WEIGH SYSTEM TECHNOLOGY

VISHAY PRECISION GROUP

BLH

LCc-II Cell Calibrator
Operator's Manual

TM036
RevC
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Doc 35113

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Call (781) 298-2216 for BLH Field Service

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SECTION 1. General LCc-II Information

1.1 INTRODUCTION

This manual contains installation, operating, and troubleshooting instructions for the BLH LCc-11 Load Cell Calibrator (Figure 1-1). Use this manual in conjunction with the appropriate load cell manual(s) to configure the LCc-11 operating system.

1.2 GENERAL DESCRIPTION

The LCc-II load cell calibration indicator uses microprocessor technology to store ten individual, ten point linearized, load cell calibration curves. This capability allows this device to be used as a calibration force measurement indicator with up to ten different load cells. In addition, the LCc-II is pre-configured at the factory to read actual load cell mV/V outputs for use as a measurement standard with virtually any load cell or other Wheatstone bridge based transducer. For portability, a ruggedized enclosure with transducer selection switch and carry handle is provided. If documentation is required, units have a serial printer communication interface.

Hot key displays provide instant access to cell mV/V output, peak, valley, zero, and tare values. To check calibration, three standard values are switch selectable, along with a fourth provision for a user supplied resistor. Rear panel tension or compression selection reverses polarity if needed.

1.3 CONFIGURATION

LCc-II configuration is performed using the menu driven keypad on the right side of the front panel and follows the flow diagram presented in Figure 1-2. This diagram shows the overall structure and general guidelines of LCc-II set-up, calibration, filter, display, I/O, diagnostic, and security configuration routines. Detailed explanations of sub menu parameter selections are defined in sequential chapters, starting with Section III. To browse through the menus, press MENU and use the arrow keys to move across menu subjects, or up and down within a menu. Parameters are not actually changed until the edit and enter keys are used.

1.4 ANALOG OUTPUT OPTION

LCc-II units are available with a high resolution 16 bit analog output. This output is configured for 0-24 mA operation via rear panel connector. Set-up and calibration of the analog output is configured via the menu keypad and can be configured to track gross or net weight/force data. Loop diagnostics are also provided to verify that the analog connection is intact. See Section II for wiring information and Section VI for configuration details.

Serial communication is available in RS-422/485 digital formats. The RS-422 signal can be used for printouts or a full, bi-directional PC interface. If BLH Weigh-View Software for Windows is purchased, all configuration, calibration, and documentation functions are performed easily with familiar, point-and-click operation.

When combined with master (NIST traceable) load cells, the LCc-II becomes a highly accurate system for checking and calibrating other force and weight measurement equipment.

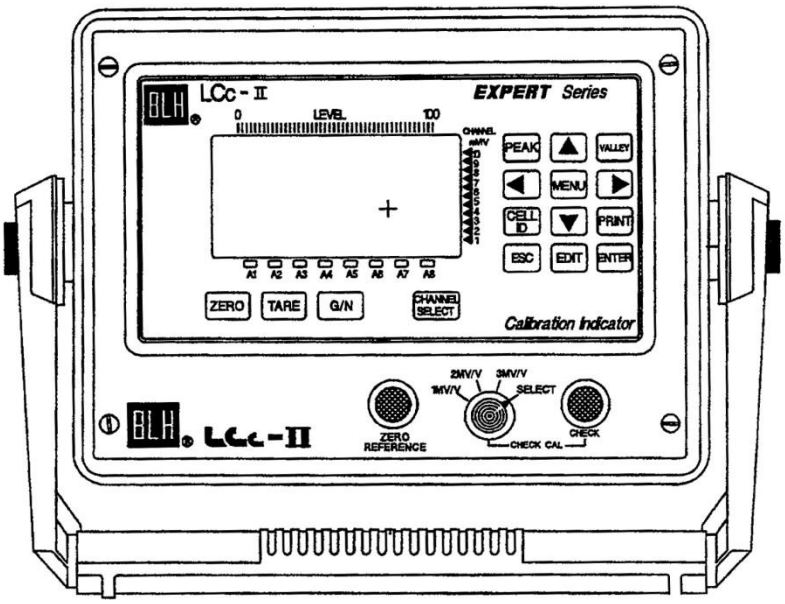


Figure 1-1. The LCc-II Load Cell Calibrator

LCc-II OPERATING SPECIFICATIONS

Performance

Resolution	1048576 total counts
Displayed Resolution	700,000 counts
Conversion Speed	50 msec
Displayed Sensitivity	0.05 l.LV per count
Noise	0.4 µV per count (min. flit setting)
Full Scale Range	3.5 mV/V
Dead Load Range	100% full scale
Input Impedance	10 m-ohms min
Excitation Voltage	10 VDC @ 250 mA
Linearity	±0.0015% full scale
Software Filter	multi-variable up to 10,000 msec
Step Response	one conversion
Temp Coefficient Zero	±2ppm/°C
Temp Coefficient Span	±7ppmfC

Environment

Operating Temperature	-10 to 55° C (15 to 131° F)
Storage Temperature	-20 to 85° C (-5 to 185° F)
Humidity	5 to 90% rh non-condensing
Voltage	1171230 VAC ±15% @50/60 Hz
Power	15 watts max

Display

Type	high intensity cobalt green vacuum fluorescent
Active Digits	7 digit alpha numeric .59" high for weight 8 digit alpha numeric .39" high for status

Remote Hold Input (Optically Isolated)

(Contact closure or de logic compatible)

Closed	hold
Open	normal operation

Communications (Standard)

Serial RS-422/485	full or half duplex ASCII, printer, Provox, MODBUS or BLH network protocols odd, even or no parity-selectable
Baud Rates	300, 1200, 2400, 4800, 9600, or 19200

Analog Output (Optional)

Conversion	16 bit D-A
Current Output	0-24 mA - 500 ohm max.

Enclosure

Dimensions (std)	8.5 x 12.3 x 10.6 in. HVVD

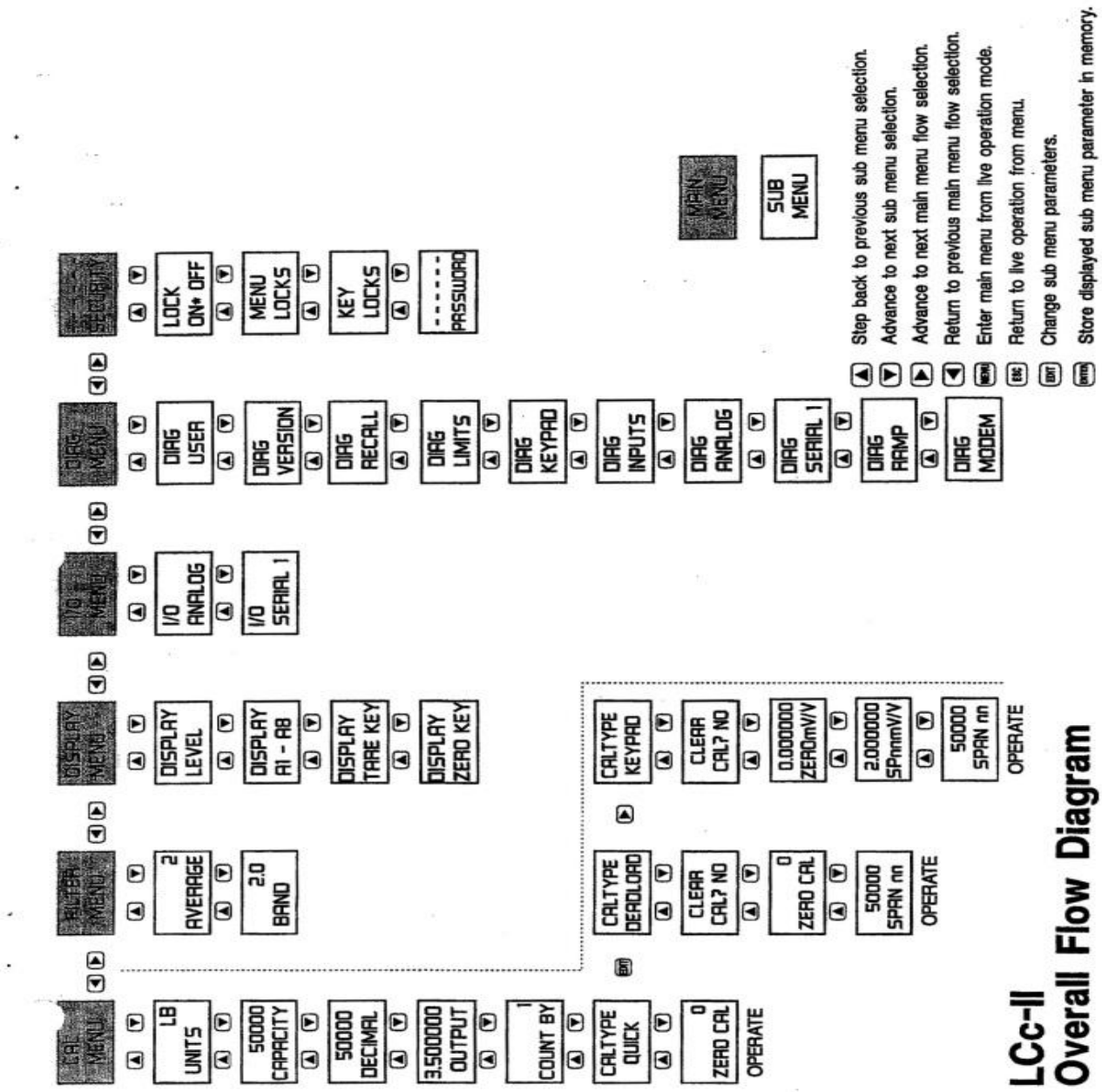


Figure 1-2. LCc-II Main Configuration Flow Diagram.

1.5 WARRANTY POLICY

BLH warrants the products covered hereby to be free from defects in material and workmanship. BLH's liability under this guarantee shall be limited to repairing or furnishing parts to replace, f.o.b. point of manufacture, any parts which, within three (3) years from date of shipment of said product(s) from BLH's plant, fail because of defective workmanship or material performed or furnished by BLH. As a condition hereof, such

defects must be brought to BLH's attention for verification when first discovered, and the material or parts alleged to be defective shall be returned to BLH if requested. BLH shall not be liable for transportation or installation charges, for expenses of Buyer for repairs or replacements or for any damages from delay or loss of use for other indirect or consequential damages of any kind. BLH may use improved designs of the parts to be replaced. This guarantee shall not apply to any material which shall have been repaired or altered outside of BLH's plant in any way, so as in BLH's judgment, to affect its strength, performance, or reliability, or to any defect due in any part to misuse, negligence, accident or any cause other than normal and reasonable use, nor shall it apply beyond their normal span of life to any materials whose normal span of life is shorter than the applicable period stated herein. In consideration of the forgoing guarantees, all implied warranties are waived by the Buyer, BLH does not guarantee quality of material or parts specified or furnished by Buyer, or by other parties designated by buyer, if not manufactured by BLH. If any modifications or repairs are made to this equipment without prior factory approval, the above warranty can become null and void.

1.6 FIELD ENGINEERING SERVICES

Improper LCc-II installation or operation may result in equipment damage. Please follow instructions carefully. BLH will not accept any liability for faulty installation and/or misuse of this product. Authorized BLH Field Service Engineers are available around the world to install LCc-I1 calibrator systems and/or train factory personnel to do so. The field service department at BLH is the most important tool to assure the best performance from your application.

Call (Factory Number)
(781) 289-2000
Ask for Field Service

In Canada, Call
(800) 567-6098 or
(416) 251-2554

SECTION 2. Installation

2.1 INTRODUCTION

This chapter provides environmental, mounting, and electrical installation information.

2.1.1 Environmental Considerations

LCc-I1 calibrators are designed to operate to specification in locations with temperatures ranging from 14 to 130 degrees Fahrenheit. The standard instrument .should be installed in an area free of vibration and supplied with a stable clean instrument power source. Do not use the LCc-II in areas containing explosive or corrosive vapors.

2.2 MOUNTING

LCc-11 calibrators are packaged in a portable carrying case. Outline dimensions shown in Figure 2-1 give the overall size and shape of the carrying case and handle (dimensions shown in inches). Press both black buttons on the carrying case handle simultaneously and rotate the handle to a detente position that allows comfortable viewing.

2.3 ELECTRICAL CONNECTIONS

Figure 2-2 on the following page shows the LCc-I1 rear panel. All electrical connections apply to this panel.

2.3.1 AC Power

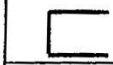
LCc-I1 calibrators come with a 6 ft. power cord and 15 amp grounded power connector for connection to a 110/220 volt 50 or 60 Hz power supply. LCc-11 calibrators are factory set for 110 VAC, 60 Hz operation. To change from 60 to 50 Hz, refer to SECTION III paragraph 3.4.1, 'The Setup Menu'. Paragraph 2.3.5 describes voltage selection changes.

Use the I/O switch above the power connector to turn the unit on and off (see Figure 2-2).

2.3.2 Load Cell Connections

The LCc-I1 rear panel provides two connector types, bendix or terminal block, for the master load cell. Do not attach the load cell leads to both connectors. Choose the desired connector type and connect leads as shown in Table 2-1. If an older or non-BLH master cell already has a mating half bendix connector, make sure the lead connections correspond to Table 2-1. For quick reference, Table 2-1 is printed on the LCc-I1 rear panel. Note: Mating half bendix connectors are not supplied by BLH.

Table 2-1. Typical Load Cell Connections

Jumpers	Signal	Typical Color	Pin No
	-EXE	Black	E
	-SENSE	Blue	F
	-SIGNAL	Red (Note 2)	C & D
	+SIGNAL	White (Note 2)	G & H
	+SENSE	Orange	B
	+EXC	Green	A
	SHIELD	Yellow	Housing

Notes:
1.) Jumper wires required for four wire system.
2.) For system using tension load cells, the red and white leads may need to reversed for positive output.
3.) Pin numbers refer to mating half bendix connectors.

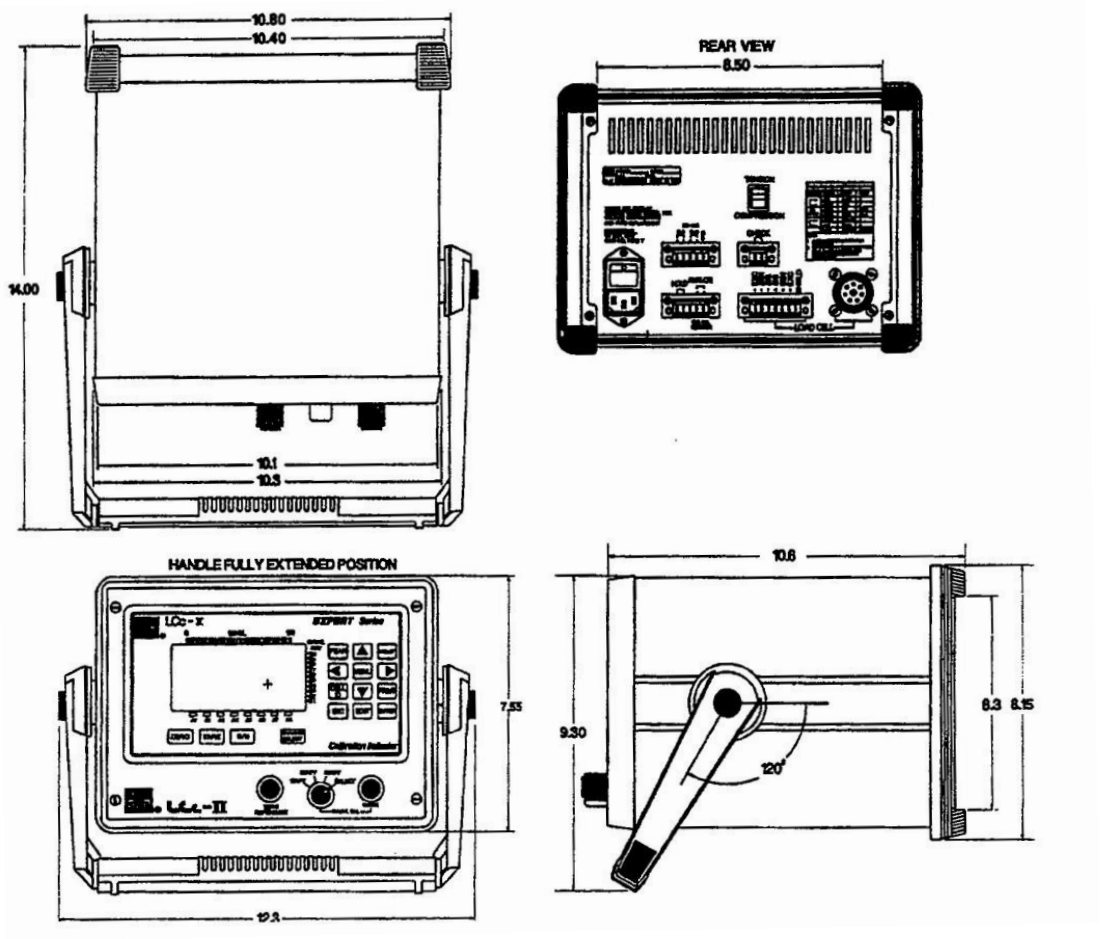


Figure 2-1. LCc-I1 Outline Dimensions

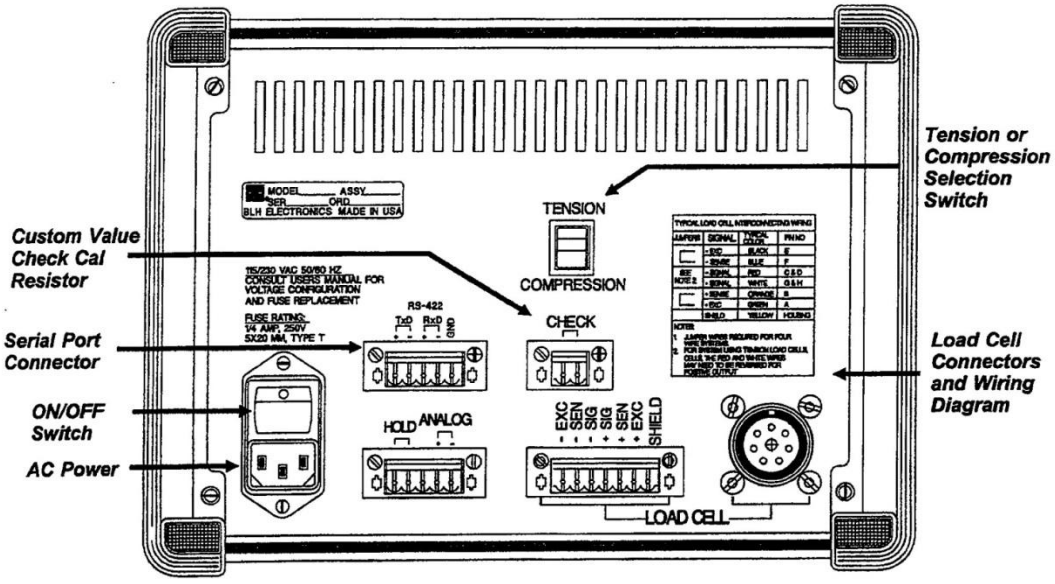


Figure 2-2. The LCc-II Rear Panel

2.3.3 Load Cell Connections

The LCc-I1 rear panel provides two connector types, bendix or terminal block, for the master load cell. Do not attach the load cell leads to both connectors. Choose the desired connector type and connect leads as shown in Table 2-1. If an older or non-BLH master cell already has a mating half bendix connector, make sure the lead connections correspond to Table 2-1. For quick reference, Table 2-1 is printed on the LCc-I1 rear panel. Note: Mating half bendix connectors are not supplied by BLH.

2.3.4 Serial Port Connections

Serial output TXD and FtXD wiring designations are printed on the rear panel (Figure 2-2). Depending upon ordering specifications, the electrical output will be factory configured for RS-422 or RS-485 operation. For Serial port protocol information, see SECTION V. Note +(positive) and - (negative) polarity designations.

2.3.5 The Check Cal Resistor

If the master load cell has an output other than 1, 2, or 3 mV/V, and check cal operation is desired, an external check cal resistor (customer supplied) must be connected to the two position CHECK terminal block. Use the formula in Table 2-2 to determine the correct resistor value for the cell being calibrated.

Table 2-2. Check Cal Resistor Selection Formula

$$R_{chkcal}\ (\Omega) = \frac{(250)\ (R_{LC})}{(V_{LC})\ (\frac{chkcal\ \%}{100}) - V_{ZERO}}$$

Where:

R_{LC} =	Load Cell Impedance in Ohms	350 typical
V_{LC} =	Load Cell Rated Output (mV/V)	2 typical
V_{ZERO} =	Load Cell Zero Offset (mV/V)	0.01 typical
chkcal% =	Desired Checkcal Magnitude	80% typical

NOTES: Use only 1% metal film resistor; RN-55 style
Use Nearest Standard Resistor Value

2.3.6 Tension or Compression Selection

LCc-11 instruments calibrate both tension and compression type load cells. Using the selector switch designated in Figure 2-2 select the appropriate polarity before testing load cell.

2.3.7 Display Hold Function

Connecting a momentary pushbutton switch to the HOLD input (Figure 2-2) allows an operator to 'freeze' the display. When activated, the upper display line freezes current data while the lower display line continues to display live weight/force.

2.3.8 Optional Analog Output

When installed, 0 to 24 mA analog output connections are made at the rear panel ANALOG terminals (Figure 2-2). Note +(positive) and - (negative) polarity designations.

SECTION 3. Set-Up, Calibration, and Serialization

3.1 INTRODUCTION

After installation, set-up, calibration, and serialization are the next steps in preparing the LCc-I1 for operation (see main menu diagram, Figure 1-3). Setup and calibration is accomplished easily using the front panel display and configuration keys. Figure 3-1 (page 3-2) presents details for set-up parameter entry and Figure 3-2 (page 3-3) shows procedures for each calibration type.

NOTE: Set-up, calibration, and serialization must be performed independently for each channel. Before entering any parameters, select the desired load cell channel by pressing the front panel CHANNEL SELECT button. All parameters entered will apply ONLY to the selected channel.

3.2 SET-UP SYSTEM PARAMETERS

Set-up establishes operating parameters such as load cell capacity, decimal point location, display units, count by, etc. Follow the flow diagram presented in Figure 3-1 to enter or alter set-up parameters.

3.2.1 Display Units

Designate the desired display units as pounds, kilograms, tons, ounces, grams, newtons, kilonewtons, liters, or blank (no units). Selection also appears on print outs and other serial transactions.

3.2.2 Capacity

Enter the load cell capacity value. (Capacity is the rated load of the load cell.) A capacity of 10000 can be displayed as 0.010000, 0.10000, 1.0000, 10.000, 100.00, 1000.0, or 10000 depending upon decimal point location.

3.2.3 Decimal Point Location

Position the decimal point as desired for weight display and serial communication.

3.2.4 Output

Enter the rated mV/V output of the cell. (The electrical output at rated capacity independent of excitation)

3.2.5 Front Panel Display Counts

Define the count value of each display increment by selecting 1, 2, 5, 10, 20, 50, or 100 (note that decimal selection still applies). The LCc-I1 will automatically default to the best possible resolution.

3.3 SYSTEM CALIBRATION

The LCc-11 offers three types of calibration; quick, deadload, and keypad. Both quick and keypad calibration use an internal mV/V reference within the LCc-11 to perform an electrical only type calibration. Deadload calibration is used when known amounts of weight are applied to the load cell to achieve calibration. Figure 3-2 provides flow diagrams for each calibration type.

3.3.1 Quick Type Calibration

Quick calibration is the fastest and least complex method of calibration. Based upon entries of full scale capacity and mV/V output, the LCc-11 will automatically establish a calibration. This method is generally suitable on any linear system.

3.3.2 Deadload Calibration

Deadload calibration is the most complex method but results in the highest calibration accuracy. Deadload calibration requires that known quantities of weight be added incrementally to the cell, preferably to full capacity. This method is preferred when testing/verifying calibration standard cells. Deadload calibration allows entry and storage of up to 10 incremental span points per channel.

3.3.3 Keypad Calibration

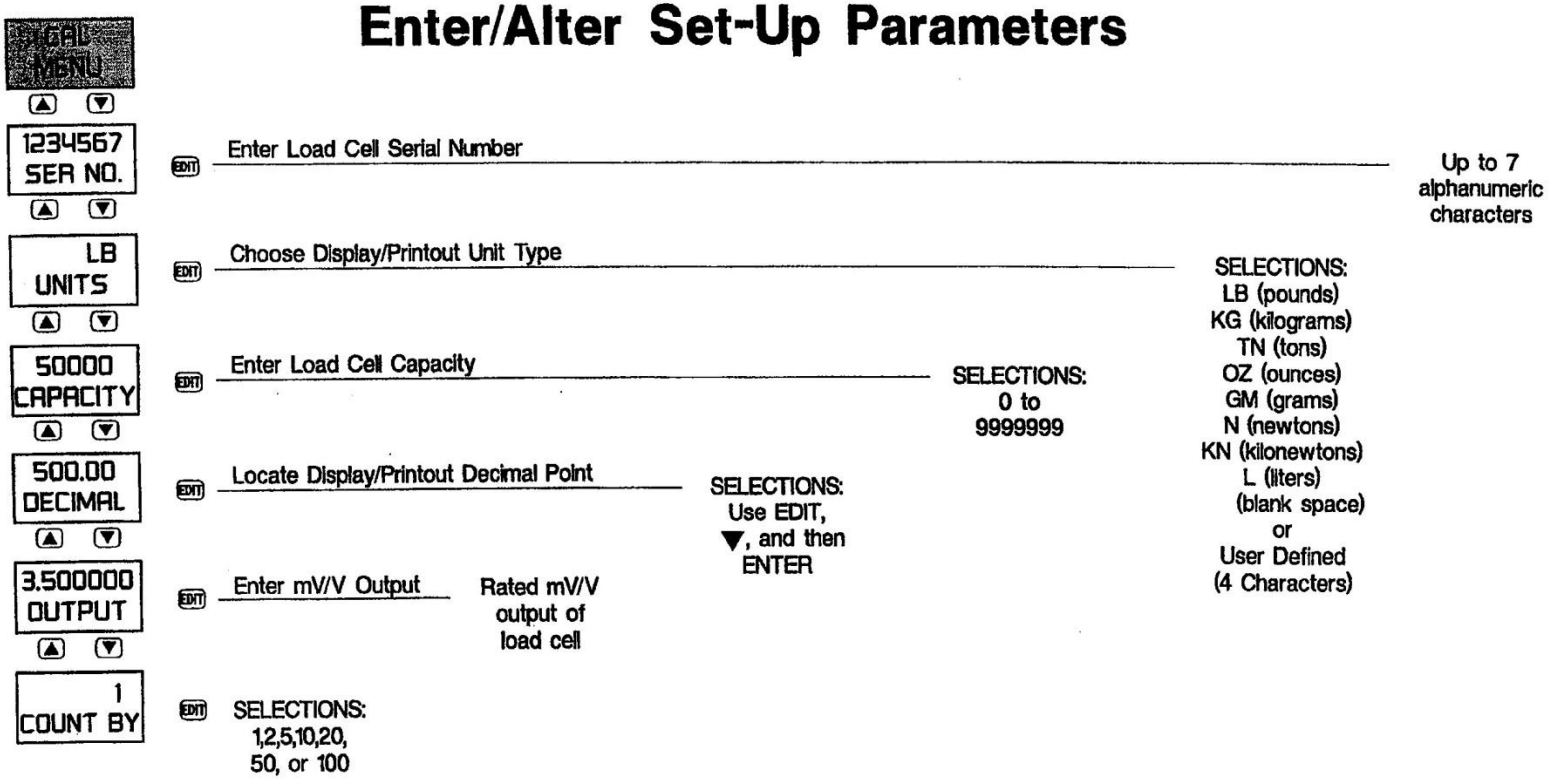
The LCc-I1 is factory calibrated as a very precise mV/V measurement device. The keypad calibration method establishes a relationship between force and mV/V, resulting in a very accurate electrical type of calibration. Keypad calibration requires a calibration sheet (Figure 3-3, page 3-4) for each load cell. The cal. sheet presents the load cell mV/V output reading for either 3 or 10 known weight/force values. Sheets also include a zero balance (no load) mV/V reading. The keypad calibration method allows for the entry and storage of up to 10 points.

3.4 SERIALIZATION

After entering set-up and calibration parameters for the selected channel (load cell), enter the cell serial number for identification purposes as follows:

1. Press the Cell ID button
2. Press the EDIT button
3. Use the right arrow button to select entry digit position
4. Use the up and down arrows to scroll through alpha-numeric characters until the desired character is reached.
5. Repeat steps 3 and 4 for each digit.
6. Press ENTER to store the complete serial number.

Enter/Alter Set-Up Parameters



General Key Functions:

- ▲ Step back to previous menu selection.
- ▼ Advance to next menu selection.
- MENU Advance to next main menu selection.
- ESC Return to live operation from menu.
- EDIT Change sub menu parameters.
- ENTER Store displayed sub menu parameter in memory.

MAIN MENU

SUB MENU

To Enter/Alter a Numeric Value:

- EDIT Press to initiate a change.
- ▲ Press to increment selected digit.
- ▼ Press to decrement selected digit.
- ▶ Press to advance to next digit.
- ◀ Press to return to previous digit.
- ENTER Press to store selection in memory.

To Enter/Alter a Parameter Selection:

- EDIT Press to initiate a change.
- ▼ Press to view parameter options.
- ENTER Press to store selection in memory.

Figure 3-1. Set Up Parameter Entry

Calibration Type - Flow Diagrams

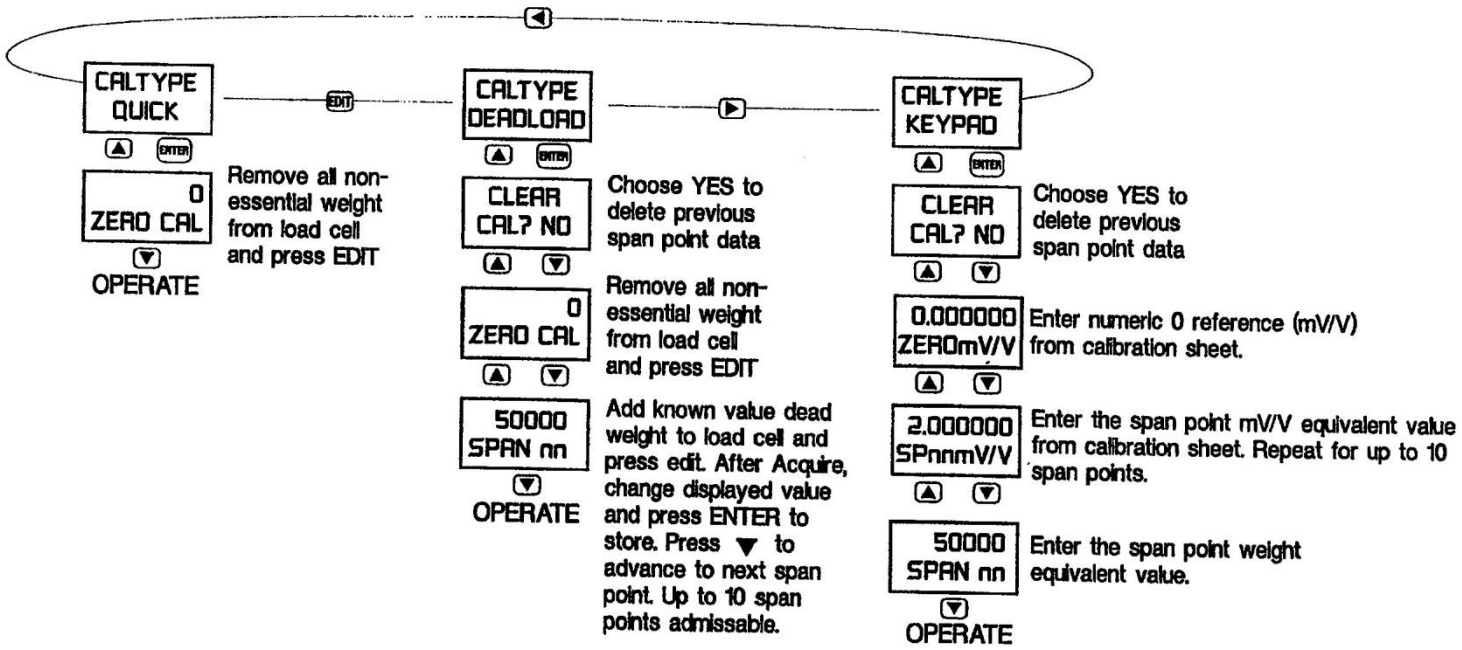


Figure 3-2. Calibration Types & Parameters

General Key Functions:

- ▲ Step back to previous menu selection.
- ▼ Advance to next menu selection.
- MENU Advance to next main menu selection.
- ESC Return to live operation from menu.
- EDIT Change sub menu parameters.
- ENTER Store displayed sub menu parameter in memory.

SUB MENU

To Enter/Alter a Numeric Value:

- EDIT Press to initiate a change.
- ▲ Press to increment selected digit.
- ▼ Press to decrement selected digit.
- ▶ Press to advance to next digit.
- ◀ Press to return to previous digit.
- ENTER Press to store selection in memory.

To Enter/Alter a Parameter Selection:

- EDIT Press to initiate a change.
- ▼ Press to view parameter options.
- ENTER Press to store selection in memory.

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Calibration Chart

Customer:	ABC Co.			**P.O :**	28523004D
Capacity	50000 lb	**Type**	C2P1	**Serial No.**	71258
Mode	Tension	**Bridge**	A	**Test Report No.**	C37-8500
Indicator	N.A.	**Serial No.**	N.A.		
Date Of Calibration	11/7/97			**Temperature :**	70 F
Calibrated By:	M. Houston			**Humidity :**	58 %

Applied Load lbf	Response Run 1 mv/V	Response Run 2 mv/V	Response Run 3 mv/V
0	0.0000	0.0000	0.0000
5,000	0.2000	0.2000	0.2000
10,000	0.4001	0.4001	0.4001
15,000	0.6001	0.6001	0.6001
20,000	0.8002	0.8002	0.8002
25,000	1.0003	1.0003	1.0003
30,000	1.2003	1.2003	1.2003
35,000	1.4003	1.4003	1.4003
40,000	1.6003	1.6003	1.6003
45,000	1.8003	1.8003	1.8003
50,000	2.0003	2.0003	2.0003
25,000	1.0000	1.0000	1.0000
0	0.0000	0.0000	0.0000

Applied Load [lb]	Output Average lb	Ideal Output lb	Output Error lb	Output Error % FS	Hysteresis Error % FS
0	0.0000	0.0000	0.0000	.000%	
5,000	0.2000	0.2000	0.0000	-.001%	
10,000	0.4001	0.4001	0.0000	.002%	
15,000	0.6001	0.6001	0.0000	.000%	
20,000	0.8002	0.8001	0.0001	.004%	
25,000	1.0003	1.0002	0.0001	.007%	
30,000	1.2003	1.2002	0.0001	.006%	
35,000	1.4003	1.4002	0.0001	.004%	
40,000	1.6003	1.6002	0.0001	.003%	
45,000	1.8003	1.8003	0.0000	.001%	
50,000	2.0003	2.0003	0.0000	.000%	
25,000	1.0000	1.0002	-0.0002	-.007%	-.015%
0	0.0000	0.0000	0.0000	.000%	.000%

J. G. Bailey 11/7/97

Q. C. Manager

Figure 3-3. Sample Load Cell Calibration Certificate

SECTION 4. Dynamic Digital Filter

4.1 GENERAL

The LCc-I1 uses a two stage digital filter. Each stage requires parameter entries as shown in Figure 4-1 (next page). Make parameter entries while viewing live weight value on the front panel display.

NOTE: Filter parameters must be selected and stored for each individual channel.

4.1.1 Digital Averaging

The filter first stage calculates a running average of weight input readings. Available selections are 1, 2, 4, 8, 16, 32, 64, and 128 conversions (see Figure 4-1). Using a 'first in - first out' algorithm, running averaging provides display updates every 50 msec regardless of the number of readings averaged. However, since each conversion averaged adds 50 msec to the filter length, the larger the averaging selection, the longer the filter length becomes. Table 4-1 shows the time relationship between conversions averaged and filter length.

4.1.2 Band Selection

The second stage of the filter, BAND, is applied after averaging is selected. A BAND value between 0 and 100 must be entered as shown in Figure 4-1. Dynamic Digital Filtering constantly compares the amount of input signal change between consecutive conversions. If the difference falls within the BAND setting, a mathematical filter attenuates the conversion to conversion variation.

Once the difference between conversions exceeds the BAND selection, the BAND filter is canceled and the display tracks live weight with maximum response. To achieve the best overall filter response, keep the BAND selection as low as possible without hindering system performance (see next paragraph for set-up instructions). If the BAND setting is higher than necessary, sensitivity to small weight changes will be reduced.

Table 4-1. Averaging Selections and Filter Length

Average	Response
1	0.05 sec
2	0.10 sec
4	0.20 sec
8	0.40 sec
16	0.80 sec
32	1.60 sec
64	3.20 sec
128	6.40 sec

Table 4-2. Dynamic Digital Filter Set-Up Procedures

1) Begin with the BAND set at a low value (approx. 4-10).
2) Increase averaging until the noise (watch display) is reduced to the least significant digit (approx. +1- 10 divisions).
3) Increase BAND, if necessary, to reduce the remaining noise to the desired level.
4) If increasing the BAND value does not reduce the noise, return to averaging and select the next higher setting, then repeat step three.
5) If the BAND value required to quiet the display becomes large (65-100), it may be better to use more averaging. Try to achieve the best balance between BAND (small weight change sensitivity reduction) and averaging (longer response time).
6) If a stable weight display cannot be achieved with reasonable selections, it may be necessary to change the instrument set-up to reduce sensitivity.

4.1.3 Filter Set-Up Procedures

Setting filter parameters requires a balance between achieving maximum noise reduction and maintaining quick response and good sensitivity to real weight changes. The goal of filter set-up is to use the lowest averaging and BAND selections needed for smooth system display/operation. If selections are higher than necessary, accurate detection of small weight changes may be hindered. Using the six steps presented in Table 4-2, tune the system to its maximum performance level.

Enter/Alter Filter Parameters

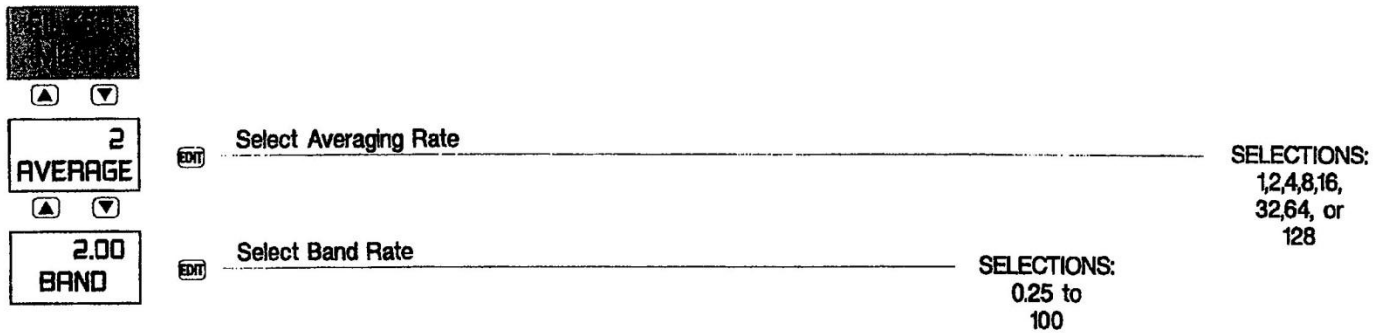


Figure 4-1. Dynamic Digital Filter Parameter Entry

General Key Functions:

- (▲) Step back to previous menu selection.
- (▼) Advance to next menu selection.
- (MENU) Advance to next main menu selection.
- (ESC) Return to live operation from menu.
- (EDIT) Change sub menu parameters.
- (ENTER) Store displayed sub menu parameter in memory.

To Enter/Alter a Parameter Selection:

- (EDIT) Press to initiate a change.
- (▼) Press to view parameter options.
- (ENTER) Press to store selection in memory.

SECTION 5. Front Panel Display Functions

5.1 FRONT PANEL FUNCTIONS

The front panel display of the LCc-I1 (Figure 5-1) includes a two line alpha numeric digital display for weight/force and status information as well as a horizontal bar graph, channel selector, and diagnostic alarm annunciators. The bar graph and alarm annunciators can be configured to display various information. Use the display menu flow diagram (Figure 5-2) to configure the front panel functions for desired system operation. Display function parameters (except for alarm status annunciators) must be selected/stored independently for each load cell channel.

5.1.1 Horizontal Bar Graph

The horizontal bar graph is considered the primary level indicator and is typically used to monitor the overall gross weight/force applied to the load cell. Vacuum fluorescent segments located under the 0 to 100% bar graph give instant visual reference to system capacity. Select ON to use; OFF for no function. Choose net or gross weight tracking and then enter the starting and ending weight values. Note that this indicator also can be configured for reverse polarity depending upon the starting and ending values.

5.1.2 Load Cell Channel Indicator

The load cell channel indicator works in conjunction with the CHANNEL SELECT key to designate the selected channel. Once a channel is chosen, a triangular LED segment illuminates next to the selected number, confirming selection. If the mV/V channel is selected, the triangular LED appears next to mV/V.

5.1.3 Alarm Status Annunciators

Eight front panel alarm/status annunciators provide ongoing system diagnostic information. Each annunciator can be configured to represent 1 of 12 conditions; OFF (no function), system in motion, zero limit exceeded, overload limit exceeded, serial communication receive, serial communication transmit, serial communication parity error, serial framing error, analog output fault, analog output over (high) selection, or analog output under (low) selection status. Once configured as A1-A8, vacuum fluorescent segments will be illuminated when configured condition is true. Configure each annunciator consecutively as shown in Figure 5-2. Note that annunciator selections apply to all load cell channels.

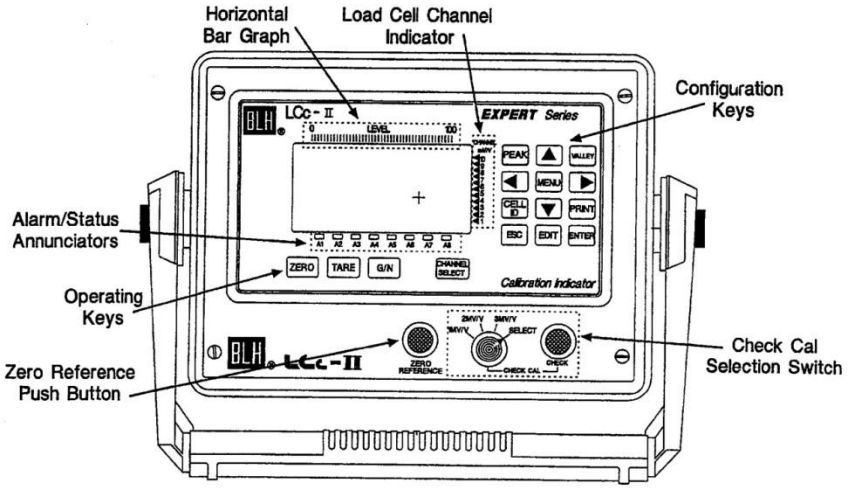


Figure 5-1. The LCc-II Functional Front Panel

Display Menu Flow Diagram

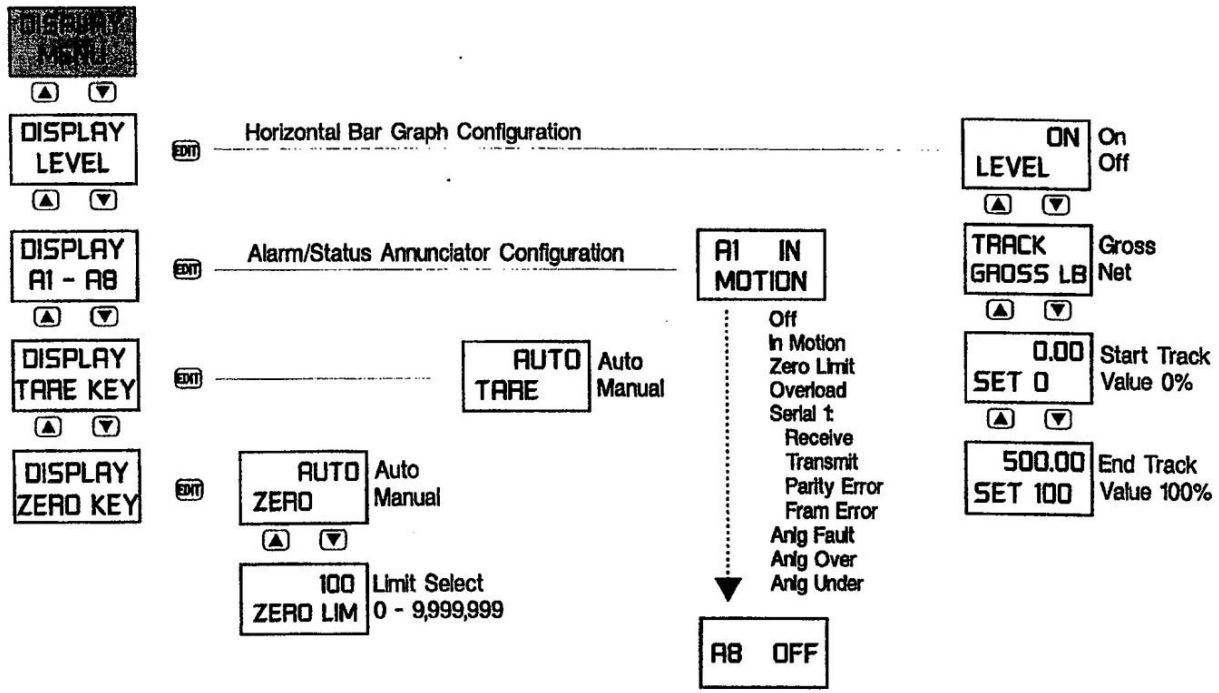


Figure 5-2. Front Panel Functions, Configuration Menu

General Key Functions:

- ▲ Step back to previous menu selection.
- ▼ Advance to next menu selection.
- MENU Advance to next main menu selection.
- ESC Return to live operation from menu.
- EDIT Change sub menu parameters.
- ENTER Store displayed sub menu parameter in memory.

To Enter/Alter a Numeric Value:

- EDIT Press to initiate a change.
- ▲ Press to increment selected digit.
- ▼ Press to decrement selected digit.
- ▶ Press to advance to next digit.
- ◀ Press to return to previous digit.
- ENTER Press to store selection in memory.

To Enter/Alter a Parameter Selection:

- EDIT Press to initiate a change.
- ▼ Press to view parameter options.
- ENTER Press to store selection in memory.

5.1.4 Configuring the TARE Key

The front panel TARE key can be configured for manual or automatic operation. If 'automatic' is selected and the unit is operating in net mode, and the tare key is pushed, the displayed weight value will be 'tared out' resulting in a display of zero (units) net. If manual is selected and the unit is operating in net mode, the operator will be prompted to enter the desired tare weight value. TARE has no function in the gross weight weighing mode.

5.1.5 Configuring the ZERO Key

The front panel ZERO key can be configured for manual or automatic operation. If 'automatic' is selected, the displayed gross weight value will be zeroed out when the key is pressed. If manual is selected, the operator will be prompted to enter the desired gross zero weight value. ZERO has no function in the net weight weighing mode.

A full scale limit selection also must be entered for the zero key. Enter a zero limit value between scale zero and full scale capacity (recommended 2-20%). The zero key will not function automatically or manually after the displayed weight value has exceeded the zero limit entry.

5.1.6 Zero Reference Push Button

A zero reference button (Figure 5-1) is provided in conjunction with the mV/V channel (see paragraph 9.7). This momentary pushbutton switch, when pressed, establishes a true zero reference so that the load cell zero balance can be measured. Any unbalance displayed should be removed prior to loading by pressing the ZERO key.

SECTION 6. Analog Output and Serial Communication

6.1 ANALOG OUTPUT CONFIGURATION (Optional)

6.1.1 Output Definition

LCc-II indicators provide a high resolution 0-24 mA analog current output, representing either gross or net weight, for driving external process equipment/recorders. This output is based upon a 16 bit digital to analog (D-A) conversion which represents up to one part in 65536 of analog precision. The scaling of the output is accomplished after the Lec-11 is calibrated and can be ranged for any portion of the gross or net weight output curve. Load resistance for this output is 500 ohms maximum.

6.1.2 Set-Up Procedure

Connect a current meter to the rear panel analog output points (see Figure 2-2 for +, - designations) and proceed with ANALOG I/O configuration as shown in Figure 6-1 (page 6-2). Note that set-up must be performed for all channels.

6.2 SERIAL COMMUNICATION

LCc-II units come with a versatile, bi-directional, serial communication port. Depending upon ordering specifications, this port will be configured for RS-422 multi-drop (loop), RS-422 full duplex (point-to-point, transmit/receive), or RS-485 half duplex (point-to-point, transmit then receive) operation. After selecting the electrical interface, the port operating parameters must be entered using the flow diagram presented in Figure 6-1. Figure 6-2 (page 6- 3) provides a full description of each (serial communication) parameter block depicted in Figure 6- 1. Note that certain parameter entries are dependent upon the print format selection (accessed by pressing edit when SERIAL I/O is displayed). Standard LCc-11 indicators offer 3 formats; PRINT for output to a printer, CON'T (continuous) for constant output to a data logger, PLC, etc., and PC for full duplex interfacing with a more sophisticated host device.

6.2.1 Transmit Only Output Formats (ASCII)

Both the PRINT and CONT ASCII output formats are transmit only. The print format is designed for use in conjunction with the front panel PRINT key. Pressing the PRINT key transmits all data strings that are selected 'YES' in Figure 6-1 (DISPLAY, GROSS, NET, ZERO, and TARE) to the printer. Table 6-1 shows the printer output format used for each transmitted data string.

The CONT output string is defined in Table 6-2 (page 6-4). Continuous output transmissions occur at the time rate configure in Figure 6-1. Continuous outputs 'feed' weight data, status, and address information to a remote data logger or PLC type device without operator intervention. Output string formats can be modified to accommodate custom interface requirements (Figure 6-1). Leading zeros can be replaced with ASCII spaces. SIX (start of text), address, and instrument status can be omitted by selecting 'NO'. Units can be expanded or abbreviated in the print format and dropped altogether from the continuous format. Line feed can be deleted from the CRLF output or both characters can be replaced by an ASCII space. Figure 6-2 provides definitions for each parameter to assist in formatting custom output strings.

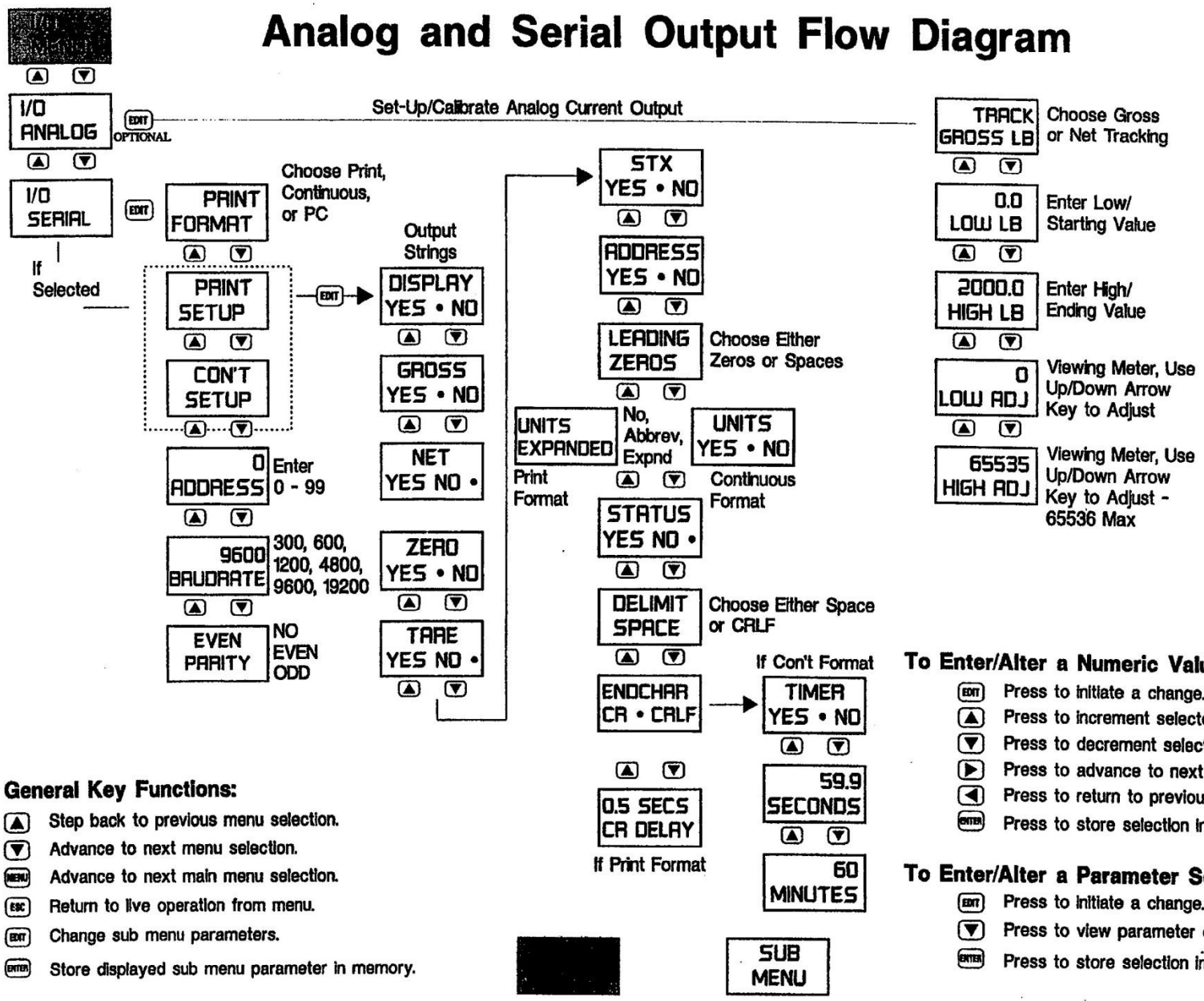
Table 6-1. Printer Output Transmission String

stx/adr/data/units/status/crlf

Defined:

stx….	start of text character, hex 02
adr....	address, 3 ASCII chars: first two are '01'-'99' followed by an ASCII space
data...	weigh data 8 characters: 7 digits with decimal point or leading space; if msd is an ASCII minus '-' the data is negative
abbreviated..	two characters; first character is 'L','K', 'T', 'Z','G','N','K','L','S', or 'spaces' for pounds, kilograms, tons, ounces, grams, newtons, kilonewtons, liters, special, or null (space). second character is 'G','N','Z',or 'T' for gross, net, zero, or tare
expanded..	ten characters; first three characters are a
units	units space plus a two character units abbreviation 'LB',' KG', 'TN',' 'OZ,'GM','N','KN','L', or 4 spaces for pounds, kilograms, tons, ounces, grams, newtons, kilonewtons, liters, or 4 user defined characters. the last seven characters are a space plus the data type spelled out with added spaces 'GROSS', 'NET', 'ZERO' or 'TARE'.
stat…	one status character: ' ' = everything ok, 'M' = motion, 'U' = a/d underload (signal below instrument capability), V = above overload limit, 'O' = a/d overload (signal beyond instrument capability), 'E' = load cell connect fault
space...	ASCII space, hex 20
CRLF...	carriage return linefeed two characters 0DH0AH

Analog and Serial Output Flow Diagram



General Key Functions:

- ▲ Step back to previous menu selection.
- ▼ Advance to next menu selection.
- MENU Advance to next main menu selection.
- ESC Return to live operation from menu.
- EDIT Change sub menu parameters.
- ENTER Store displayed sub menu parameter in memory.

To Enter/Alter a Numeric Value:

- EDIT Press to initiate a change.
- ▲ Press to increment selected digit.
- ▼ Press to decrement selected digit.
- ▶ Press to advance to next digit.
- ◀ Press to return to previous digit.
- ENTER Press to store selection in memory.

To Enter/Alter a Parameter Selection:

- EDIT Press to initiate a change.
- ▼ Press to view parameter options.
- ENTER Press to store selection in memory.

Serial Output Flow Diagram Block Explanations

DISPLAY YES • NO	Transmit current weight display (gross or net)
GROSS YES • NO	Transmit current gross weight value
NET YES • NO	Transmit current net weight value
ZERO YES • NO	Transmit current manual zero value
TARE YES • NO	Transmit current manual tare value

STX YES • NO	Typical leading character of any ASCII output data string
ADDRESS YES • NO	Include designated address in output data string
LEADING SPACES	Choose either leading spaces or leading zeros in output string
UNITS EXPANDED	Choose either no units, abbreviated units (2 characters), or expanded (10 character) units in printout
	Include units in transmit string; units are abbreviated (2 characters)
STATUS YES • NO	Include status character in output string
DELIMIT SPACE	If more than one data selection (i.e. gross, net, tare) is requested, chose either a space or a carriage return/line feed (CRLF) to separate them
ENDCHAR CR CRLF	Choose either a carriage return (CR) or a carriage return/line feed (CRLF) to end the output string
0.5 SECS CR DELAY	If the printer does not have a character bufer, prevent data loss by selecting a delay time between carriage returns
	Choose wether or not to use a timed interval between continuous transmissions
	If YES chosen, select seconds portion of time interval
	If YES chosen, select minutes portion of time interval

BOTH FORMATS

PRINTER OUTPUT FORMAT

Table 6-2. Continuous Output String

TX string:

stx/adr/data/units/status/crlf

Defined:	
stx….	start of text character, hex 02
adr....	address, 3 ASCII chars: first two are '01'-'99' followed by an ASCII space
data...	weigh data 8 characters: 7 digits with decimal point or leading space; if msd is an ASCII minus '-' the data is negative
abbreviated..	two characters; first character is 'L','K', 'T', 'Z','G','N','K','L','S', or 'snull' for pounds, kilograms, tons, ounces, grams, newtons, kilonewtons, liters, special, or null (space). second character is 'G','N','Z',or 'T' for gross, net, zero, or tare
stat…	one status character: ' ' = everything ok, 'M' = motion, 'U' = a/d underload (signal below instrument capability), V = above overload limit, 'O' = a/d overload (signal beyond instrument capability), 'E' = load cell connect fault
space...	ASCII space, hex 20
CRLF...	carriage return linefeed two characters 0DH0AH

6.2.2 Full/Half Duplex Bi-Directional Interface

If PC output format is selected, units are capable of transmitting and receiving ASCII data stings. Table 6-3 (page 6-5) presents digit for digit data and syntax information for this interface.

Basically, the LCc-II has 82 internal (EEPROM) registers which store all calibration, configuration, operation, and live weight data parameters. The PC format allows data in these registers to be read or re-written. By re-writing calibration span points (key-pad type calibration) and operating parameters, the LCc-I1 can be quickly and completely re configured by a remote host device.

Several additional tables are provided to explain PC interfacing. Table 6-4 (page 6-7) provides examples of EEPROM reading/writing, and error code exchanges. Table 6-5 (page 6-8) demonstrates live weight transactions.

Table 6-3. Bi-Directional PC Interface Register Assignments

Note - This is an ASCII interface. Requesting data from the LCc-I1 is done mainly by sending a 3 character command followed by a carnage return (ODH). These 3 character commands are listed under CODE in the following chart The LCc-11's response to these commands is listed under RESPONSE. The response data is followed by a carriage return line feed (ODH,OAH).
There are also ways of stringing the commands together as shown in examples immediately following this chart

Note -400000000> represents weight data: # of zeros = number of digits. If there is a decimal point there will be one less digit If the number is negative the most significant digit will be an ASCII minus i.e. -500 will be '-<00000000>0500', -0.5 will be '-<00000000>00.5' is numeric data,<xxoococ> is mV/V data; if negative leading x = '-'

CODE	DEFINITION	RESPONSE	EXPLANATION
00;	ND REV	00<IA>	1-9 = ND TYPE, A-Z = REV
01;	SERIAL #	01<1234567>	1 = YEAR, 2-3 = WEEK, 4-7 = instrument number
02;	REF DATE	02<MMDDYY>	Month Day Year of mV/V cal
03;	mV/V ZERO CAL	03<x.xxxxxx>	instrument mV/V zero cal point
04;	mV/V SPAN CAL	04<x.xxxxxx>	instrument mV/V span cal point
05;	ZERO mV/V	05<x.xxxxxx>	zero in mV/V
06;	SPAN1 mV/V	06<x.xxxxxx>	span1 mV/V
07;	SPAN1 units	07<00000000>	span1 in units
08;	SPAN2 mV/V	08<x.xxxxxx>	span2 in mV/V
09;	SPAN2 units	09<00000000>	span2 in units
10;	SPAN3 mV/V	10<x.xxxxxx>	span3 in mV/V
11;	SPAN3 units	11<00000000>	span3 in units
12;	SPAN4 mV/V	12<x.xxxxxx>	span4 in mV/V
13;	SPAN4 units	13<00000000>	span4 in units
14;	SPAN5 mV/V	14<x.xxxxxx>	span5 in mV/V
15;	SPAN5 units	15<00000000>	span5 in units
16;	SPANS mV/V	16<x.xxxxxx>	span6 in mV/V
17;	SPAN6 units	17<00000000>	span6 in units
18;	SPAN7 mV/V	18<x.xxxxxx>	span7 in mV/V
19;	SPAN7 units	19<00000000>	span7 in units
20;	SPAN8 mV/V	20<x.xxxxxx>	span8 in mV/V
21;	SPAN8 units	21<00000000>	span8 in units
22;	SPAN9 mV/V	22<x.xxxxxx>	span9 in mV/V
23;	SPAN9 units	23<00000000>	span9 in units
24;	SPAN10 mV/V	24<x.xxxxxx>	span10 in mV/V
25;	SPAN10 units	25<00000000>	span10 in units
26;	# of SPAN POINTS	26<xx>	00 - 10
27;	CAL TYPE	27<x>	0= QUICK, 1 = DEADLOAD, 2= KEYPAD
28;	ENG UNITS	28<x>	0 = LB, 1 = KG, 2 = TN, 3 = OZ, 4 = GM. 5 = N. 6 = KN. 7 = L or 4 user defined characters
29;	CAPACITY	29<00000000>	sum of rated capacity of load cells
30;	DECIMAL POINT	30<x>	0 - 6 decimal point position 0 = none, 3 =0.000
31;	RATED OUTPUT mV/V	31<x.xxxxxx>	average of load cells rated output in mV/V
32;	UNIT COUNT BY	32<x>	0 - 6 = 1,2,5,10,20,50,100
33;	ZERO LIMIT	33<00000000>	keypad push to zero limit from cal zero, 0 = no limit
34;	OVERLOAD	34<00000000>	overload limit, 0 = no limit
35;	LEVEL CONFIG	35 <x>	level bar graph configuration 0= off/gross, 1 = on/gross 2 = off/net 3 = on/net
36;	LEVEL 0%	36<00000000>	level 0% setting
37;	LEVEL 100%	37<00000000>	level 100% setting
38;	ARROWS CONFIG	38<x>	side arrows configuration 0= off/gross, 1 = on/gross 2off/net off/net 3 = on/net
39;	ARROWS 0%	39<00000000>	arrows 0% setting
40;	ARROWS 100%	40<00000000>	arrows 100% setting
41;	Al ANNUNCIATOR	41 <me.	0-13: 7 = ser1 fram err
42;	A2 ANNUNCIATOR	42<xx>	0 = off 8 = analog fault
43;	A3 ANNUNCIATOR	43<xx>	1 = in motion 9 = analog over
44;	A4 ANNUNCIATOR	44<xx>	2 = zero lim 10 = analog under
45;	A5 ANNUNCIATOR	45<xx>	3 = overload 11 = rio status
46;	A6 ANNUNCIATOR	46<xx>	4 = ser1 rx 12 = modem rx
47;	A7 ANNUNCIATOR	47<xx>	5 = ser1 13 = modem b:
48;	A8 ANNUNCIATOR	48<xx>	6= ser1 par err
49;	ZERO KEY CONFIG	49<x>	0 = auto, 1 = manual

Table 6-3. Continued

50;	TARE KEY CONFIG	50<x>	0= auto, 1 = manual
51;	ANALOG CONFIG	51<x>	0 = gross, 1 = net
52;	ANALOG LOW	52<00000000>	low output weight setting
53;	ANALOG HIGH	53<00000000>	high output weight setting
54;	ANALOG LOW ADJUST	54<xxxxx>	low analog output adjustment
55:	ANALOG HIGH ADJUST	55<xxxxx>	high analog output adjustment
56;	MANUAL ZERO	56<00000000>	manual zero
57;	MANUAL TARE	57<00000000>	manual tare
58;	FILTER AVERAGING	58<x>	0 - 7 = 1,2,4,8,16,32,64,128
59;	FILTER BAND	59<xxxx>	0, 0.25 - 2.50, 3- 100
60;	MOTION	60<xxxx>	0, 0.25 - 2.50, 3 - 50
61;	MOTION TIMER	61<x>	0 - 3 = 0.5, 1.0, 1.5, 2.0
62;	SECURITY LOCK	62,X.	0 = off, 1 = on
63;	PASSWORD	63<AAAAAA >	security password 1-0,'-', ' ',A-Z
64;	MENU LOCKS	64<xxxxx>	0 = off, 1 = on; msd - lsd =diag,i/o,display,filter,cal
65;	KEY LOCKS	65 <xxxxx>	0 = off, 1 = on; msd - lsd =edit,print,g/n,tare, zero
66;	SERIAL 1 FORMAT	66<x>	0= print, 1 = continuous, 2= pc, 3 = MODBUS, 4= ProVox
67;	SERIAL 1 ADDRESS	67<x>	0-99
68;	SERIAL 1 BAUD RATE	68<x>	0 = 9600, 1 = 19200, 2 = 300, 3 = 600,4 = 1200, 5 = 2400, 6 = 4800
69;	SERIAL 1 PARITY	69<x>	0 = none, 1 = even, 2 = odd
70;	PRINT DATA	70<xxxxx>	0 = no, 1 = yes; msd - tsd = tare,zero,net,gross,display
71;	PRINT DATA FORMAT	71<xxxxxxxx>	lsd = stx; 0/1 = no/yes 2sd = address: 0/1 = no/yes 3sd = leading 0s: 0 = spaces, 1 = zeros 4sd = units: 0= no, 1 = abbreviated, 2 = expanded 5sd = status: 0/1 = no/yes 6sd = delimiter 0 = space, 1 = crlf 7sd = terminating character, 0 = crlf, 1 = cr
72;	PRINT CRLF DELAY	72<x.x>	0.0 - 9.9 seconds
73;	CONT DATA	73< xxxxx >	0 = no, 1 = yes; lsd - msd =display,gross,netzero,tare
74;	CONT DATA FORMAT	74<xxxxxxxx>	lsd = stx: 0/1 = no/yes 2sd = address: 0/1 = no/yes 3sd = leading 0s: 0 = spaces, 1 = zeros 4sd = units: Oil = no/yes 5sd = status: Oil = no/yes 6sd = delimiter: 0 = space, 1 = crlf 7sd = terminating character:0 = crlf, 1 = cr 8sd = timer 0/1 = no/yes
75;	CONT TX TIMER	75<xx.x>	00.0 - 59.9 seconds
76;	CONT TX TIMER	76<xxx>	0 - 240 minutes
77;	TAG NO.	77<AAAAAAA>	cust tag no. 1-0,'-', ' ',A-Z
78;	CAL DATE	78<MMDDYY>	Month Day Year of calibration
79;	NEXT CAL	79<MMDDYY>	Month Day Year of next cal
80;	INSTRUMENT	84<xxxx>	instrument type: (0100) for LCc-II
81;	FIRMWARE VERSION	85<xxxx>	firmware version (1.00, 9020 etc)
82;	OPTIONS	86<xxxxxx>	[M] – [A] – [P] – [C] – [B] - [M]
VER	SOFTWARE VERSION	VER<xx<>	1.00- 9.99
OPT	OPTIONS	OPT<rc000rx>	[M]–[A]–[P]–[C]–[B]-[M]
CLR	CLEAR	CALCLR	clear calibration
CAL	CALIBRATE		used to precede other commands

Table 6-4. Read/Write and Error Code Examples

EEPROM data request examples:

note - CRLF = carriage return = two ASCII characters 0D, 0A Hex

note - CR = carriage return = one ASCII character 0D Hex

note - using a dash between command numbers facilitates retrieving multiple parameters (see example #3).

1. to get span 1 mV/V value (code 06;)

sent	received
06;CR	06<x.xxxxxx>CRLF

2. to get span 1 mV/V and units values (code 06; and 07;)

sent	received
06;07;CR	06<x.xxxxxx>07<00000000>CRLF

3. to get complete analog output setup (codes 51; through 55;)

sent	received
51-55:CR	5152<00000000>53<00000000>54<xxxxx>55<xxxxx>CRLF

EEPROM data write examples:

Note - Downloading data to the LCc-II is done by sending a 3 character command, the data enclosed in brackets <>, and a carriage return as shown in the examples below. The response will be staggered depending upon the time it takes to store the data. First the command will be returned and then after the data is stored the CRLF or next command will be returned.

1. to download capacity setting (code 29;), send (if capacity is 50000): 29<00050000>CR or
   29<50000>CR
   response will be: 29<00050000>CRLF

2. to download display LEVEL bar graph settings (codes 35; 36; 37;), send (if tracking gross and 0% is 0 and 100% is 15000):
   35<0>36<00000000>37<00015000>CR or 35<0>36<0>37<15000>CR
   response will be: 35<0>36<00000000>37<00015000>CRLF

3. to download zero and span 1 settings (codes 05; 06; 073, send (if zero mV/V = 0.500000>,span1 mV/V = 1.500000, span1 units = 20000): 05<0.500000>06<1.500000>0720000>CR
   response will be: 05<0.500000>06<1.500000>07<00020000>CRLF

4. to acquire an new system zero (not download) (code 05;), send CAL05<0>CR:
   The LCcell will store the current mV/V value as a new system zero
   response will be: immediately CAL then after zero is acquired: 05<xa000pooCRLE

5. to acquire a live deadload span 1 (code 07;), send (if span 1 = 2000.0) CAL07<2000.0>CR:
   the LCc-II will store the current live (above system zero) mV/V level as span 1 mV/V value (code 06;) and store 2000.0 as the units value
   response will be: immediately CAL, then after span is acquired: 07<0002000.0>CRLF

6. to dear existing calibration send CALCLR CR:
   if the LCc-I1 is in deadload or keypad cal all spans will be cleared, # of span points will be set to 0 and digital output will be based on system capacity and load cell mV/v output settings.
   response will be: immediately CALCLR then after cal is cleared, CRLF.

Note: cal zero is not cleared by this command. If the LCo-II is in quick cal, response will be: CALCLR<NA>,CRLF.

INTERFACE ERROR CODES

NA = not allowed
NT = no terminator
LM = limit
BF = input buffer overflow (too many characters sent, max is 255)
AD = a/d error
? = unknown command

ERROR CODE EXAMPLES

sent	**received**	**description**
99,CR	99,?CRLF	unknown command
CR	?CRLF	unknown command
00<A1>CR	00<NA>CRLF	not allowed value for a/d rev
00<000>CR	00<NA>CRLF	not allowed value for a/d rev
28<5>CR	28<LM>CRLF	value limit for eng units
07<000050000>CR	07<NT>CRLF	no terminator (too many digits)

Table 6-5. Live Data Transactions and Default Settings

LIVE DATA

Note: - live weight data uses () and not as a frame, this Is because the numerical part of the live weight data and stored eeprom data codes are the same number sequence 00 01 etc.

CODE	DEFINITION	RESPONSE	EXPLANATION
00,	GROSS	00(00000000)	current gross weight
01,	NET	01(00000000)	current net weight
02,	mV/V	02(x.xxxxxx)	current mV/V data
03,	LIVE mV/V	03(x.xxxxxx)	current live mV/V data
04,	WEIGHT STATUS	04(A)	A =a/d status (_) = normal (M) = motion (U) = signal underload (V)= above overload limit (O) = signal overload (E) = load cell connect fault
05,	ANALOG STATUS	05(A)	A = analog output status ( ) = normal (U) = analog under-range (0) = analog over-range (E) = analog open circuit
06,	ANALOG	06()0000c)	0 - 65537 analog output
07,	DISPLAY	07(ABODEFGH	upper display - alpha numeric with dp or leading space
		IJKLMNOPQ	lower display - alpha numeric with dp or leading space
		R	level - from left to right = left arrow on A-Z = segments on + = right arrow on
		S	arrows- from bottom to top = off = bottom arrow on A-I = arrows on + = top arrow on
		TU)	annunciators - Al,A2,A3,A4 = low 4 bits of T T = 1 0 0 0 0 0 0 Al A2 A3 A4 for A1-A4 off T = (40 hex) if A3 is on T = B (42 hex)= off A5,A6,A7,A8 = low 4 bits of U U = 1 0 00 0 0 0 A5 A6 A7 A8 for A5-AS off U = @ (40 Hex) if A6,A7 are on U = F (46 hex)
08,	REMOTE INPUT	08(,00cxX)	lsb = freeze, all others = unused
09,	PEAK DATA	09(00000000)	current peak data value
10,	VALLEY DATA	10(00000000)	current valley data

LIVE DATA REQUEST EXAMPLES

1.to get gross weight (code 00,) if current gross weight is -10.1 lb

sent	received
00,CR	00(-000010.1)CRLF

2.to get gross & net weights and status (codes 00, 01, 04,) if current gross weight is 440.05, tare value is 200.1 and scale is in motion:

sent	received
00,01,04,CR	00(000440.05)01(000240.04)04(M)CRLF

3.to get live data codes 00 - 05 (data values used as example only):

sent	received
00-05,CR	00(000440.05)01(000240.04)02(1.200505)03(0.800400)04(M)05( )CRLF

LIVE DATA CONVENIENCE COMMAND CODES

code	definition	response	explanation
G	SWITCH TO GROSS	(per print format)	switch to gross and return current gross weight
N	SWITCH TO NET T	(per print format)	switch to net and return current net weight
	SWITCH TO NET & TARE	(per print format)	switch to net, tare,return current net weight
Z	SWITCH TO GROSS & ZERO	(per print format) (previous data)	switch to gross, zero, return current gross weigh
P	CLEAR PEAK/ VALLEY DATAt		clear peak and valley registers

LIVE DATA CONVENIENCE COMMANDS (examples)

1. to switch LCc-II to gross mode and get gross weight (code G), if current gross weight is -10.1 lb, unit # is 01, and scale is in motion:

sent	received (according to print format setup)
GCR	01 -000010.1LGMCRLF

2. to switch LCc-II to net mode, tare and get net weight (code T), if current gross weight is -10.1 lb, unit # is 01:

sent	received (according to print format setup)
TCR	01 000000.0LN CRLF

SECTION 7. System Diagnostics

7.1 OVERVIEW

LCc-II diagnostics provide easy access to critical operational data, and test/verification procedures for many indicator functions. Unique to LCc-I1 diagnostics is the simulated weighment or ramp feature.

Figure 7-1 (next page) presents the diagnostic flow diagram. Follow the procedures in this diagram to view values, set function limitations, test the front panel keypad, verify I/O functions, and run a simulated weighment.

7.1.1 Diagnostic User

Diagnostic user provides three registers for storage of customer tag and calibration records. Users may enter a tag number, current calibration date, and projected date of next calibration, if desired.

7.1.2 Diagnostic Version

Diagnostic version provides the software version, the installed option code derived from the ordering specification, the serial number, the ND converter revision level, and the date of the factory calibration.

7.1.3 Diagnostic Recall

Recall allows the operator to view current tare and zero values of selected cell.

7.1.4 Selecting Limits

DIAG LIMITS is accessed to enter/alter zero, overload, and motion limits and motion timer. The value entered for zero will limit the range of the front panel zero key (recommended 2-20%). Overload sets the alarm annunciator activate point. Motion determines how many counts must be exceeded before the 'in motion' alarm annunciator is activated. The motion timer determines how long the motion alarm remains activated after the motion condition is cleared (for selected cell).

7.1.5 Front Panel Key Test

DIAG KEYPAD allows an operator to functionally test any/all front panel keys. **Press any two keys simultaneously to exit.**

7.1.6 Check Remote Inputs

DIAG INPUTS is a check of all remote inputs. If inputs are inactive, their respective numbers will appear (54321). Once activated, the input number will change to a dash.

7.1.7 Test/Verify the Analog Output

DIAG ANALOG tests the analog output (if analog option installed). Test should be performed with a current meter attached. Testing firstly shows the actual analog count value being transmitted. Since the analog output is based on a 16 bit D-A conversion, the percent of span can be calculated by dividing the displayed counts by 65535. Secondly, any value may be entered to test the analog output. Enter a known value such as 65535 (max setting) and check current meter for appropriate output. Exiting this menu will automatically discontinue the test mode.

7.1.8 Test/Troubleshoot the Serial Output

DIAG SERIAL provides the means to view both the transmit and receive buffers. After pressing EDIT, use the left/right arrow keys to increment forward or decrement backward through the selected buffer and view the hexadecimal value of each character. Using this procedure, incoming data requests can be checked for protocol/syntax accuracy and compared to LCc-I1 output responses.

7.2 SIMULATING A WEIGHMENT

'Ramping' allows entry of starting and ending gross weight values, and then simulates live weight addition without dead weight loading the cell. During the ramping exercise all outputs function as if an actual weight change were in progress.

DIAG RAMP allows entry of simulated starting (typically 0) and ending (typically full scale load cell capacity) weight points. Time for a

complete ramp `up' cycle (starting point up to ending point) can be selected from 1 to 240 seconds. Once ramp 'up' is complete, a ramp 'down' (ending point down to starting point) sequence automatically begins. At the BEGIN display, press EDIT to start ramping. Ramping will continue until ESC is pressed.

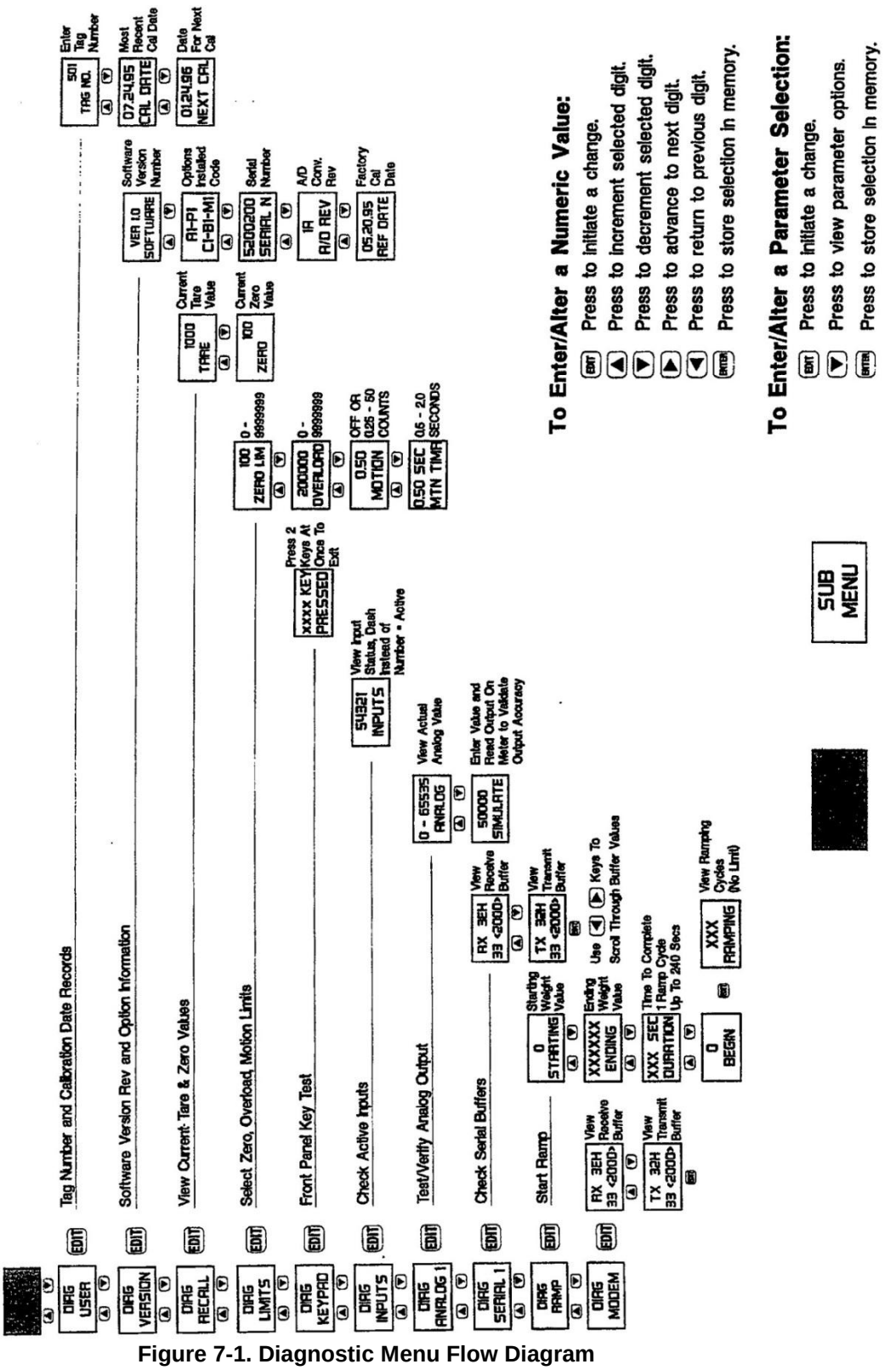


Figure 7-1. Diagnostic Menu Flow Diagram

SECTION 8. Security System

8.1 INTRODUCTION

From password access to individually selectable menu and key 'locks', Safe-Weigh Software protects the LCc-II system from overt tampering or accidental data/configuration/calibration alterations. Figure 8-1 (next page) presents the security menu flow diagram. Follow the procedures designated to secure as many parameters as desired.

8.1.1 Lock On/Off

Lock 'On' restricts access to the security menu and all other menus/keys designated as 'locked'. If locked, the designated password (see paragraph 8.2) must be entered to gain access to the security menu. Units are shipped with the lock 'Off' to allow initial configuration without a password. Note that the mV/V channel is always locked.

8.1.2 Menu Locks

Any or all of the LCc-I1 main menus can be 'locked' to prevent parameter changes. To lock a menu, choose ON by pressing the EDIT and RIGHT arrow keys in sequence. Then press ENTER to store. Once a menu is designated as locked access to that menu is barred. To 'unlock' a locked menu, return to the security menu, enter the correct password, and change the status to OFF.

8.1.3 Key Locks

Five of the LCc-I1 front panel keys can be 'locked' to prohibit key function. Keys that can be locked are; ZERO, TARE, G/N (gross/net), CHANNEL SELECT, and EDIT. To lock a key, choose ON by pressing the EDIT and RIGHT arrow keys in sequence. Then press ENTER to store. If a key is designated as locked, it will not function when pressed. To 'unlock' a locked key, return to the security menu, enter the correct password, and change the status to OFF.

8.2 PASSWORD ACCESS

If lock ON is selected (paragraph 8.1.1), a password must be entered to regain access to the security menu. The following paragraphs explain how to select and enter a password. Once a password is chosen, it should be written down and stored in a confidential area.

8.2.1 Selecting/Storing a Password

A password can be any combination of alphanumeric characters up to seven digits long. It is not necessary to use all seven digits.

At the PASSWORD display, key in the designated characters using the arrow keys (LEFT/RIGHT to change digits, UP/DOWN to select character). When the password is correctly displayed, press ENTER to store.

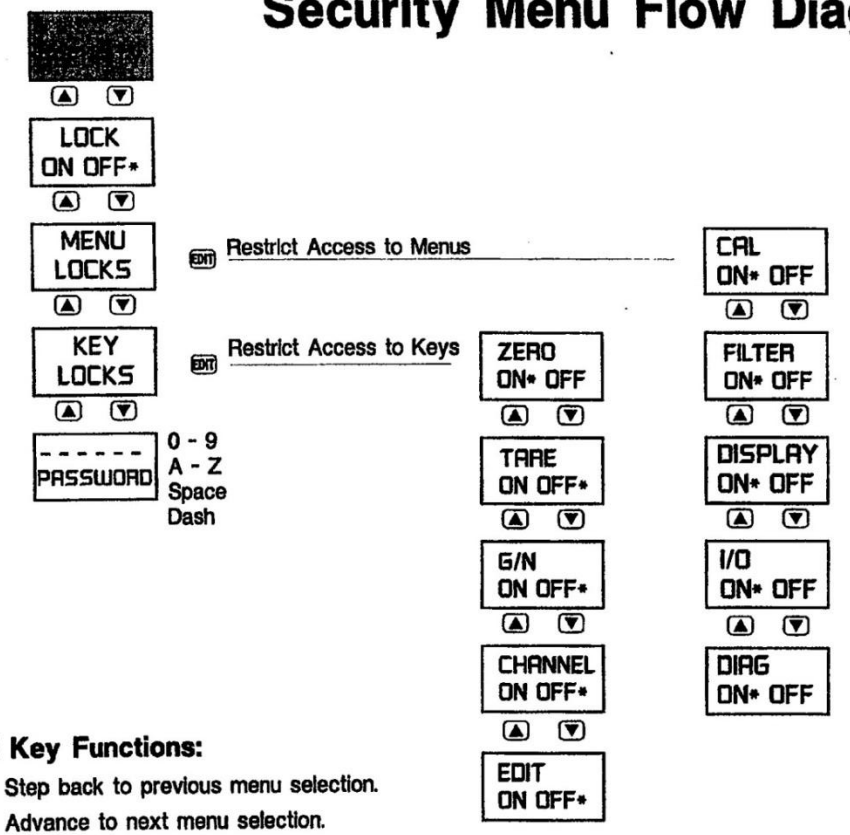
8.2.2 Entering the Password

If the lock is 'ON', the password must be entered to access the security menu. With the display reading SECURITY (a row of dashes above), press EDIT. Use the arrow keys to enter the complete password, as it was stored, on the row above SECURITY. When the correct password is displayed, press ENTER. Note that entering the password does not turn the lock off; it simply allows access to the security menu. If the lock is left ON, the password must be entered each time the security menu is accessed.

8.2.3 Master Password

In addition to the user selected password there is also factory installed master password. If the user selected password is lost, contact any BLH service location for the master password.

Security Menu Flow Diagram



General Key Functions:

- ▲ Step back to previous menu selection.
- ▼ Advance to next menu selection.
- MENU Advance to next main menu selection.
- ESC Return to live operation from menu.
- EDIT Change sub menu parameters.
- ENTER Store displayed sub menu parameter in memory.

SUB MENU

To Enter/Alter a Numeric Value:

- EDIT Press to initiate a change.
- ▲ Press to increment selected digit.
- ▼ Press to decrement selected digit.
- ▶ Press to advance to next digit.
- ◀ Press to return to previous digit.
- ENTER Press to store selection in memory.

To Enter/Alter a Parameter Selection:

- EDIT Press to initiate a change.
- ▼ Press to view parameter options.
- ENTER Press to store selection in memory.

Figure 8-1. Security Menu Functions

SECTION 9. OPERATION

9.1 INTRODUCTION.

Once the LCc-II is connected to a master load cell, configured, and calibrated, the system is ready for operation. Upon power up LCc-II instruments display the software version number (VER XX). LCc-II operation consists of displaying force values which correspond to force imposed upon the master load cell. The force value will be displayed on the first line of the two line display.

All operating transactions occur through the LCc-II front panel keys (Figure 9-1). The following paragraphs describe how to choose a load cell (with its calibration curve parameters), perform a calibration check, and change the operating modes from the LCc-I1 front panel.

9.2 LOAD CELL SELECTION

The first operating function is to choose the desired load cell channel (with all stored parameters) and confirm the 'ID' or serial number (refer to paragraph 3.4). Press the CHANNEL SELECT key until the triangular LED points to the number of the master load cell channel. Then, press the CELL ID key to confirm the load cell serial number. If the selected channel has not been configured, display readings of NO ZERO, NO TARE, or NO ENGCAL may result. Go back to SECTION III and configure/re-configure the channel as needed.

9.3 PERFORM CHECK CAL

When operating for the first time, make certain that there is no load on the master load cell. Set the check cal selector switch to the correct mV/V (rated output of load cell) position and press the cal button. Record the resulting display value in the table provided in Appendix B for future reference. NOTE: If using a load cell with a non-standard mV/V output, refer to SECTION II, paragraph 2.3.4 for selection and installation of a rear panel, custom value check cal resistor. Set the check cal selector switch to 'SELECT' and proceed as previously discussed in this paragraph.

To insure that the instrument and certain load cell specifications have not changed from use to use, set the check cal selector switch to the correct mV/V value and press the cal button. (Again, make sure there is no load on the master load cell.) Compare the resulting display value to the previously recorded value in Appendix D. If values do not match, double-check to be sure the proper channel is selected and that the load cell is not damaged.

Key Functions During Operation		
EDIT	No function	
ESC	No function	
CELL ID	Confirm channel #, display serial number	HOT
MENU	Switch to configuration mode	
VALLEY	Display valley value	HOT
PEAK	Display peak value	HOT
◀	Display live mV/V value	HOT
▲	Display gross mode zero value	HOT
▼	Display net mode tare value	HOT
▶	Display mV/V value	HOT
PRINT	Print if formatted for print output	
ENTER	No function	
ZERO	Acquire zero in gross mode	
TARE	Acquire tare in net mode	
G/N	Change operating mode	
CHANNEL SELECT	Display or advance (double press) channel selection	

Figure 9-1. Front Panel Function Keys

9.4 FRONT PANEL KEY FUNCTIONS

Most operating functions such as mode changes, push to zero, and printing are performed using the front panel keys. Figure 9-1 provides a detailed explanation of each key function during operation.

9.4.1 Hot Keys

Hot keys allow the operator to view stored and/or live data without changing operating modes. Keys designated "HOT' in Figure 9-1 function on a push-hold-view-release basis.

9.4.2 Quick Change Key Sequence

The key sequence presented in Figure 9-2 quickly accomplishes two functions as follows:

1. If a locked function is encountered, use this sequence to enter the password and unlock the function.
2. In normal operating mode, use this sequence to change the units designation i.e., lb to kg, etc.

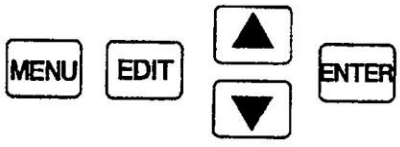


Figure 9-2. Unlock: or Change Units - Quick Key

OPERATING MODES

LCc-II calibrators power up in the mode they were left in when last operated. Pressing the GROSS-NET key toggles operation between gross and net modes. Both modes are indicated by two characters on the lower line of the Lec-11 two line display.

9.4.3 Gross Display Mode.

Gross display mode (factory default mode) is indicated as GR under the weight value display. In the gross display mode, all of the force imposed upon the master load cell is displayed at all times. If a mechanical fixture is placed upon the load cell, the weight value of the fixture is included in the gross weight display. If the master load cell has a tendency to drift or creep after a period of operation, press the ZERO key to reset the gross weight zero reference point.

NOTE The ZERO key will function only when the LCc-II is in the gross weight display mode. Push to zero functions up to the limit select value entered in Figure 5-2; zero limit. Attempting to subtract a value greater than the zero limit results in a momentary flashing display of ZERO LIMIT, without subtraction.

9.4.4 Net Display Mode

Net display mode is indicated as NT on the second line of the two line display. Net display operation is typically used in conjunction with the tare feature. Pressing TARE allows force, such as the weight of a mechanical fixture or stabilizer, to be electronically 'tared out' (deleted) from the weight display.

NOTE: The TARE key will function only when the LCc-II is in the Net Weight mode.

9.4.5 Tare Value Display Mode (Custom Display)

The tare value can be recalled and displayed at any time during normal operation by pressing the 'down' directional HOT key.

9.4.6 Zero Value Display Mode

The push to zero value can be recalled and displayed at any time during normal operation by pressing `up' directional HOT key.

9.4.7 Peak Valley Display Modes

The largest force value applied to the master load cell is saved in the peak register. Peak display mode can be accessed at any time by pressing the PEAK key. The lowest or valley value is displayed by pressing the VALLEY key. Peak and valley values may be reset by pressing any other key simultaneously with PEAK or VALLEY. Selecting a new channel also resets peak and valley values.

9.5 COMPARATIVE ANALYSIS

By combining the LCc-II with a master load cell, a 'standard' calibrating system is produced. Load cells with unknown calibration curves can be compared to the curve of the master cell for test and verification purposes. This process is commonly called 'bucking'. With load cell bucking, the unknown cell and the master cell are typically placed in a hydraulic press so that a known force value can be applied equally to both cells simultaneously (Figure 9-3).

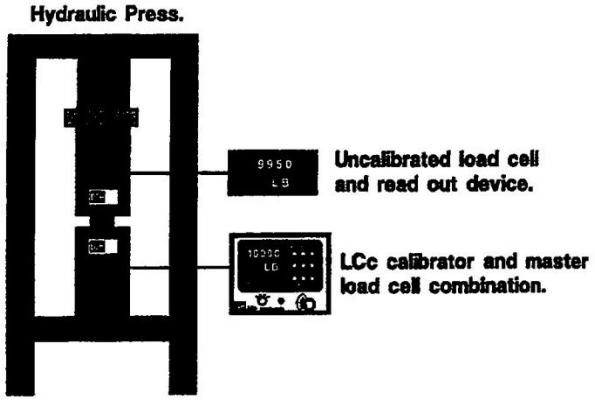


Figure 9-3. Load Cell Bucking

The resulting output from the unknown cell is compared to the standard output of the master cell and a deviation curve is plotted for the unknown cell.

9.6 Using the mV/V Calibration Channel

The LCc-II provides an eleventh, mV/V viewing channel which accommodates full scale mV/V inputs of up to 3.6mV/V. Use this channel to view actual cell mV/V output signals. Zero and tare functions, if actuated, will be applied to the signal during viewing.

NOTE: This is strictly a viewing channel. No calibration functions can be applied to this channel.

A zero reference switch (Figure 5-1) is provided in conjunction with the mV/V channel. This momentary pushbutton switch, when pressed, establishes a true zero reference so that the load cell zero balance can be measured. Any unbalance displayed should be removed prior to loading by pressing the ZERO key.

9.7 THE DISPLAY HOLD FUNCTION

A display hold input (see paragraph 2.3.6) allows an operator to freeze the displayed weight/force value at any time. When activated, the upper display line freezes current data while the lower display line continues to display live weight/force.

9.8 ERROR DETECTION AND CORRECTION

Should an error condition occur, a scrolling message will appear on the bottom line of the front panel display. As much as possible, messages define the exact error and suggest a remedy. Once the error is cleared, the scrolling message will stop and normal operation will resume. Table 9-1 presents all error messages with recommended solutions.

Table 9-1. Error Messages and Explanations

POWER-UP FAULT MESSAGES

FAULT CONDITION	DISPLAY	REMEDY
The aid module does not have a revision number	NO ND REV	Factory procedure
The *aid* module does not have an mV/V calibration date	NO CAL DATE	Factory procedure
The aid module does not have a temperature compensation reference	NO TMP COMP	Factory procedure
The aid module does not have an mV/V calibration	NO mV/V CAL	Factory procedure
The instrument serial number has not been downloaded	NO SER NUMBER	Factory procedure
The instrument has not been calibrated for weight	NO CAL	Set to quick cal or Acquire deadload cal or Enter keypad cal
The instrument does not have a valid zero value	NO MAN ZERO	Acquire zero using zero key or enter manual zero
The instrument does not have a valid tare value	NO MAN TARE	Acquire tare using tare key of enter manual tare

OPERATE MODE FAULT DISPLAYS

Load cell excitation short, or no excitation	FAULT LOAD CELL	Check connections
	scrolling message = 'EXCITATION FAULT CHECK CONNECTIONS"	
Load cell excitation fault cleared	FAULT CLEARED	
A/D reference values out of limit	A/D FAULT followed by RESTART, followed by reset of instrument	Check connections, possible sense line open
Eeprom read/write failure when storing parameters	EEPROM ERROR	Contact BI-11 field service
Aid output has reached maximum value	OVER RANGE	Check connections, excitation to signal short
Aid output has reached minimum value	UNDER RANGE	Check connections, excitation to signal short

OPERATE MODE SPECIAL DISPLAYS

Gross weight is equal to or greater than overload setting	5000 OVER LS (over is blinking)	
Attempt to enter locked menu or perform locked function	LOCKED to unlock	Go to security menu
Attempt to zero gross weight when in net mode	SWITCH TO GROSS	Switch to gross mode
Attempt to tare net weight when in gross mode	SWITCH TO NET	Switch to net mode
Attempt to zero gross weight at or above zero limit	ZERO UMIT	
Attempt to zero gross weight or tare net weight in motion	IN MOTION	Wait for stable weight signal

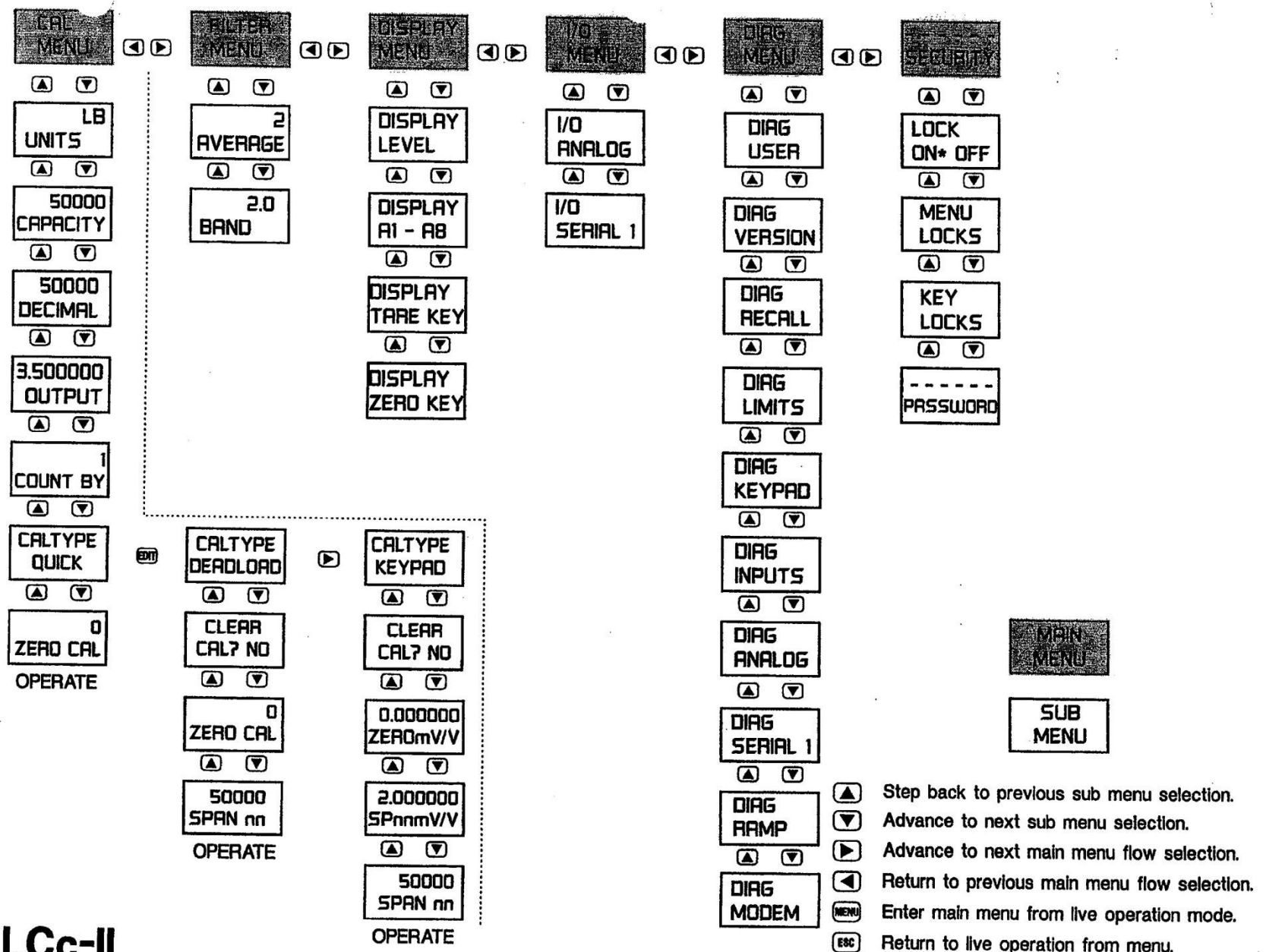
Appendix A

LCc-II Spare Parts List

Description	BLII Part Number
Power Cord	144998
Tip-Up Handle	149087
Rubber Feet	149088
7 Pos. Terminal Block Mating Connector	149293
8 Pin Bendix Mating Connector	133261

Appendix B
LCc Check Cal Reference Records

Master Load Cell Serial Number	Check Cal Reference Value
(1) _____	_____
(2) _____	_____
(3) _____	_____
(4) _____	_____
(5) _____	_____
(6) _____	_____
(7) _____	_____
(8) _____	_____
(9) _____	_____
(10) _____	_____



LCc-II
Overall Flow Diagram

- Step back to previous sub menu selection.
- Advance to next sub menu selection.
- Advance to next main menu flow selection.
- Return to previous main menu flow selection.
- MENU Enter main menu from live operation mode.
- ESC Return to live operation from menu.
- EDIT Change sub menu parameters.
- ENTER Store displayed sub menu parameter in memory.

BLH

3 Edgewater Drive,

Norwood, MA 02062 U.S.A.

Phone (781) 298-2200

Fax (781) 762-3988

www.vishaypg.com