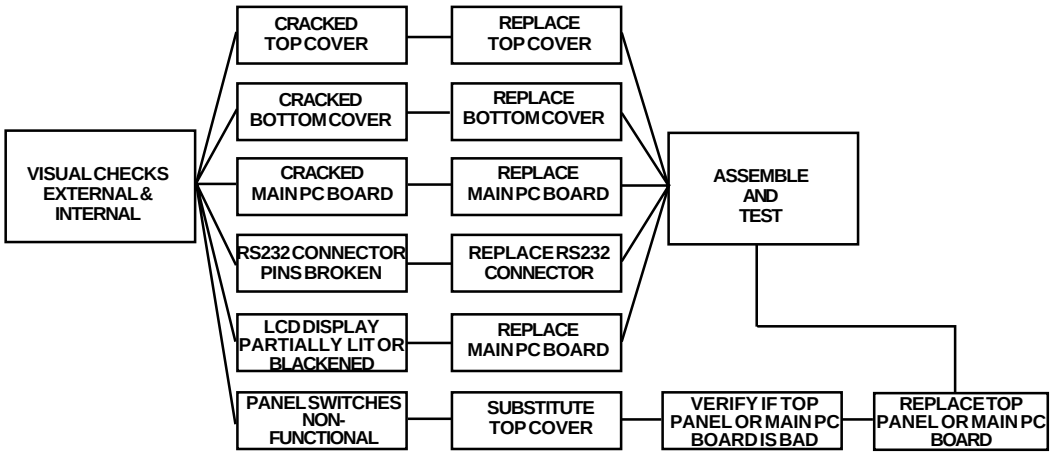
2. At the bottom of the Indicator, remove the battery cover, batteries and the four case screws. Separate the covers and retain all hardware. If the Indicator has been sealed legal for trade, remove the seal to gain access to the one cover screw.

3. Examine the top of the main PC board for cracks or signs of corrosion.

4. If it appears that corrosion may have affected the board and you want to examine the bottom of the PC board, remove the four screws holding the main PC board to the base.

5. Carefully lift out the main PC board and disconnect the cable connector from the cover membrane switches. If the PC board is cracked or shows signs of corrosion, the ***warranty is voided*** and the board requires replacement. Refer to Chapter 5 Maintenance Procedures for board replacement and testing. If the Indicator shows no sign of physical damage, continue with procedures.

   See chart below for visual checking procedures.



CHAPTER 3 INITIAL OPERATIONAL TESTS

3.3 CONNECTING THE INDICATOR TO A SCALE BASE OR SIMULATOR

In order to test the Indicator, connections must be made to a known good operating scale base which is compatible with the Indicator or a simulator such as a model 1550A manufactured by Measurements Group or equivalent.

NOTE: Check the wiring instructions of your scale base and or simulator.

1. Make sure the cover screws are removed.
2. Remove the top cover.
3. Remove batteries if installed.
4. Pass the load cell cable through the liquid tight connector on the left side of the housing.
5. Refer to the color code of the load cell cable and connect the wires to Terminal Strip J4. Tighten all screws securely. The connections are shown for a 6 wire cable. When a 4 wire cable is used, the Jump 1 and Jump 2 jumpers on the PC board must be positioned as shown in Figure 3-1.

For obtaining better performance, it is recommended to keep both JUMP 1 and JUMP 2 jumpers open when a 6-wire load cell is connected to the CD-11.

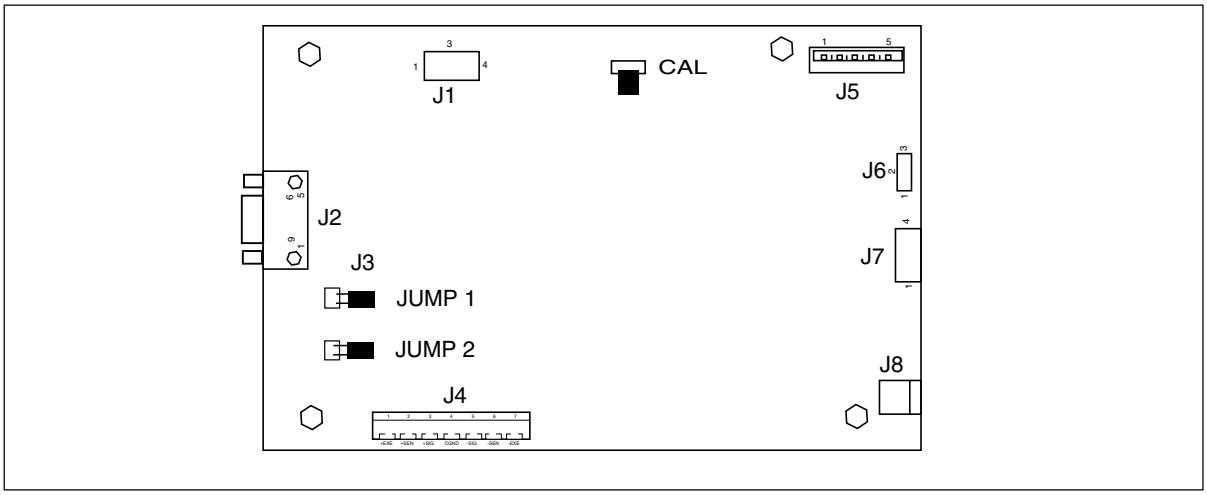


Figure 3-1. Printed Circuit Board Connector Locations.

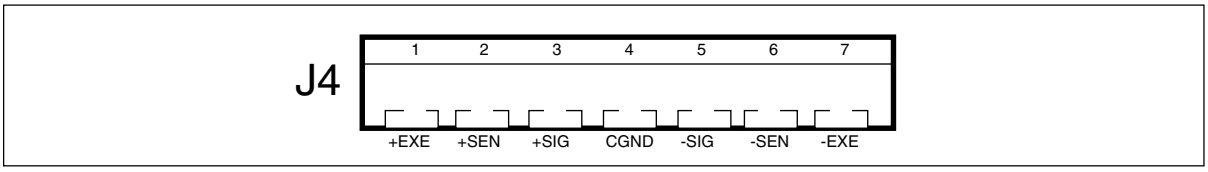


Figure 3-2. Connector J4 Terminations.

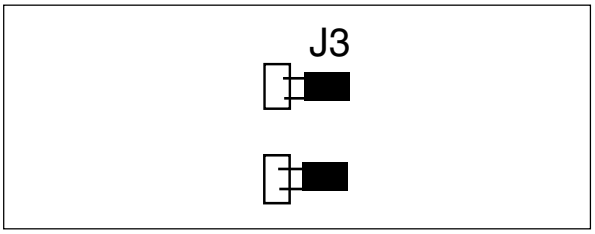


Figure 3-3. 4-Wire Jumper Connections.

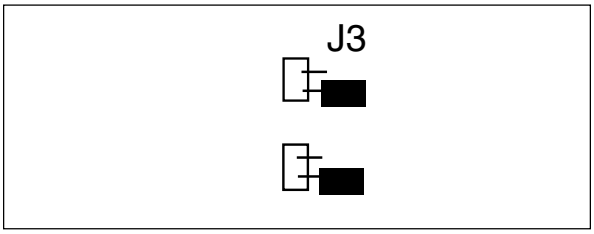


Figure 3-4. 6-Wire Jumper Connections.

3.4 CONNECTING RS232 INTERFACE

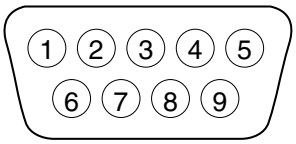
CD-11 Indicator is equipped with a standard IBM™ compatible, bi-directional RS232 interface for communication with printers and computers. When the Indicator is connected directly to a printer or Programmable Logic Controller (PLC), displayed data can be recorded at any time by simply pressing the PRINT button.

Connecting the Indicator to a computer or PLC enables you to operate several functions of the Indicator from the computer, as well as receive data such as displayed weight, weighing mode, stability status, etc.

3.4.1 Hardware

A 9-pin “D” female connector is located at the left side of the Indicator. Pin connections are shown in the Ilustration.

Connect an Ohaus RS232 cable to the Indicator. Testing is done later.



NOTE: Pins are shown on the pin side of a male connector or the wiring side of a female connector.

Figure 3-5. RS-232 Connector Pin Layout.

TABLE 3-1. RS-232 PIN DESIGINATIONS.

1	N/C
2	RXD
3	TXD
4	N/C
5	GND
6	N/C
7	N/C
8	N/C
9	N/C

3.5 CONNECTING POWER

Connect an AC Adapter (9V dc, 150ma) to the connector located at the right-hand side of the Indicator.

3.5.1 Cautionary Note

- Before connecting the AC adapter, verify that the voltage printed on it corresponds to the local mains voltage.

3.5.2 Turning the Indicator ON

NOTICE:
The socket/outlet must be installed near the equipment and shall be easily accessible.

3.5.3 Power ON/OFF

1. Plug the AC adapter to an appropriate power supply. Power is now applied to the Indicator.

2. With the Indicator connected to an appropriate power supply, press the **On/Off** button. The Indicator performs a self-test, indicates the software revision momentarily and then goes to a weighing mode. At this point, the Indicator is on and ready for initial setup.

Stabilization
Before initially using the Indicator, allow time for it to adjust to its new environment. Recommended warm up period is five (5) minutes.

3.6 SCALE BASE SETUP

In this section, you will set up the parameters for the scale base if connected to the Indicator. Before the Indicator can be tested, the parameters for the scale base being used with the Indicator must be set first in order to calibrate and test any functions.

3.6.1 Control functions

The Indicator has five menus; CAL, SETUP, READ, PRINT and LOCSW which are entered by pressing and holding the **Zero/Menu** button until MENU is displayed, then releasing it. The display then switches to CAL. To access the rest of the menus, the **Print/Units** button is repeatedly pressed until the desired menu is reached.

On/Off Button
Turns Indicator on or off.

Print/Units Button
Change between menus horizontally or change sub-menu parameters.

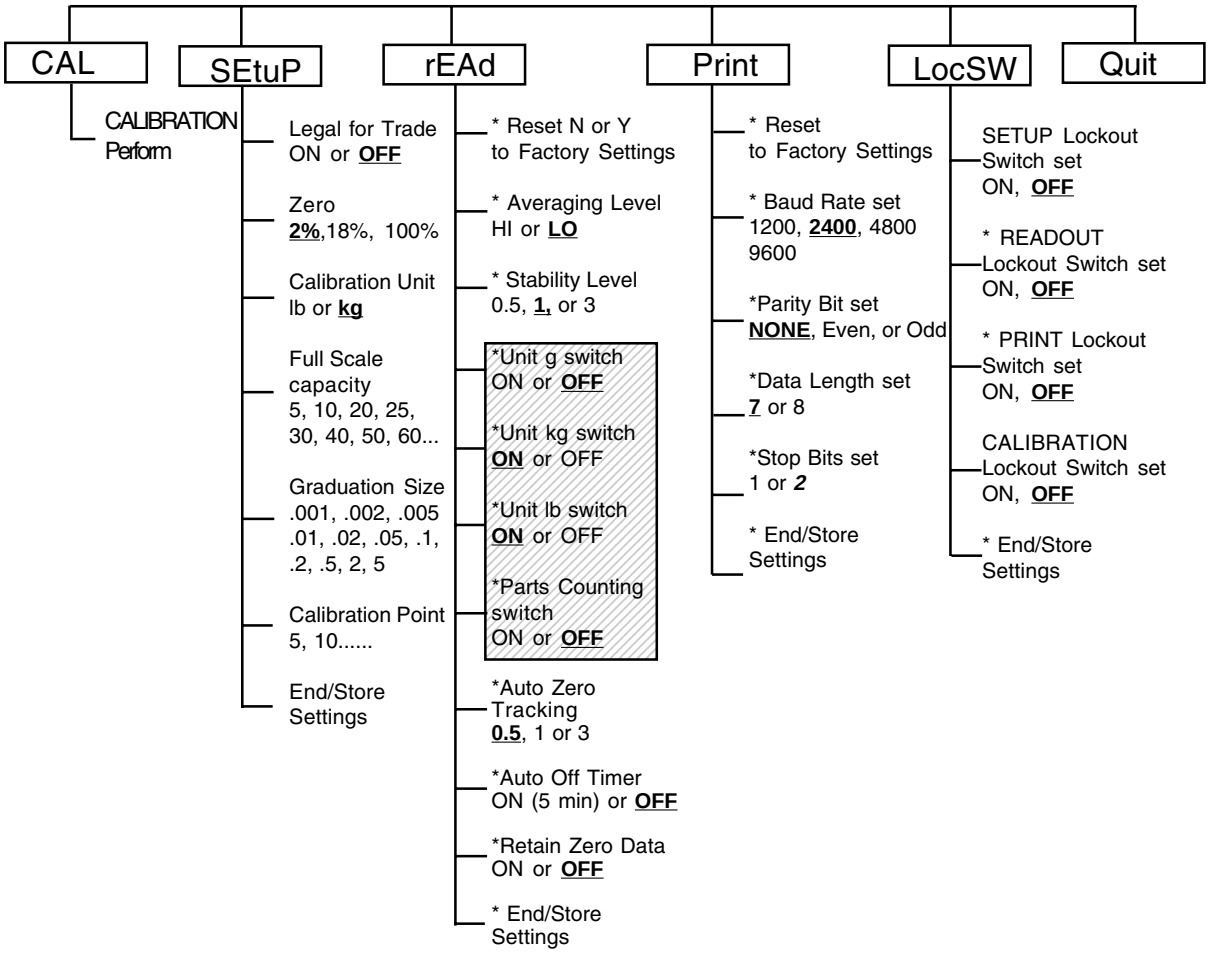
Zero/Menu Button
Press and hold to enter menu. Enters menu and steps through sub-menus vertically.

G/N/T Button
Allows switching between GROSS, NET and TARE weights.

3.6.2 Menu Structure

Table 3-2 illustrates the menu structure in the CD-11 Indicator.

TABLE 3-2. MAIN MENU



Press (**Zero/Menu**) to enter the display sumenu or select a displayed setting.

Press (**Print/Units**) to change the displayed submenu or setting.

Factory default settings are shown in **underlined and boldface** type.

When jumper (CAL) on the circuit board is opened, all of the menus can be reached except CALIBRATION Menu, but only the submenus which are marked ' * ' can be setup, see menu structure.

NOTE: For details about units in shaded area, refer to paragraph 3.8.

3.6 SCALE BASE SETUP (Cont.)

Review the specifications of the scale base to be used with the Indicator. Make sure the settings you select in the Indicator are compatible with the scale base. Below is a Load Cell Scale Capacity (lb or kg) table. Use this table to determine the settings of the Indicator based on the capacity and resolution of the scale base.

3.6.3 Load Cell Capacity Information

TABLE 3-3. LOAD CELL CAPACITY TABLE

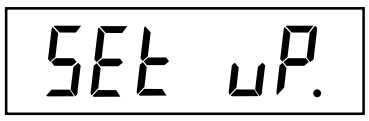
Grad	LOAD CELL SCALE CAPACITIES (LB OR Kg)											
	1000d	1200d	1500d	2000d	2500d	3000d	4000d	5000d	6000d	7500d	10000d	20000d
0.001	-	-	-	-	-	-	-	5	-	-	10	20
0.002	-	-	-	-	-	-	-	10	-	-	20	40
0.005	5	-	-	10	-	-	-	20	25	30	50	100
0.005	5	6	7.5	10	12.5	15	20	25	30	37.5	50	100
0.01	10	-	-	20	25	30	40	50	60	75	100	200
0.02	20	-	30	40	50	60	-	100	120	150	200	400
0.05	50	60	75	100	-	150	200	250	300	-	500	1000
0.1	100	120	150	200	250	300	400	500	600	750	1000	2000
0.2	200	-	300	400	500	600	-	1000	-	1500	2000	-
0.5	500	600	750	1000	-	1500	2000	2500	3000	-	5000	10000
1	1000	1200	1500	2000	2500	3000	4000	5000	-	7500	10000	20000
2	2000	-	3000	-	5000	-	-	10000	-	-	20000	-
5	5000	-	7500	10000	-	-	20000	-	-	-	-	-

3.6.4 Setup Menu

The CD-11 Indicator Setup Menu ***must be entered the first time*** the Indicator is used to set the scale base parameters to match the Indicator. **Do not attempt to calibrate the Indicator** before setting up the Setup Menu.

Procedure

1. With the Indicator ON, press and hold the **Zero/ Menu** button until MENU is displayed. When you release **Zero/Menu** button, CAL is dis played when the CAL jumper on the PC board is in place. When the CAL jumper is removed, the Indicator will not permit calibration. This jumper should be in place initially.



2. Press **Print/Units** button, SETuP is displayed.

3. Press **Zero/Menu** button, LFTOFF is displayed. legal for trade selections are:
   'ON' - LFT is ON
   'OFF' - LFT is OFF.

4. Press **Print/Units** button and select either ON or OFF.

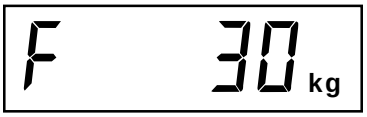
3.6.4 Setup menu (Cont.)

5. Press **Zero/Menu** button, 0 2 is displayed. This is the Zero 2%, 18% or 100% setting. 2% - zero operation range is - 2% to + 2%. 18% - zero operating range is -2% to +18%, 100% - zero operation range is -2% to +100%. **NOTE:** If LFT is ON, only 2% and 18% are available.

5. Press **Print/Units** button, and select either 2%, 18% or 100%.

6. Press **Zero/Menu** button, CAL Un kg is displayed. This is the calibration unit setting. Selections are:
   'lb' - calibration unit is lb
   'kg' - calibration unit is kg.

7. Press **Print/Units** button, and select either kg or lb.

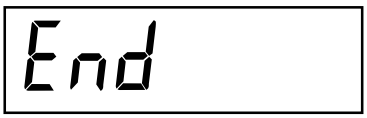


8. Press **Zero/Menu,** F xx is displayed**.** This is full scale capacity selections. xx= value last set. Selections are:
   5, 10, 20, 25, 30, 40, 50, 60, 75, 100, 120, 200, 250, 300, 400, 500, 600, 750, 1000, 1500, 2000, 2500, 3000, 5000, 7500, 10000, 20000 (lb or kg).

9. Press **Print/Units** button until desired capacity value is reached.

10. Press **Zero/Menu** button, Gd0.01 is displayed. This is the graduation size. Refer to paragraph 3.6.1 Load Cell Capacity Information table. For available selections, press **Print/Units** button until desired graduation value is reached.

11. Press **Zero/Menu** button, CP 30 kg is displayed. This is the full scale calibration point setting. The range is from 20% to 100% Full scale capacity. Press **Print/Units** button until desired calibration value is reached.



12. Press **Zero/Menu** button to end this block, END is displayed.

13. Press **Zero/Menu** button, rEAD is displayed which is the next menu or press **Print/Units** button to return to Setup menu.

The Indicator is now matched up with the scale base and the Indicator parameters may now be set and calibrated.

3.7 CALIBRATION MENU PROTECTION

3.7.1 Disabling Legal for Trade Operation

When an Indicator is received sealed and has been been set to operate in a legal for trade application, is is necessary to restore the Indicator to normal operation in order to check out all functions. Legal for Trade (LFT) operation is possible through a software controlled LOCSW menu which can be set to lock out the Calibration, Setup, Readout, and Print menus by setting the lock switch function to ON. Setting the lock switch menu settings to ON locks out the menus. When the menus have been locked out and the Indicator has been calibrated, the Indicator can be used to operate in a legal for trade application after sealing. The software settings works in conjunction with a Lock Switch (CAL jumper) located on the PC board. After disabling LFT, the Indicator must be calibrated. All functions can be checked after calibration. To restore LFT operation after all tests have been made on the Indicator, perform paragraph 3.7.2 and reseal the Indicator. If the Indicator is not set for LFT operation, disregard this procedure.

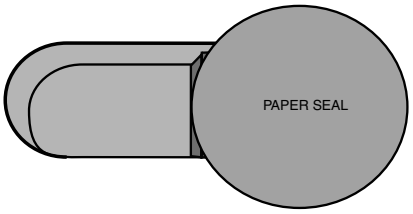


Figure 3-6. Paper Seal.

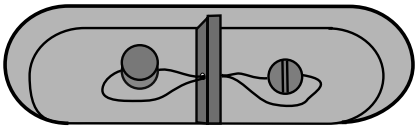


Figure 3-7. Lead Seal.

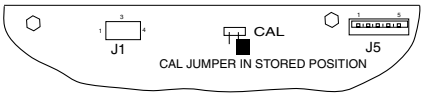


Figure 3-8. CAL Jumper Shown with LFT ON.

Procedure

1. Remove the paper seal from the bottom of the balance.
2. Remove the lead seal.
3. Remove the front cover from the Indicator to expose the PC board, tilt it back. Be careful as the cover is connected to the PC board by a flexible cable.
4. Refer to Figures 3-8 and notice the position of the CAL jumper, this is shown with LFT operation ON. To un-lock the menus, remove the jumper and position it on both pins as shown in the Figure 3-9.
5. Continue with paragraph 3.7.2 and unlock all menu items.

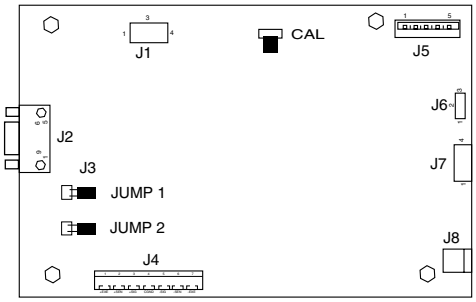


Figure 3-9. CAL Jumper Shown with LFT OFF.

3.7.2 Lockout Switch Menu

Lockout Switch menu (LOCSW) is a software controlled option which can lock the settings in the Calibration, Setup, Readout, and Print menus to prevent tampering. When used in conjunction with the Lock Switch (jumper) on the printed circuit board, the Calibration, Setup, Readout and Print menus can be read only and not changed by an operator.

Procedure

To select any of the items in the Lockswitch menu, proceed as follows: **NOTE**: If you have entered from the preceeding menu, disregard the first step.

1. With the Indicator ON, press and hold the **Zero/ Menu** button until MENU is displayed. When you release the **Zero/Menu** button, CAL is displayed, then press **Print/Units** button, until LOCSW is displayed.

2. Press **Zero/Menu** button, LSTOFF is displayed. This permits locking the Setup menu. OFF is unlocked, ON is read only (locked). This menu is hidden if CAL jumper is off.

3. Press **Print/Units** button, and select ON or OFF.

4. Press **Zero/Menu** button, LrdOFF displayed. This permits locking the Readout menu. OFF is un locked, ON is read only (locked).

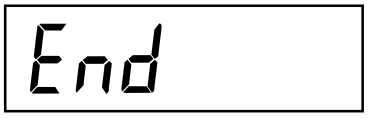
5. Press **Print/Units** button, and select ON or OFF.

6. Press **Zero/Menu** button, LPtOFF is displayed. This permits locking the Print menu. OFF is un locked, ON is read only (locked).

7. Press **Print/Units** button, and select ON or OFF.

8. Press **Zero/Menu** button, LCLOFF is displayed. This permits locking the Calibration menu. OFF is unlocked, ON is read only (locked). This menu is hidden if the CAL jumper is off.

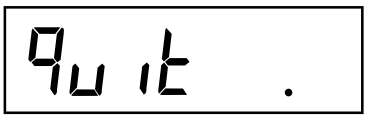
9. Press **Print/Units** button, and select ON or OFF.



10. Press **Zero/Menu** button to end this block, END is displayed.

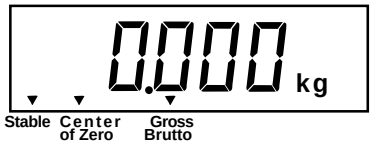
3.7.2 Lockout Switch Menu (Cont.)

Procedure (Cont.)



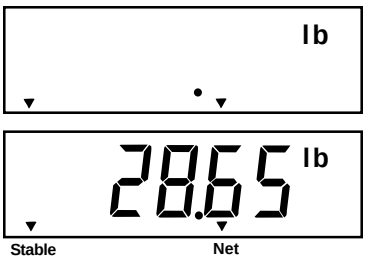
11. Press **Zero/Menu** button, Quit is displayed.

12. Press **Print/Units** button to go to CAL or press **Zero/Menu** button, Indicator returns to a weighing mode.



NOTE: At this point, the Indicator must be calibrated and the jumper removed from the CAL connector in order to lock out the menus. The top cover of the Indicator should be free to gain access to the CAL jumper.

3.8 UNIT SWITCH OPERATION



To switch measuring units, proceed as follows:

Press and hold **Print Units** button until display changes to selected measuring unit. If grams and kg were enabled, you have a choice of g, lb or kg. the display sample indicates 13kg load changed to lbs shown as a net weight because a tared weight of 2kg was used and stored in memory.

If enabled in program mode, additional units of measure may be utilized beyond the primary unit of measure used for callibration or display. Switching between primary and secondary units is accomplished by pressing the **Print/Units** button. Which unit is displayed depends on the current units being used. The following tables detail the graduation size conversions when switching between kg, lb and g.

Cal unit in Lb	Alternate Unit.	Alternate Unit
Lb	kg	g
0.001	0.001	1
0.002	0.001	1
0.005	0.002	2
0.01	0.005	5
0.02	0.01	N/A
0.05	0.02	N/A
0.1	0.05	N/A
0.2	0.1	N/A
0.5	0.2	N/A
1	0.5	N/A
2	1	N/A
5	2	N/A

Cal unit in Lb	Alternate Unit.	Alternate
KG	LB	g
0.001	0.002	1
0.002	0.005	2
0.005	0.01	5
0.01	0.02	N/A
0.02	0.05	N/A
0.05	0.01	N/A
0.1	0.2	N/A
0.2	0.1	N/A
0.5	1	N/A
1	2	N/A
2	5	N/A
5	N/A	N/A

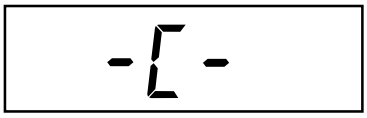
3.9 CALIBRATION PROCEDURES

To verify that the indicator is functioning properly, it must be calibrated prior to testing. After the indicator scale base setup has been performed and matches the test base, perform a span calibration.

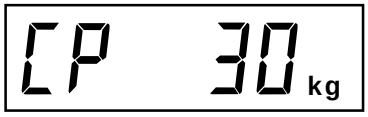
Span calibration ensures that the Indicator reads correctly within specifications using weight values of 20% to 100% of capacity. For best results, calibrate at or near full capacity. Calibration unit can be set to either kg or lb. *When the Indicator is used in Legal for trade applications, the calibration menu is locked out and is not accessable.* This is to prevent unauthorized personnel from changing calibration. Before beginning calibration, make sure masses are available. If you begin calibration and realize calibration masses are not available, exit the menu. The Indicator will retain previously stored calibration data. Masses required to perform the procedures should be in compliance with the requirements of the scale base being used to test the Indicator.

Procedure

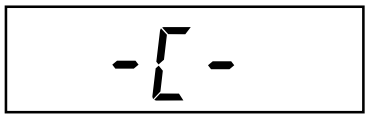
1. With the Indicator ON, press and hold the **Zero/ Menu** button until MENU is displayed. When you release the **Zero/Menu** button, CAL is displayed.



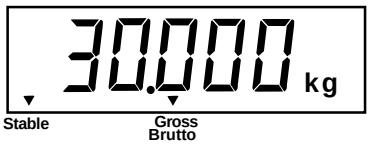
2. Press **Zero/Menu** button, -C- is displayed. The scale base MUST be stable during this period and is establishing a zero point. After a few seconds, the requested weight value is displayed. The sample illustration indicates a 30kg scale. (Cal Point CP was set for 30kg)



3. Place the indicated mass on the platform. Keep the platform stable during this period.



4. Press **Zero/Menu** button, -C- is displayed while the Indicator stores the reading and then displays the weight of the mass.



5. If the calibration was successful, the calibration mass is displayed and the calibration data is saved automatically. If unsuccessful, refer to the troubleshooting section.

6. Remove calibration masses from platform.

NOTE: If the Indicator is to be used for legal for trade applications, it must be calibrated and the jumper removed from the CAL connector in order to lock out the menus. The top cover of the Indicator should be free to gain access to the CAL jumper. You must also set Setup and read LOCSW to ON.

CHAPTER 4 TROUBLESHOOTING

4.1 TROUBLESHOOTING

This section of the manual specifies problem areas of the Indicator which can occur. Information is contained to isolate specific problems using Table 4-1, Diagnostic Guide, and Table 4-2, Error Codes. In order to repair the Indicator, it is necessary that the maintenance technician is fully trained in the repair of instrumentation and have a background in electronics. Follow all directions step by step. Make certain that the work area is clean and use care when handling components of the Indicator.

4.2 DIAGNOSTIC GUIDE

Table 4-1 is a diagnostic guide designed to help locate the problem area quickly and easily. To use the table, first locate the symptom that you are observing. Follow the symptom column and review the probable cause column and remedy column. The probable causes are listed with the most common cause first. If the first remedy does not fix the problem, proceed on to the next remedy. Before attempting to repair the Indicator, read all chapters of this manual to familiarize yourself with the Indicator components and operation. Do not attempt repairs unless you fully understand the operation of the indicator. Refer to the Instruction manual for the CD-11 for detailed operation and menu setup procedures.

4.2.1 Diagnosis

1. Isolate and identify the symptom.

2. Refer to Table 4-1 Diagnostic guide and locate the symptom.

3. Follow the suggested remedies in the order that they appear.

4. Perform the indicated checks, or see the appropriate section of the manual.

5. Repair or replace the defective section of the Indicator.

NOTE:

If more than one symptom is observed, it is necessary to approach one area at a time, and also remember, that the symptoms may be interrelated.

If a problem arises that is not covered in this manual, contact Ohaus Corporation for further information.

CHAPTER 4 TROUBLESHOOTING

TABLE 4-1 DIAGNOSTIC GUIDE

SYMPTOM	PROBABLE CAUSE(S)	REMEDY
Unit will not turn on.	Adapter not plugged in or properly connected.	Check power cord connections. Make sure adapter connector is plugged all the way into the Indicator.
	Batteries dead or not properly installed.	Check battery connector. Check orientation of the batteries. Replace batteries.
Cannot zero Indicator, or will not zero when turned on.	Membrane switch failure.	Check functions of membrane switch.
	Load on scale base exceeds allowable zero % entered in ZERO parameter of Setup menu.	Remove load on scale base to less than entered zero %. Change allowable zero % in ZERO parameter of Setup menu.
Center of Zero display indicator erratic or does not appear with no load on scale base.	Retain Zero Data is enabled in scale menu.	Normal operation when this feature is enabled.
	Scale base motion or disturbances exceed center of zero criteria.	Remove disturbances or reduce motion. Increase AZT level in readout menu. Increase averaging level in readout menu.
Cannot display weight in desired weighing unit.	Desired unit not set to ON in Readout menu.	Enable desired unit in Readout menu.
		Conversion to large (typically in g).
RS232 not working.	RS232 communication parameters set up incorrectly.	Verify communication parameters.
	Improper or loose cable connections.	Check cable connections.
	Scale base disconnected.	Check connections.
Unable to calibrate unit.	SETUP Lockout switch set to ON and jump CAL on the circuit board set to open position.	Set LCL to OFF in the LocSW menu, and set Jump CAL on the circuit board to short position.
	Incorrect value for calibration mass.	Use correct calibration mass.

4.3 ERROR CODES

The Indicator is equipped with software which will display an error condition when it occurs. Table 4-2 Error Codes, describes the various error codes which can appear on the display.

TABLE 4-2. ERROR CODES

DISPLAY	CONDITION
LoBat	Is indicated when batteries are weak. Approximately 20 minutes of operating time remains.
Error 1	Indicates an overload condition.
Error 2	Indicates an underload condition.
Error 7	EEPROM data incorrect.
Error 14	Zero exceeds ZERO% and cannot be zeroed.
Err 21	Calibration data does not match current full scale, Grad and Cal Point settings. Settings must be restored or the Indicator must be recalibrated using the current settings.

CHAPTER 5 MAINTENANCE PROCEDURES

5.1 PREVENTIVE MAINTENANCE

Ohaus Indicators are precision instruments and should be carefully handled, stored in a clean dry area which is dust free, and cleaned periodically. The Indicator will resist most common laboratory materials. However, it is recommended that when an Indicator has had chemicals or liquids spilled on it, the Indicator should be cleaned as soon as possible. Use warm water on a damp cloth to clean all exterior surfaces. When moving the Indicator from a storage area which is at a different temperature than the area where the Indicator is to be operated, allow at least 10 minutes for the Indicator to temperature stabilize.

5.1.1 Preventive Maintenance Checklist

On a regular basis, the Indicator should be inspected and checked as follows:

1. Unplug the AC Adapter before cleaning.

2. Clean the outside of the Indicator using a damp cloth with water.

CAUTION

DO NOT USE CHEMICAL CLEANERS OR SOLVENTS OF ANY TYPE. SOME CLEANERS ARE ABRASIVE AND MAY AFFECT THE FINISH OF THE INDICATOR.

3. Check the AC Adapter power cord for broken or damaged insulation.

4. Make a visual inspection for faulty connectors, wiring, and loose hard ware.

5.2 TESTING

Before servicing the Indicator, operational and performance tests should be made to ascertain whether or not the Indicator meets specifications. Turn the Indicator ON and allow it to warm up for at least 10 minutes before performing these checks. The masses used for calibration should be ASTM Class 4 tolerance or better.

5.2.1 Power Test

The purpose of this test is to determine if the electronic circuitry of the Indicator is functioning properly or not at all. In some cases, the AC Adapter supplied with the Indicator may have become defective.

1. Connect a functioning AC Adapter to the Indicator power plug.

2. Plug the AC Adapter into a suitable power source.

5.2.1 Power Test (Cont.)

3. With the Indicator connected to an appropriate power supply, press the **ON/OFF** button. The Indicator performs a self-test, indicates the software revision and then goes to a weighing mode.

4. If all of the displays appear normal in this test, continue with the next test. If the display did not appear, check the ac adapter output and repeat test with a good adapter. If the display was erratic, the PC board is defective and requires replacement.

5.2.2 Setup Parameters

Programmable features of the Indicator are contained in menus.

The Indicator must be properly set in order for test results to be valid. Use the following procedure to match the capacity of the scale base being used for testing. The menus should be set as follows:

1. Set legal for trade OFF.

2. Calibration Unit, set to lb.

3. Full scale capacity - must match scale base capacity.

4. Graduation size - set to information in Table 3-3 Load Cell Capacity Table. Refer to paragraph 3.6.1.

   If Legal for trade is set ON, resolution (Capacity ÷ Graduations) is limited to 5,000 divisions. The graduation selections available are limited by the capacity entered under Full Scale Capacity to prevent a combination which exceeds 20,000 divisions.

   If the graduation size is selected does not meet the resolution requirement, the Setup menu cannot be exited. An error message is displayed. A valid graduation value *must* be selected.

EXAMPLE:

For any scale:

TEST LOAD	TOLERANCE
0 - 500e	± 0.35e
>500 - 2000e	± 0.70e
>2000 - 4000e	± 1.05e
>4000 - 5000e	± 1.75e

n_{max} = 5000e

where e = verification scale interval for legal for trade applications (LFTreadability).

5.2.2 Setup Parameters (Cont.)

When using a scale base with a 30 x .01 lb capacity to test the indicator, a graduation size of 0.002 would be entered. This provides a resolution of 1:15,000.

(e)	TEST LOAD (LB)	(e)	TOLERANCE (LB)
0	0	±0.35	± 0.002
500	5	±0.35	± 0.002
1500	15	±0.70	± 0.006
2000	20	±0.70	± 0.006
3000	30	±1.05	± 0.010

NOTE:

The tolerances have been rounded down to the nearest displayed division size.

5.2.3 Performance Tests Using a Scale Base

This test is performed on the Indicator using a known good scale base and test mass. At this point, the Indicator has been checked for full display, menu setup and calibrated. If a Load Cell Simulator is being used, proceed to paragraph 5.2.4. Select the maximum possible resolution (≤1:20,000) to obtain the most accurate test results.

5.2.3.1 Increasing/Decreasing Load Test

This test determines the accuracy of the Indicator to display a full range of values from 0 lbs to full capacity and back to 0 lbs.

NOTE:

This test is based on using a 30 lb scale base.
FS Cap = 30, Grad = .002.

1. With no mass on the scale base, the Indicator should display, 0.000, ± 0.002 lb.
2. Place a 5 lb mass on the scale base. The Indicator should display, 5.000, ± 0.002 lb.
3. Place a 15 lb mass on the scale base. The Indicator should display, 15.000, ± 0.006 lb.
4. Place a 20 lb mass on the scale base. The Indicator should display, 20.000, ± 0.006 lb.
5. Place a 30 lb mass on the scale base. The Indicator should display, 30.000, ± 0.010 lb.
6. Place a 20 lb mass on the scale base. The Indicator should display, 20.000, ± 0.006 lb.
7. Place a 15 lb mass on the scale base. The Indicator should display, 15.000, ± 0.006 lb.
8. Place a 5 lb mass on the scale base. The Indicator should display, 5.000, ± 0.002 lb.
9. With no mass on the scale base, the Indicator should display, 0.000, ± 0.002 lb.

5.2.4. Performance Tests Using a Load Cell Simulator

A simulator can be used in place of a scale base if available. At this point , the Indicator should have been checked for a full display, menus set and calibrated. Determine the accuracy of the Indicator to display a full range of values from 0 lbs to full capacity and back to 0 lbs.

5.2.5 Overload/Underload Test

This test determines if the Indicator displays the proper indication when an underload or overload condition exists on the scale base.

1. With the Indicator ON and no mass on the scale base, lift up on the scale base platform and observe the display. The display should indicate Error 2. Release the platform, the display should return to zero.

2. Place a mass on the scale base platform which exceed the capacity of the scale base and observe the Indicator display. The display should indicate Error 1. Remove the mass from the scale base, the display should return to zero.

5.2.6 Calibration Retention

This test checks that the Indicator retains calibration after power is removed and then restored.

1. Turn the Indicator OFF and disconnect the AC Adapter.

2. Wait one minute, reconnect the AC Adapter to the Indicator.

3. Check to insure that the Indicator retained calbration settings.

5.2.7 RS232 Interface Test

The RS232 Interface performance can be monitored using an external printer or computer connected to the Indicator.

The RS232 Interface is a bi-directional interface which enables the Indicator to communicate with a printer or computer equipped with an RS232 serial port. The RS232 menu enables various parameters such as Baud rate, Data bits, Stop bits, values to be set by the function switches on the indicator. Table 5-1 illustrates the RS232 menu structure.

TABLE 5-1. RS-232 MENU STRUCTURE

RS232	
Baud	1200, **2400**, 4800, 9600
Parity	**None**, -E-, -Odd-
Data	**7** or 8
Stop	1 or **2**
Exit	

5.2.8 Print Menu Setup

To test the RS232 interface, the Print menu has to be entered and parameters set to match either the external printer or computer interface requirements.

Procedure

To select any of the items in the Print menu, proceed as follows: **NOTE**: If you have entered from the preceeding menu, disregard the first step.

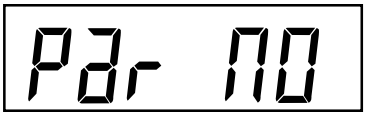
1. With the Indicator ON, press and hold the **Zero/ Menu** button until MENU is displayed. When you release the **Zero/Menu** button, CAL is displayed, then press **Print/Units** button, until Print is displayed.

2. Press **Zero/Menu** button, rESEtn is displayed. This allows resetting the Print menu to factory defaults. rESETn = no does not reset settings. rESETy= yes will reset the entire Print menu as follows:
   Baud rate =2400, parity =none, data length=7, stop bit=2.

3. Press **Print/Units** button, and select N or Y.

4. Press **Zero/Menu** button, bd2400 displayed.

5. Press **Print/Units** button, and select desired baud rate. Baud rate selections are: 1200, 2400, 4800 and 9600. 2400 is the default setting.



6. Press **Zero/Menu** button, PAr NO is displayed. This is the parity bit.

7. Press **Print/Units** button, and select desired parity of NO=none, Odd=odd, E=even. Default setting is none.

8. Press **Zero/Menu** button, dAtA 7 is displayed. This is the data length.

9. Press **Print/Units** button, and select desired data length of 7 or 8. Default setting is 7.

10. Press **Zero/Menu** button, StOP 2 is displayed. This is the stop bit.

5.2.8 Print Menu Setup(Cont.)

Procedure (Cont.)

11. Press **Print/Units** button, and select desired stop bit of 1 or 2. Default is 2.

12. Press **Zero/Menu** button to end this block, END is displayed.

13. Press **Zero/Menu** button, LOCSW is dis played which is the next menu or press Print Units button to go back to the Print menu.

    (If initial setup, go to the next paragraph. To exit from the Print menu Setup, press **Prints/Units** button to skip to PRINT then to LOCKSW, then QUIT.

14. Press **Zero/Menu** button to go back to the weighing mode).

5.2.9 Print Test

Printing data to an external computer or printer requires that the communications parameters in the Print menu are set.

Procedure

1. Press the **Print/Units** button. Printing to an external printer or computer will occur each time the **Print/Units** button is pressed.

5.2.10 RS232 Commands

All communication is accomplished using standard ASCII format. Characters shown in the following table are acknowledged by the Indicator. Invalid command response "ES" error indicates the Indicator has not recognized the command. Commands sent to the Indicator must be terminated with a carriage return (CR) or carriage return-line line feed (CRLF). Data output by the Indicator is always terminated with a carriage return - line feed (CRLF).

5.2.11 Output Formats

Data output can be initiated in one of two ways: 1) By pressing PRINT/UNIT; 2) Sending a print command (“P”) from a computer.

5.3 REPLACEMENT OF MAJOR COMPONENTS

The decision to replace any component should only be made after thoroughly diagnosing the problem.

If, after the replacement of any component, the Indicator is still non functional and no other information on the subject is available in the manual, contact:

Ohaus Corporation
29 Hanover Road
Florham Park, NJ 07932 USA
Tel: 973-377-9000
Fax: 973-593-0359

In the United States call Ohaus Aftermarket toll free, 800-526-0659 between 8:00 a.m. and 4:00 p.m. EST.

5.3.1 Main Printed Circuit Board Replacement

The circuitry used on the printed circuit board is very complex. Troubleshooting the Main PCB requires an Oscilloscope, DVM, hand tools, and should only be attempted by a trained technician. Repairs are not recommended on the Main PC board. Component parts of the PC board are not stocked by Ohaus. Replacement of the Main PC board is recommended rather than repairing.

1. Unplug Indicator from the AC Adapter.

2. Remove the four screws (B2) from the Base (6).

3. Carefully separate the Top Cover (2) and Base (6).

4. Disconnect wires from the terminal block coming from the scale base.

5. Remove the four screws (B2) from the Main PC board (3). See Figure 5-2.

CAUTION

When handling the PC board, grasp it by the edges only! Do not touch the foil side. Static discharge may damage some components.

6. Remove the two screws from the RS232 connector located on the left side of the Base.

5.3.1 Main Printed Circuit Board Replacement (Cont.)

7. Carefully remove the ribbon cable from the Main PC board connector located on the right-hand corner. This is the membrane switch connector.

8. Remove the battery connector plug and the power jack plug from the right-hand side of the Main PC board. Each connector has a small locking tab which has to be pried out slightly to release the plug from the board.

9. Lift out the Main PC board (3).

10. Replace the Main PC board for any of the following reasons:
    A. If the display is defective; characters missing or partial display.
    B. Fails to calibrate properly.
    C. Display is erratic or unstable.
    D. Certain functions not operational.
    E. Does not operate at all.

11. Replace the Main PC board and secure with four screws (B2).

12. Connect the ribbon cable from the Cover to the Main PC board and the power and battery connectors.

13. Reconnect test scale base wires to terminal block.

14. Place Cover (2) into position on the Base (6) and secure with the four screws (B2) previously removed. Secure the RS232 connector with the two screws previously removed and perform scale base setup procedures in paragraph 3.6.

15. Perform calibration procedures in paragraph 3.8.

16. Perform testing procedures in paragraph 5.2.

5.3.2 Power Connector Harness Replacement

1. Unplug Indicator from the AC Adapter.

2. Disconnect wires from the terminal block coming from the scale base.

3. Remove the four screws (B2) from the Base (6).

4. Carefully separate the Top Cover (2) and Base (6).

5. Unscrew the nut holding the power connector to the Base (6).

6. Remove the power jack plug and wiring harness (5) from the right-hand side of the Main PC board. The connector has a small locking tab which has to be pried out slightly to release the plug from the board.

5.3.2 Power Connector Harness Replacement (Cont.)

7. Replace the Power Connector Harness and install the Power Connector in the Base and secure with the locking nut previously removed. Make sure the connector is properly installed on the Main PC board.

8. Place Cover (2) into position on the Base (6) and secure with the four screws (B2) previously removed.

5.3.3 Battery Connector Harness Replacement

The Battery Harness (4) comes complete with a connector and wire leads. When the connector is damaged or the wire leads are damaged, replace as follows:

1. Unplug Indicator from the AC Adapter.

2. Disconnect wires from the terminal block coming from the scale base.

3. Remove the four screws (B2) from the Base (6).

4. Carefully separate the Top Cover (2) and Base (6).

5. Remove the battery connector plug from the right-hand side of the Main PC board. The connector has a small locking tab which has to be pried out slightly to release the plug from the board.

6. Unsolder the wires from the Battery Reeds (9) and (11). Remember the polarity, the red wire (positive) is connected to Battery Reed (9), the black wire (negative) is connected to Battery Reed (11) with the spring.

7. Install the replacement Battery Harness (4) and solder the wires to the Battery Reeds .

8. Place Cover (2) into position on the Base (6) and secure with the four screws (B2) previously removed.

5.3.4 Top Cover/Keyboard Overlay Replacement

When the Top Cover has to be replaced, the Keyboard Overlay has to replaced also. Make sure both items are on hand before replacing the Top Cover.

1. Unplug Indicator from the AC Adapter.

2. Disconnect wires from the terminal block coming from the scale base.

3. Remove the four screws (B2) from the Base (6).

4. Carefully separate the Top Cover (2) and Base (6).

5. Disconnect the ribbon cable from the Main PC board (3) coming from the Top Cover (2).

5.3.4 Top Cover/Keyboard Overlay Replacement (Cont.)

6. If just the Keyboard Overlay has to be replaced, lift the Overlay off from the Top Cover. The Keyboard Overlay is held in place with a strong adhesive. Clean the Top Cover and remove all traces of adhesive. If a new cover is to be replaced, a new Keyboard Overlay is also required.

CAUTION

In the next step, use care when placing the overlay into position as the adhesive will not allow repositioning once attached to the cover.

7. Remove the protective backing from the back of the new Keyboard Overlay and insert the ribbon cable though the slot in the Top Cover (2). Position the Keyboard Overlay (1) on the Top Cover (2) near the bottom of the cover. Using a rolling motion, smooth the Keyboard Overlay into position.

8. Connect the ribbon cable from the Top cover back into the connector on the Main PC board.

9. Position the Top Cover (2) on the Base (6) and secure with the four screws (B2) previously removed.

10. Connect scale base wires, connect power cord and install batteries and Battery Cover (12).

5.3.5 LCD Replacement (optional procedure)

1. To replace the LCD, follow the procedure in paragraph 5.3.1 and remove the Main Printed Circuit Board (3) from the Base (6).

2. Turn the Main Printed Circuit Board (3) over to expose the solder connections. Using a solder remover, remove all solder from the pins on the LCD.

3. On the solder side of the PC board, squeeze the LCD support arms protruding at the bottom of the board together to release it from the PC board. Do this for each support, then carefully remove the LCD.

4. Position the replacement LCD on the support arms and insert the pins of the LCD in the PC board.

5. Solder the pins of the LCD.

6. Reassemble the Indicator, connect scale base, power and batteries.

5.4 DRAWINGS

This section of the manual contains exploded views, schematic diagrams, and printed circuit board layout drawings for the CD-11 Indicator. The exploded view drawing is designed to identify the parts which can be serviced on the Indicator in the field.

.

NOTE:
When the PC board is replaced, the Indicator must be thoroughly checked after the replacement is made. The Indicator **MUST** meet the parameters of all applicable specifications in this manual.

If further technical information is needed, in the United States call Ohaus Aftermarket toll-free 1-800-526-0659 between 8.00 a.m. and 4.00 p.m. EST. An Ohaus factory service technician will be available to provide assistance. Outside the U.S.A., please contact:

Ohaus Corporation
29 Hanover Road
Florham Park, NJ 07932, USA
Tel: (973) 377-9000,
Fax: (973) 593-0359

5.4 DRAWINGS (CONT.)

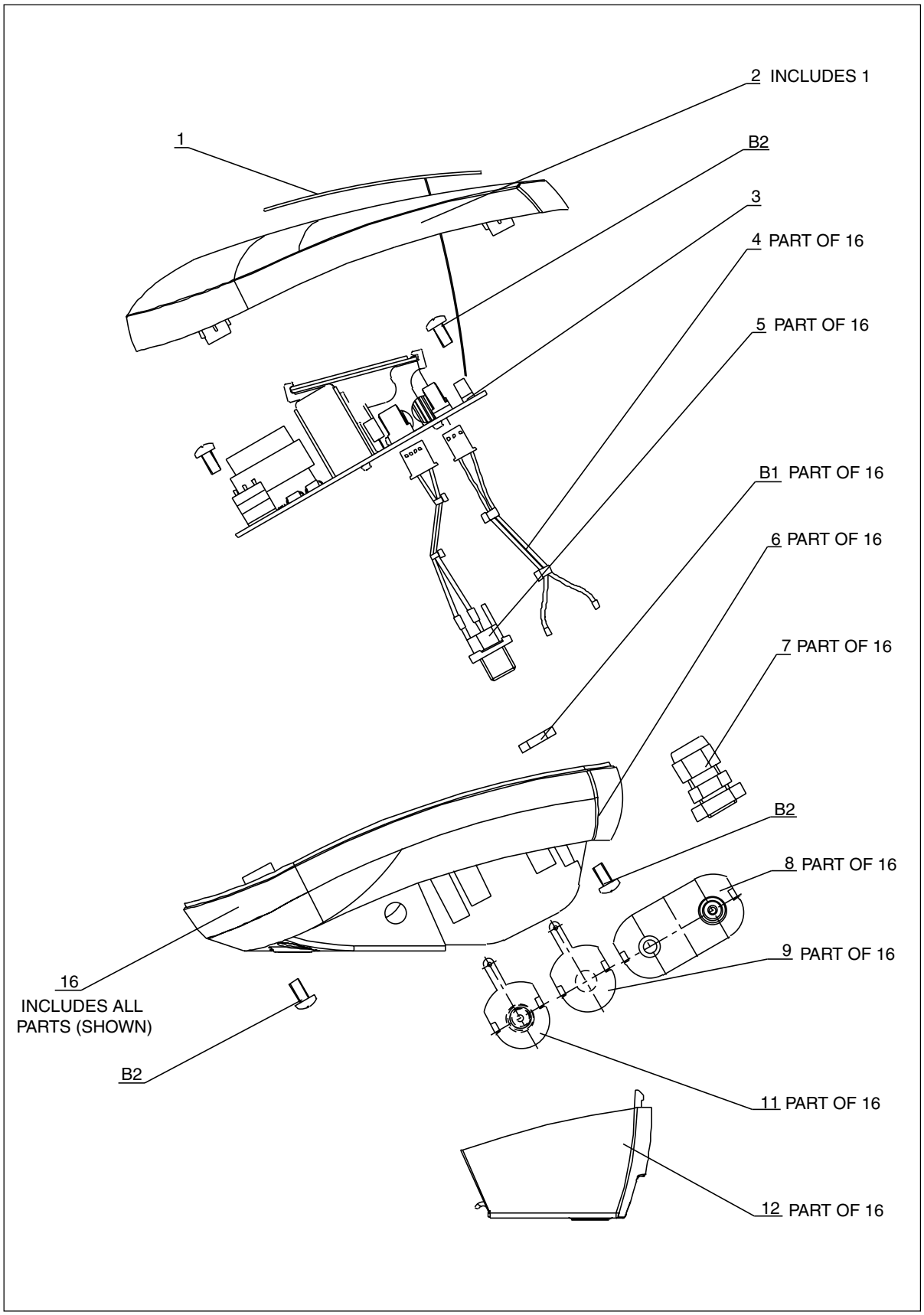


Figure 5-1. Exploded View of CD-11 Indicator.

5.4. DRAWINGS (CONT.)

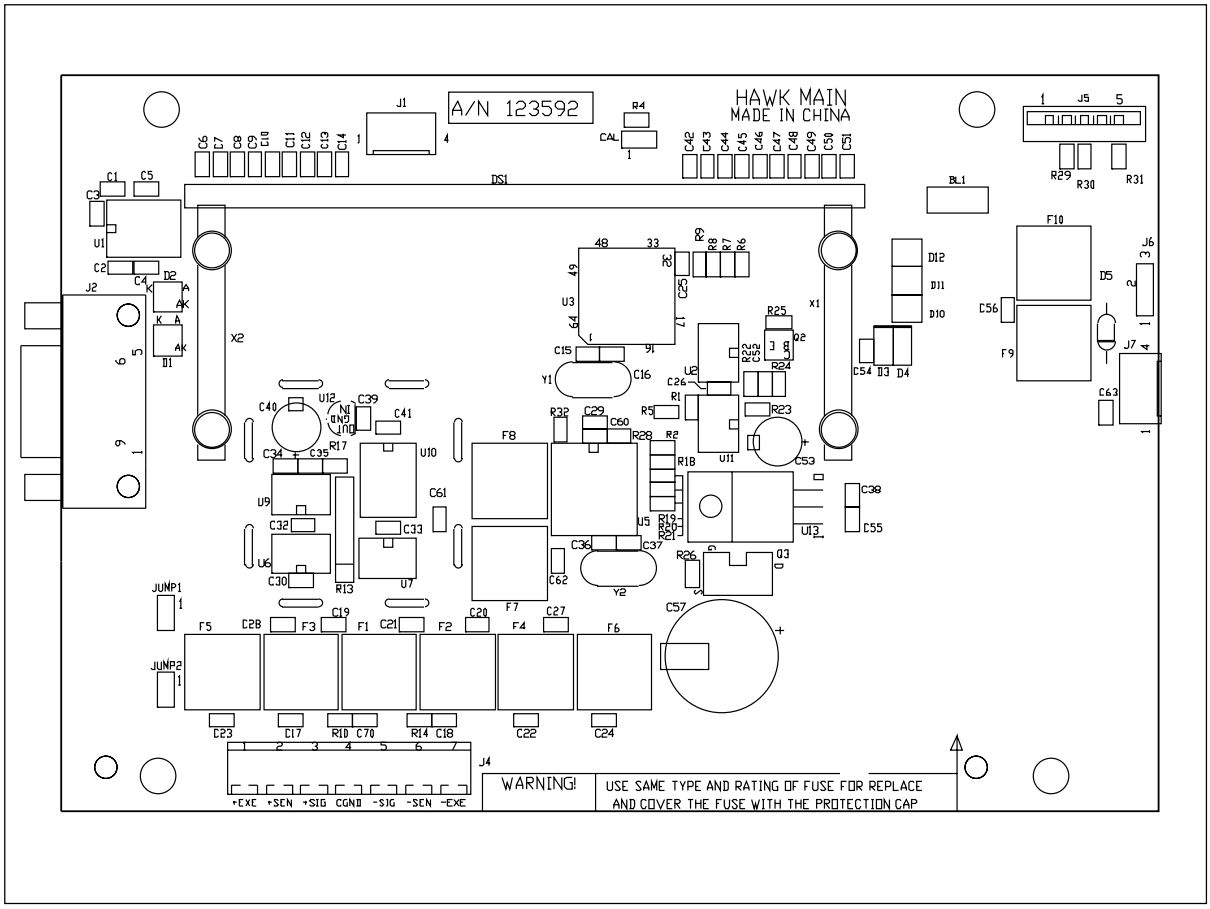


Figure 5-2. Main PC Board, Component Layout Drawing.

5.4 DRAWINGS (CONT.)

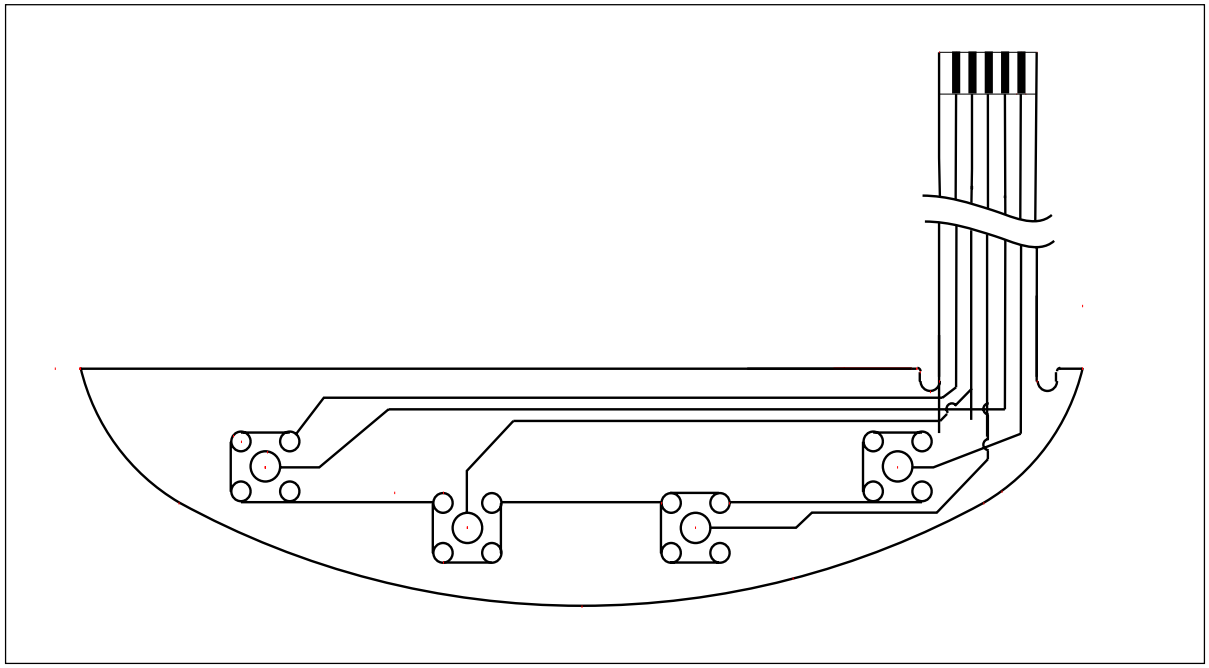


Figure 5-3. Keyboard Wiring Diagram.

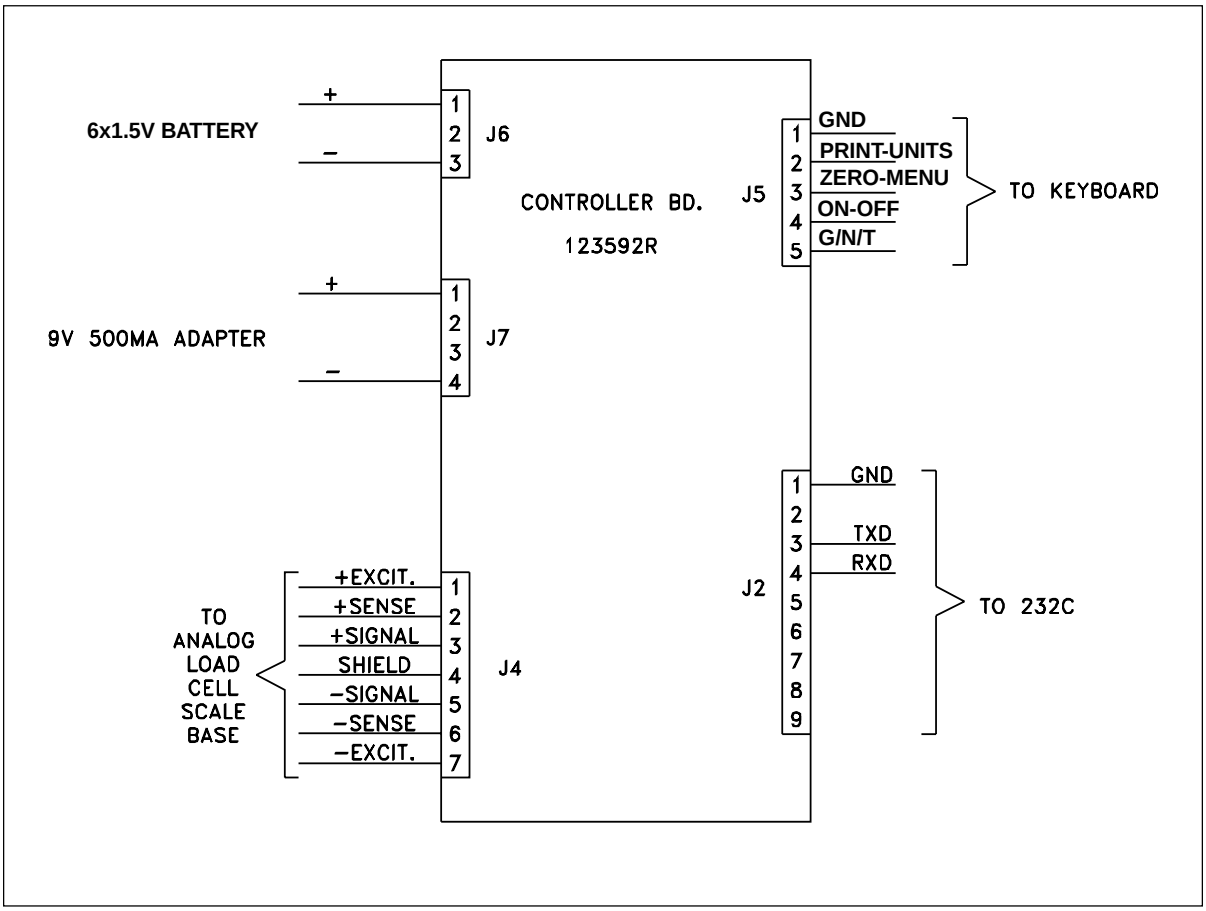


Figure 5-4. Interconnection Diagram.

SYMBOL	DESCRIPTION	+5V	GND	+5E	AGND	BYPASS
U1	MAX202	16	15			C1
U2	93C46	8	5			C26
U3	TMP89CH29U	32	1			C25
U4						
U5	MELSI2-B	20	10			*
U6	LTC1050			7	4	C30
U7	LTC1050			7	4	C31
U8						
U9	TLC393			8	4	C34
U10	74HC4053			16	8	C33
U11	MAX708	2	3			C38
U12	LP2950			*	*	*
U13	LM2931	*	*			*

MELSI2-B USE +5M
* – SHOWN ON SCHEMATIC

Figure 5-5. CD-11 Schematic Diagram. 5-15/5-16

5.5 PARTS LIST

This section of the manual contains the replaceable parts for the Model CD-11 Indicator.

TABLE 5-2. REPLACEMENT PARTS LIST.

KEY NO.	PART NO.	DESCRIPTION
1	80250678R	Membrane Switch, CD-11
2	80250676R	Top Housing with Membrane Switch
3	80500451R	PCB Assembly CD-11 complete
4	N/A	Battery Harness, Part of 16 (Base)
5	N/A	Adapter Harness, Part of 16 (Base)
6	N/A	Bottom Housing Only, Part of 16 (Base)
7	N/A	Cord Connector, Part of 16 (Base)
8	N/A	Battery Connector, Part of 16 (Base)
9	N/A	Battery Connector, Part of 16 (Base)
11	N/A	Battery Connector, Part of 16 (Base)
12	N/A	Battery Cover, Part of 16 (Base)
16	71132083	Base Assembly, CD11
B2	Reference	M4 x 6 Screw (4)