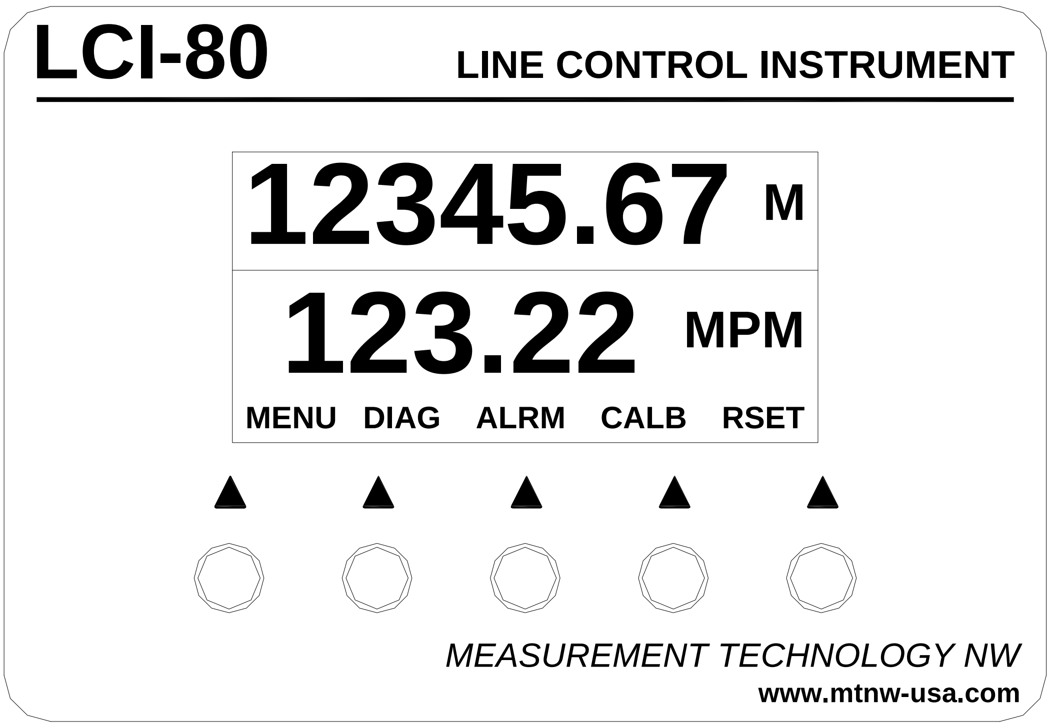
INSTALLATION MANUAL

LCI-80 Line Control Instrument

Revision 1.00
October 29, 2009



MEASUREMENT Technology NORTHWEST

4211 24th Ave West
Seattle WA 98199
USA

Phone: 206.634.1308
Fax: 206.634.1309
Email: LCI@mtnw-usa.com

Table of Contents

1.0 Overview *6*
2.0 Quick Start *7*
2.1 Mounting **7**
2.2 Basic Field Wiring **7**
2.3 Basic Hardware Configuration **8**
2.4 Basic Operation **8**
3.0 Mechanical Installation *10*
3.1 Environmental Considerations **10**
3.2 Dimensions and Cutout **10**
3.3 Display Mounting **10**
3.4 Ventilation Requirements **10**
3.5 Cleaning Instructions **10**
4.0 Connection Options and Wiring Diagrams *11*
4.1 Wiring Hookup **11**
4.1.1 Display Power and Fuse 11
4.1.2 Count (Payout) Sensor Inputs 12
4.1.3 Alarm Outputs 13
4.1.4 Digital Inputs 14
4.1.5 Communication Port Connections 14
4.1.6 External Dimming Connection 15
5.0 Display Operation *16*
5.1 Front Panel Identification **16**
5.2 Programming Menu **17**
5.3 Handling of Unit Conversions **19**
5.4 Payout and Speed Calibration **19**
5.4.1 Payout Calibration System 19
5.4.2 Speed Calibration System 20
5.5 Display Configuration **21**
5.5.1 Locating Variables on the Screen 21
5.5.2 Setting Display Units 22
5.5.3 Setting Decimal Places 22
5.5.4 Screensaver 22
5.5.5 Display Contrast Setting 23
5.6 Alarms **23**
5.6.1 Acknowledging Alarms 23
5.6.2 Setting Alarm Limits 23
6.0 Hardware Configuration *25*
6.1 Security Lockout **25**

6.2 Count Sensor Configuration 25
6.2.1 Count and Direction 25
6.2.2 Up/Down Counter 26
6.2.3 Quadrature Counter 26
6.2.4 Setting the Counter Mode 27

6.3 Digital Input and Output Configuration 27
6.3.1 Relay Output Configuration 27
6.3.2 Digital Input Configuration 27

6.4 Factory Setup Utility 28

6.5 Communications 29
6.5.1 LAN ID Number 29
6.5.2 Setting the Date and Time 29
6.5.3 Terminal Mode 30
6.5.4 Ethernet Communications 30
6.5.5 USB Communications 33
6.5.6 RS-232 Communications 34
6.5.7 RS-485 Communications 34
6.5.8 Datalogging Methodology 35
6.5.9 Datalogging Protocols 36

7.0 Troubleshooting 37

7.1 Diagnostics Screen Utility 37

7.2 Troubleshooting Procedures 38

7.3 Technical Support 40

8.0 Appendix A – Dimensional Drawing 41

9.0 Appendix B – DIP Switch Settings 42

10.0 Appendix C – LCI-80 Specifications 43

11.0 Appendix D – LCI-80 Wirelist 45

Figures and Tables

Figure 1.1 – LCI-80 Front Panel 6
Figure 2.1 – Power Hookup – DC Power 7
Figure 2.2 – Payout Sensor Hookup – 5VDC Quadrature Encoder 8
Figure 2.3 - Calibration Menu 8
Figure 2.4 - Calibration Menu 9
Figure 4.1 - Identification of hardware options, DIP switches and manual section by function 11
Figure 4.2 - Local Display Power Hookup 12
Figure 4.3 - Payout Sensor Hookup - 12V NPN/PNP switches 12
Figure 4.4 - Payout Sensor Hookup - TTL Encoder 13
Figure 4.5 - Payout Sensor Hookup - Magnetic Pickup 13
Figure 4.6 - Alarm Output Hookup 13
Figure 4.7 - Digital Input Hookup 14
Figure 4.8 - RS-232 Serial Port Connection 14
Figure 4.9 - RS-485 Serial Port Connection 14
Figure 4.10 - USB Serial Port Connection 15
Figure 4.11 - Ethernet Port Connection 15
Figure 4.12 - Dimming Port Connection 15
Figure 5.1 - LCI-80 Front Panel 16
Figure 5.2 - LCI-80 Menu Tree 18
Figure 5.3 - Payout Calibration Menu 19
Figure 5.4 - Speed Calibration Menu 20
Figure 5.5 - Effect of Speed Filter Variables 21
Figure 5.6 - Display Configuration Menu 21
Figure 5.7 - Payout Display Menu 22
Figure 5.8 - LCI-80 Display Units 22
Figure 5.9 - Alarm Configuration Menu 24
Figure 5.10 - Alarm 1 Configuration Menu 24
Figure 6.1 - System Configuration Menu 25
Figure 6.2 - Locked Menu 25
Figure 6.3 - Count and Direction Mode 26
Figure 6.4 - Up/Down Counter Mode 26
Figure 6.5 - Digital I/O Configuration Menu 27
Figure 6.6 - Digital Input Functions 27
Figure 6.7 - Factory Setup Menu 28
Figure 6.8 - Communications Ports 29
Figure 6.9 - Communications Menu 29
Figure 6.10 - Set Date and Time Menu 30
Figure 6.11 - Serial Communications Menu 30

Figure 6.12 - TCP Ethernet Menu 31
Figure 6.13 - UDP Ethernet Menu 32
Figure 6.14 - Basic Ethernet Settings Menu 32
Figure 6.15 - USB Communications Menu 33
Figure 6.16 - RS-232 Communications Menu 34
Figure 6.17 - RS-485 Communications Menu 34
Figure 7.1 - Diagnostics Screen 37

1.0 Overview

The LCI-80 Wireline Winch Panel is a versatile instrument that displays line Payout and Speed for wireline winch and other wire rope applications. The display interfaces with payout sensors, converts the signals into engineering units, and displays these values on a high visibility electro-luminescent display. The display includes five pushbuttons which allow the user to easily configure the display, calibrate the payout sensors, and acknowledge alarms; all using a full English language menu system.

The function of each front panel button is written on the display immediately above the button. This text will change as the user navigates through the menus to indicate the current function of the button.

The LCI-80 is a flexible device and can be configured in many ways. The display can be configured to accept inputs from a wide variety of payout sensors, the payout and speed values can be displayed in a number of different units (both Imperial and SI), the user can specify the formatting of the output values, up to two relay outputs can be configured as alarms, and several communications ports can be enabled to provide data logging or remote monitoring.

This manual is intended to cover the installation, set-up, and operation of the LCI-80 display.

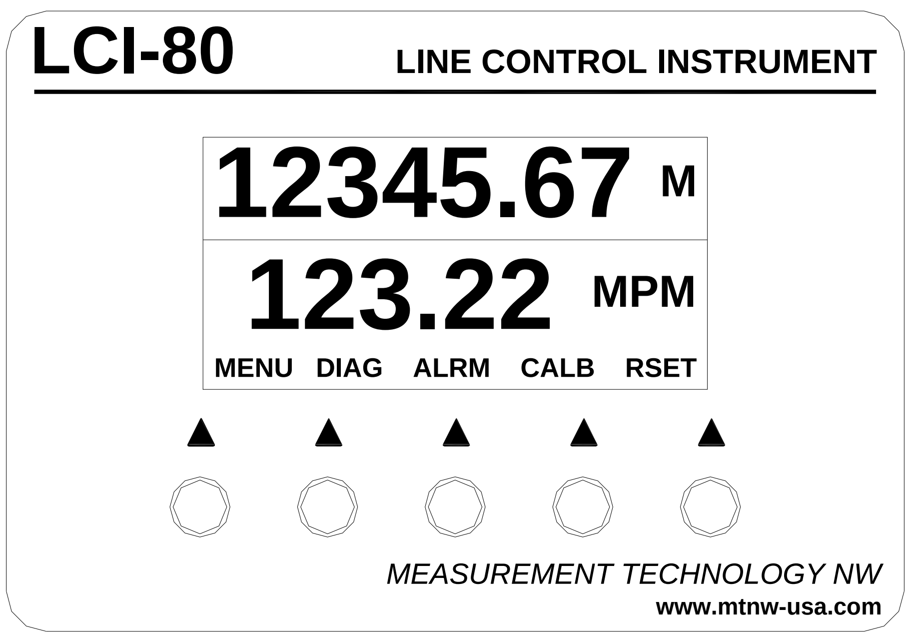


Figure 1.1 – LCI-80 Front Panel

2.0 Quick Start

This section provides a subset of the full technical manual to facilitate installation and start-up of the LCI-80. For a complete technical description please refer to Sections 3.0-6.0.

2.1 Mounting

The LCI-80 will fit in a 5.27” x 3.55” cutout, with a minimum of 2.38” depth clearance (see Appendix A for dimensional drawing). The instrument is held in place with removable panel clamps that index into the slotted holes on all sides of the display. Two clamps are included with each display.

After sliding the display into the cutout, clip the two panel clamps on to the sides of the display, with the flanged end of the clamp facing away from the panel. Once the panel clamps are installed, tighten the jackscrews against the panel to compress the LCI-80’s gasket and seal the unit against the panel. Lock the jackscrews with the provided hex nuts to prevent them from vibrating loose over time.

2.2 Basic Field Wiring

The basic field wiring connections for the LCI-80 are those for power and payout sensors. When shipped, a factory default LCI-80 display is initially configured for connection to a quadrature encoder payout sensor. The unit is capable of interfacing with a number of payout sensor types; Section 4.1.2 details the wiring connections for all compatible sensors.

During installation, an appropriate disconnect device must be installed to provide a means of disconnecting the display from the external power source for servicing. This disconnect device is not provided with this equipment.

Input power requirements are 9-36VDC (nominal 12VDC) at 13 Watts (max). The LCI-80 is design for DC supply only.

Connection diagrams for the factory standard power input and payout sensors are shown in the following tables. Connections on the rear of the LCI-80 are listed on the left while the corresponding field connections are shown on the right.

DC Power Connection

TB2	Power: 9-36 VDC, 13 Watts, 1.5 Amps
+V	DC +
COM	DC –

Figure 2.1 – Power Hookup – DC Power

TB1	Payout Sensor – Quadrature Encoder
+5	+ EXCITATION
A	SIGNAL – SENSOR A
B	SIGNAL – SENSOR B
COM	- EXCITATION (COMMON)

Figure 2.2 – Payout Sensor Hookup – 5VDC Quadrature Encoder

2.3 Basic Hardware Configuration

The base unit LCI-80 (i.e. no options) will accommodate the field device wiring and input devices shown in Section 2.2 above. No menu programming or DIP switch changes are necessary if these inputs are used. Setup procedures for alarms, digital inputs, and serial communication options are discussed in Sections 4.0-6.0.

2.4 Basic Operation

The LCI-80 unit is configured at the factory to display payout at the top of the display with the speed displayed below. The unit will display two decimal places for the payout value and one decimal place for the speed value. Default display units are meters and meters per minute respectively. These settings can easily be changed as described in Section 5.5 of this manual.

Before the LCI-80 can provide meaningful information, the payout sensor must be correctly calibrated. The following is a brief description of the calibration procedure, however, in-depth instructions can be found in Section 5.4. To begin calibrating the payout sensor, turn on power to the LCI-80. The RUN screen will appear similar to that shown in Figure 1.1. Now press the CAL button to bring up the **2.0 CALIBRATION** menu as shown in the following Figure.

	2.0 CALIBRATION	
>	**1**	**PAYOUT CALIB.**
	2	**SPEED CALIB.**

RUN	UP	DWN	ENT	ESC

Figure 2.3 - Calibration Menu

Using the ENT button navigate into the Payout Calibration menu. Using the UP and DWN keys, align the cursor with the first menu item (SCALE) and press the ENT key. This will enter edit mode so that the Payout Scale Factor can be modified as shown in the following Figure.

	2.1 PAYOUT CALIB.		
>	**1**	**SCALE**	**1.00 P/M**
	2	**PRESET**	**0.00 M**
	3	**MODE**	**QUAD 4X**

DEC	INC	→	ENT	ESC

Figure 2.4 - Calibration Menu

Now, use the DEC, INC and → keys to change the value to the correct number of pulses per meter that the payout sensor provides (this can be calculated from the geometry of the sensor arrangement, see Section 5.4.1 for details). Pressing ENT again will accept the new value and calibrate the LCI-80's payout sensor system. Alternatively, pressing ESC will undo any change that has been made to the value. Following this, pressing the RUN button will save the new value into non-volatile memory and return the LCI-80 to the RUN screen and normal operation.

The LCI-80 unit will now be fully calibrated and ready for operation.

3.0 Mechanical Installation

The LCI-80 is designed for mounting on the front-panel of an electrical enclosure with a suitable environmental rating. The sealed front face of the LCI-80 is made of a laminated stainless steel assembly and the slotted rear cage is designed to promote heat transfer, facilitate field wire terminations, and provide a purchase point for the panel clamps. The front face is 3.9” high x 5.6” wide and the total depth is 2.38” (measured from the rear of the stainless steel front panel to the rear extremity of the LCI-80’s enclosure).

3.1 Environmental Considerations

The front face of the LCI-80 is designed for NEMA 4X applications. It consists of a 316 stainless steel top layer, a sealed polycarbonate window, and five membrane-sealed stainless steel push buttons. The rear cage is NEMA 1 and requires protection with a suitable enclosure. A polyurethane gasket, held in-place by a high temperature adhesive is applied to the backside of the front face. When mounting the LCI-80 in exposed locations, a front-panel cover is recommended to protect the unit when it is not in use.

The standard temperature range of the LCI-80 is –40°C to +70°C.

3.2 Dimensions and Cutout

The LCI-80 will fit in a 5.27” x 3.55” cutout (tolerance –0.01, +0.100), with a minimum of 2.38” depth clearance (see Appendix A for dimensional drawing). The enclosure’s front panel can be up to 5/8” thick.

3.3 Display Mounting

The instrument is held in place with removable panel clamps that index into the slotted holes on all sides of the display. Two clamps are included with each display.

After sliding the display into the cutout, clip the two panel clamps on to the sides of the display, using the slotted grooves on the display’s enclosure, with the flanged end of the clamp facing away from the panel. Once the panel clamps are installed, tighten the jackscrews against the panel to compress the LCI-80 gasket to seal against the panel. Lock the jackscrews with the provided hex nuts to prevent them from vibrating loose over time. Care should be taken to not over tighten the jackscrews.

3.4 Ventilation Requirements

The instrument should be mounted with a minimum of 0.75” spacing between the rear enclosure (all edges) of the display and adjacent equipment to allow for adequate ventilation and heat transfer.

3.5 Cleaning Instructions

To clean the front panel of the display, use a clean lint free cloth and a high quality and pure isopropanol. Do not apply the mild solvent directly to the polycarbonate window, instead wet the cloth or wipe first and then gently wipe the window and the stainless steel bezel.

4.0 Connection Options and Wiring Diagrams

The LCI-80 can be configured for a wide range of signal input and output functions. Each of these functions requires the instrument to have the correct menu settings (Section 5.0), DIP switch settings (Appendix B), signal wiring, and power wiring. The wiring diagrams are given in this Section. The table below gives of a summary of the available LCI-80 functions, referenced to their associated menu and DIP switch numbers, and to the section of this manual covering the required wiring termination.

Function	Menu Number	DIP Switch #	Wiring – Manual Section
DC Power	N/A	N/A	4.1.1
Count Sensor Input	2.0	SW3	4.1.2
Alarm Output	4.3	N/A	4.1.3
Digital Input	4.3	N/A	4.1.4
RS232 Serial Comm.	4.422	N/A	4.1.5
RS485 Serial Comm.	4.423	SW2	4.1.5
USB Comm.	4.421	N/A	4.1.5
Ethernet Comm.	4.41	N/A	4.1.5
External Dimming	N/A	N/A	4.1.6

Figure 4.1 - Identification of hardware options, DIP switches and manual section by function

4.1 Wiring Hookup

This section provides wiring diagrams and related specifications for power and signal input and output connections for the LCI-80.

4.1.1 Display Power and Fuse

The fuse, F1, is located on the rear panel of the display. Use a flat blade screwdriver to open the cover for access. The replacement part is a 5 x 20 mm fuse rated for 1.5 Amps. Recommended Bussmann Cooper part number is GMA 1.5A or equivalent.

During installation, an appropriate disconnect device must be installed to provide a means of disconnecting the display from the external power source for servicing. This disconnect device is not provided with this equipment.

Input power requirements are 9-36VDC at 13 Watts. This device is a DC device. Wiring for the display's power connection (9-36 Volt DC) is shown below.

TB2	Power: 9-36 VDC, 13 W
+V	DC +
COM	DC –

Figure 4.2 - Local Display Power Hookup

4.1.2 Count (Payout) Sensor Inputs

The LCI-80 uses count sensors to measure payout and the unit can interface with NPN and PNP type proximity and Hall-Effect inputs, as well as TTL/CMOS encoder inputs, and magnetic pickup sensors. The input threshold voltages are factory set to accommodate all of the above sensor types without the need for adjustment, however, if required the unit can be reconfigured to accept any digital pulse stream with levels between 0 and 12VDC (note: voltages up to 36VDC can be present on the count sensor inputs without causing harm to the display, although the unit will clip these inputs to approximately 12VDC internally). To get information on connecting the unit to other sensor types please contact the manufacturer.

The LCI-80 can count incoming pulses in multiple ways including quadrature inputs, count and direction inputs,

Count sensors are connected to the display using TB1 and four DIP switches (SW3) must be set correctly depending on the sensor type. The following tables detail the wiring connections for the primary sensor types. See Appendix B for details of the DIP switch settings.

Dual NPN/PNP Switches, +12 V Excitation

TB1	Payout Sensors – Proximity Switch
+12	EXCITATION – SENSOR A
+12	EXCITATION – SENSOR B
A	SIGNAL – SENSOR A
B	SIGNAL – SENSOR B
COM	COMMON – SENSOR A
COM	COMMON – SENSOR B

Figure 4.3 - Payout Sensor Hookup - 12V NPN/PNP switches

TTL Encoder, +5 V Excitation

TB1	Payout Sensors – Encoder
+5	+ EXCITATION
A	SIGNAL – SENSOR A
B	SIGNAL – SENSOR B
COM	– EXCITATION

Figure 4.4 - Payout Sensor Hookup - TTL Encoder

Magnetic Pickup

TB1	Payout Sensors – Encoder
+5	SENSOR –VE TERMINAL
A	SENSOR +VE TERMINAL
B	GROUND (CONNECT TO TB1-COM on LCI-80)

Figure 4.5 - Payout Sensor Hookup - Magnetic Pickup

4.1.3 Alarm Outputs

The LCI-80 has four internal, software configurable alarms that can be set to trigger at either a high or low level of payout or speed. Each of these alarms can subsequently be linked with one of two relay outputs that can be used to trigger external sirens, beacons or other alarm systems. Each relay output has both a normally open and a normally closed output along with the common. Connections to the relays are made on TB4. The following table lists the two types of connection that can be made on this terminal block. In this example, Alarm 1 is connected as a normally closed output and Alarm 2 is connected as a normally open output.

Alarm Outputs (2 channels total)

TB4	External Alarm/Device
OUT 1 – NC	ALARM 1 SIGNAL +
OUT 1 – C	ALARM 1 SIGNAL -
OUT 1 – NO	N/C
OUT 2 – NC	N/C
OUT 2 – C	ALARM 1 SIGNAL -
OUT 2 – NO	ALARM 1 SIGNAL +

Figure 4.6 - Alarm Output Hookup

4.1.4 Digital Inputs

The LCI-80 has two digital input channels that can accept input voltages between 0VDC and 60VDC. Functionality of the inputs is determined in software. The inputs use CMOS logic levels (switching point of approximately 2.5V). Connection of the inputs to the LCI-80 is on TB4; the following table shows the wiring connections.

Digital Inputs

TB4	External Alarm/Device
IN 1	DIGITAL INPUT 1
IN 2	DIGITAL INPUT 2

Figure 4.7 - Digital Input Hookup

4.1.5 Communication Port Connections

The LCI-80 has many communications options for remote data logging and monitoring purposes. RS-232, RS-485, and USB ports are present for serial communications. Additionally, an Ethernet port is available as an easy to use alternative to the serial interfaces. Full details of the functionality of these communications channels are discussed in Section 6.5 of this manual. The following tables detail the connections required for each interface.

RS-232 Serial Port Connection

TB5	Remote Device
TX	Receive
RX	Transmit
COM	DC Common

Figure 4.8 - RS-232 Serial Port Connection

RS-485 Serial Port Connection

TB6	Remote Device
T–/R–	Network, T–/R–
T–/R–	Network, T–/R–
SHLD	Cable Shield
SHLD	Cable Shield
T+/R+	Network, T+/R+
T+/R+	Network, T+/R+

Note: the duplicate terminal blocks are used for daisy chaining multiple units.

Figure 4.9 - RS-485 Serial Port Connection

USB Serial Port Connection

J2	Remote Device
USB-B Connector	USB Port on PC or other device

Figure 4.10 - USB Serial Port Connection

Ethernet Port Connection

J6	Remote Device
RJ-45 Connector	Ethernet port on PC, hub or other device

Figure 4.11 - Ethernet Port Connection

4.1.6 External Dimming Connection

The LCI-80 has a connection to allow external dimming of the display. This is facilitated by connecting a 100kΩ preferably logarithmic potentiometer between two pins on a terminal block at the rear of the display. The following table shows this connection.

TB3	Remote Device
D+	Potentiometer Wiper
D-	Potentiometer Fixed Contact

Figure 4.12 - Dimming Port Connection

5.0 Display Operation

5.1 Front Panel Identification

The LCI-80 front panel, as shown in Figure 5.1, features a high visibility display and a five-button keypad. Each key has a label at the bottom of the screen (immediately above the button itself) that identifies its function. When a key is pressed its function (and the label) changes to reflect the current “operating mode” of the instrument.

In normal operation the RUN screen (shown below) is displayed. This screen is divided into two distinct sections at the top and bottom, which can be user programmed to display speed and payout in any order. Alarm messages are displayed to the right of the value that they are monitoring; up to two alarms can be displayed in this area for each variable (total of four alarms).

The function of the five menu keys during RUN mode are as follows:

MEN Displays the menu for programming and/or calibration of the unit. Section 5.2 describes the navigation and data editing within the programming menu

DIA Switches to the diagnostics screen which shows raw count data, the scaled payout value, the internal temperature of the unit and the state of the digital inputs. Once in DIAG mode, the same button (now labeled **RUN**) returns the display to the RUN screen.

ALM If an alarm condition is present, this button will reset all relay output modules to their default state. **Double-pressing** this button within a two-second interval will bring up the **1.0 ALARM CONFIG** menu (see Section 5.6).

CAL Acts as a shortcut to the **2.0 CALIBRATION** menu (see Section 5.4).

RST Resets payout to zero. Requires two key-pushes within a 2 second period to zero the payout display.

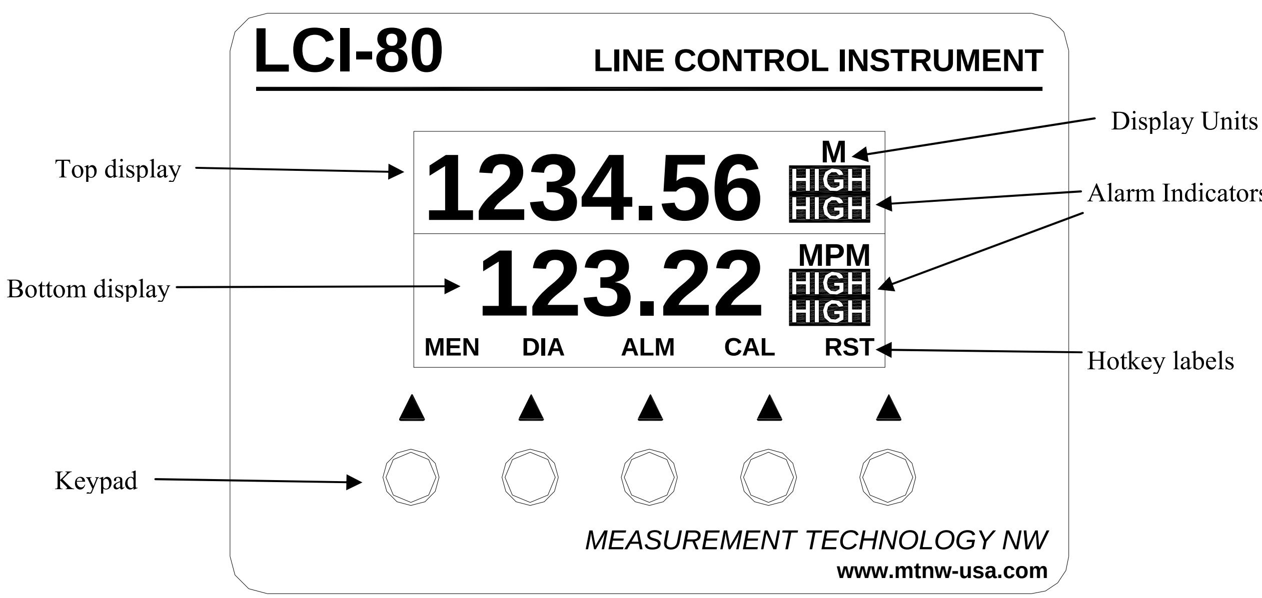


Figure 5.1 - LCI-80 Front Panel

5.2 Programming Menu

The LCI-80 is user programmable via the front panel keypad and the display. Programming options include system settings, setting screen displays and formats, defining alarm points, and calibrating the unit. The menu tree is shown below in Figure 5.2.

Pressing the **MENU** key displays the **0 MAIN MENU** screen. The key labels also change to indicate the functions they perform in **MENU** mode, allowing the user to navigate through the menu system and select menu items. Once an item is selected, the keypad labels change again to reflect their uses in **EDIT** mode for modifying data fields.

In **MENU** mode the keys have the following labels and functions:

RUN	UP	DWN	ENT	ESC

RUN Returns to the Run screen.

UP Moves pointer up the menu (wraps to the bottom)

DWN Moves pointer down the menu (wraps to the top)

ENT If the pointer indicates a sub-menu, jumps to that menu. If the pointer indicates a data field, enters **EDIT** mode to allow changes on the selected field (see below).

ESC Moves back one menu level. When reaching the top menu, pressing this key again will return the display to the Run screen.

When a data field is selected with the **ENT** key, the labels and functions of the keypad change to **EDIT** mode as shown below.

DEC	INC	→	ENT	ESC

DEC Decreases the selected digit by one when editing a numeric field, or reverse scrolls through a list of available options.

INC Increases the selected digit by one when editing a numeric field, or scrolls through a list of the available options.

→ Moves the edit cursor to next digit in data field, or scrolls through a list of choices.

ENT Accepts the edited value and returns to **Menu** mode

ESC Rejects the edited value and return to **Menu** mode

An overview of the LCI-80 menu system is shown on the following page.

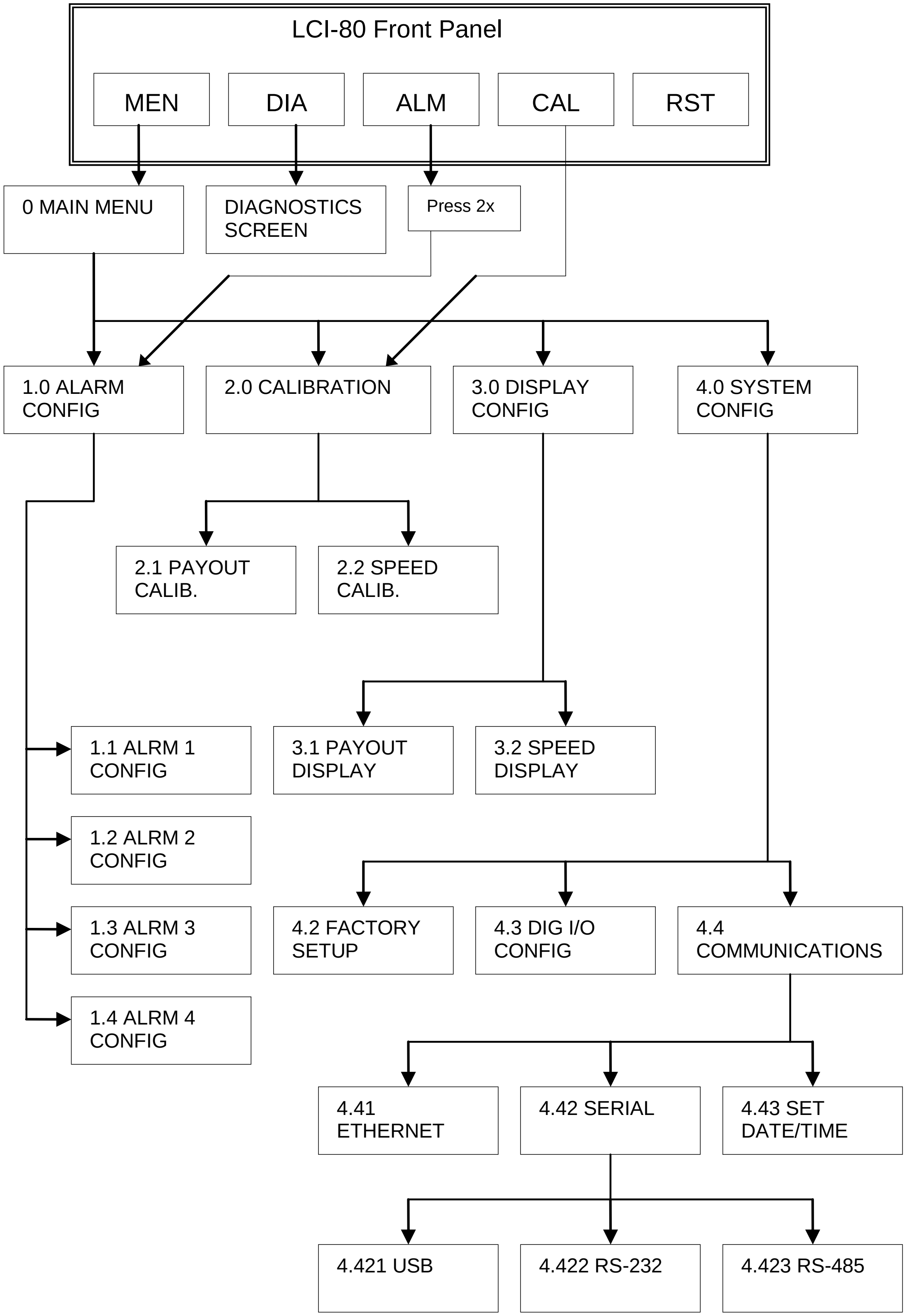


Figure 5.2 - LCI-80 Menu Tree

5.3 Handling of Unit Conversions

Variables stored or calculated by the LCI-80 are handled in a units-aware manner. That is, the device takes the units into account at all times so that when any setting is changed, all other numbers that rely on the setting will be updated accordingly. Thus, the unit does not require recalibration when display units are changed.

During operation, both of the two display units can be switched and all calculations will automatically accommodate the change. For example, if the Run screen shows a payout of 3000 meters and the units are then changed to feet, the screen will immediately display 9843 feet. For details on how to change display units, see Section 5.5.2.

5.4 Payout and Speed Calibration

5.4.1 Payout Calibration System

To calibrate the payout system of the LCI-80, press the **CAL** button to enter the **2.0 CALIBRATION** menu. Then select the **PAYOUT CALIB.** item to bring up the menu shown below. From this menu the user can calibrate the payout sensors (count sensors).

	2.1 PAYOUT CALIB.		
>	1	SCALE	1.00 P/M
	2	PRESET	1.00 M
	3	MODE	QUAD 4X

Figure 5.3 - Payout Calibration Menu

5.4.1.1 Payout Scale

The payout scale factor represents the number of counter pulses per unit length. In a typical application the line will pay out over a sheave with a known circumference and number of targets (= pulses) per revolution. The payout scale factor is calculated as follows:

Payout Scale = Number of Targets / [(Sheave Diameter + Line Diameter) * π]

More generally, the payout scale can be calculated by determining the total number of pulses received while a known length of wire is wound off the winch. The scale factor is calculated by dividing the total number of pulses by the total length of wire.

To edit the scale factor, use the **UP** and **DWN** buttons to move the cursor to the **SCALE** item in the menu. Then press **ENT** to enter edit mode. Now, using the **INC**, **DEC**, and → keys the user can modify the scale factor to the correct value. Pressing the **ENT** key will save the result into non-volatile memory. Pressing the **ESC** key will undo any changes that have been made.

5.4.1.2 Payout Preset

Selecting item 2 in the payout calibration menu allows the operator to manually enter a Payout value. This is useful for resetting the payout to a known (non-zero) value in order to initialize the system (Note: the **RST** button on the Run screen provides a similar result when the known payout is zero).

5.4.2 Speed Calibration System

To calibrate the payout or speed systems of the LCI-80, press the **CAL** button to enter the **2.0 CALIBRATION** menu. Then select the **SPEED CALIB.** item to bring up the menu shown below. From this menu the user can calibrate the speed algorithm.

	2.1 SPEED CALIB.		
>	**1**	**FILTER LEVEL**	**1**
	3	**RESPONSE**	**2 S**

Figure 5.4 - Speed Calibration Menu

5.4.2.1 Speed Filter Level

The **FILTER LEVEL** item specifies the intensity of the speed filter algorithm used by the LCI-80. The value can vary from 1 to 5 and is a qualitative indication of the amount of smoothing applied to the incoming pulse stream when calculating the current speed. A value of five indicates maximum smoothing (least noise).

The **RESPONSE** item specifies the settling time of the speed filter in response to step changes. It is the total amount of time that will have to elapse after a step change in speed before the change has fully passed through the filter, thus, it indicates the length of time that will elapse before the LCI-80 will provide an accurate speed reading.

The response value can be set between two seconds and twenty seconds.

It must be noted that the **FILTER LEVEL** and **RESPONSE** interact with one another. The following table summarizes the merits of various settings for these variables. In the table, Output Noise refers to the fluctuations in the displayed speed value and Update Rate refers to the frequency at which the speed value is recalculated and displayed.

Filter Level	Response	Output Noise	Update Rate
Low (eg. 1)	Low (eg. 2s)	Very high	Middle
Low (eg. 1)	High (eg. 20s)	Middle	Very slow
High (eg. 5)	Low (eg. 2s)	Middle	Very fast
High (eg. 5)	High (eg. 20s)	Very low	Middle

Middle (eg. 3)	Middle (eg. 6s)	Low	Fast

Figure 5.5 - Effect of Speed Filter Variables

In order to appropriately set these parameters, take into mind the frequencies of interest. If the speed is not expected to change quickly then a high response time can be used, otherwise, if the faster response is required the variable must be set lower. Then, a tradeoff between calculation update rate and output noise should be evaluated in order to set the Filter Level. Some experimentation with different values will produce a satisfactory result.

5.5 Display Configuration

The LCI-80 allows the user to modify the Run screen in a number of ways. The position of the two variables (payout and speed) can be changed, the display units can be altered, the number of decimal places can be set, and the display's contrast can be set. Additionally, a screensaver is incorporated into the unit to prolong display life. To access these settings, enter the **3.0 DISPLAY CONFIG** menu which can be reached from the Main menu. The following figure shows this menu.

	3.0 DISPLAY CONFIG		
>	1	PAYOUT DISPLAY	
	2	SPEED DISPLAY	
	3	SCREEN SAVER	ON
	4	CONTRAST	10

Figure 5.6 - Display Configuration Menu

5.5.1 Locating Variables on the Screen

The LCI-80 has two distinct areas on its Run screen for the display of the two variables: payout and speed. Both areas are capable of displaying six digits (this includes a minus sign if it is present) plus a decimal point character.

If the number is unable to fit in the available space, the rightmost digits are clipped to make it fit. If the clipped digits are decimal places the number simply looses precision. If, however, the unit is forced to clip digits to the left of the decimal point, then the characters "**OR**" will be displayed over the top of the number to indicate the over-range event. If this occurs during normal operation, consider using different units for that variable (Eg. Use meters instead of feet).

It is possible to set the location of the two variables through either the **3.1 PAYOUT DISPLAY** (shown in Figure 5.7) or **3.2 SPEED DISPLAY** menus. The first item, labeled **LOCATION**, can be edited to show one of the following values specifying where the variable is to be displayed: **TOP**, **BOTTOM**, or **NONE**. If both the payout and speed are set to be displayed at the same location then the payout will be displayed by default and the speed will be hidden.

	3.1 PAYOUT DISPLAY		
>	**1**	**LOCATION**	**TOP**
	2	**UNITS**	**M**
	3	**DECIMAL PLCS**	**2**

Figure 5.7 - Payout Display Menu

5.5.2 Setting Display Units

As discussed in Section 5.3, the LCI-80 is units-aware so changes in display units can be made without adversely effecting the calibration or setup of the device. To change display units, enter either the **3.1 PAYOUT DISPLAY** or **3.2 SPEED DISPLAY** menu and move the cursor to the **UNITS** item. To change the units, scroll through the available choices using the **INC** or **DEC** keys and push **ENT** when the desired units are displayed. The following table lists the available units for both payout and speed.

Variable	Units – Abbreviation
Speed	Feet per Minute – FPM Meters per Minute – MPM Feet per Second – FPS Meters per Second – MPS
Payout	Feet – FT Meters – M

Figure 5.8 - LCI-80 Display Units

5.5.3 Setting Decimal Places

Item 3 in the **3.1** or **3.2** menus allows the operator to set the maximum number of decimal places to be displayed for a variable. Scroll through the available options using the **INC**, **DEC**, or → keys.

The payout and speed variables can have zero, one or two decimal places. However, if a display value is too large to fit on the display with the full complement of decimal places, then the right-most digits will be clipped.

5.5.4 Screensaver

The LCI-80 is equipped with a screen-saver to prolong the life of the display. The screen will go blank after 30 minutes if the unit has not detected a change in Payout or an operator key press. To re-energize the display, push any front panel button.

From the **3.0 DISPLAY CONFIG** menu (shown in Figure 5.6), using the **SCREENSAVER** item, the operator can disable the screensaver.

5.5.5 Display Contrast Setting

From the **3.0 DISPLAY CONFIG** menu (shown in Figure 5.6), using the **CONTRAST** item, the operator can set the contrast of the display. This functionality is akin to the remote dimming system discussed in Section 4.1.6. A value from 1 to 10 can be selected with ten indicating maximum contrast.

5.6 Alarms

The LCI-80 provides the user with up to four optional visual alarms that can be configured to indicate high and low conditions of payout or speed. Each alarm can be configured to either of the two variables and can also be connected to either or both of two relay outputs. The alarms can be configured as high or low state alarms and it is also possible to set a deadband to the alarms.

An alarm will trigger when its associated variable exceeds a specified **LIMIT**. The alarm will remain in effect until the variable drops below the **LIMIT** minus the **DEADBAND** (Note: for **LOW** alarms the polarity of the calculations is reversed). For example, if a high alarm is set to trigger at 100 meters with a deadband of 5 meters, the alarm will turn on as soon as the payout exceeds 100 meters and will stay in effect until the payout decreases below 95 meters.

Visual indication of the alarms is provided on the display to the right of the corresponding variable. The words “HIGH” or “LOW” will be displayed to indicate the alarm event and the type of alarm.

Note that there is only space for two alarms to be displayed per variable at any one time. In the event that more than two alarms are configured for a given variable (payout or speed) and more than two of the alarms are active at the same time, then the two alarms with the lowest alarm number will be displayed and the subsequent alarm/s will not be displayed. The relay outputs will still function correctly in this event.

5.6.1 Acknowledging Alarms

When an alarm condition occurs the alarm will be displayed to the screen and any associated relay output will be triggered. The visual indication will remain on the display until the alarm condition has gone away (taking into account the deadband). Pressing the **ALM** button on the Run screen during an alarm event will de-energize both of the relay outputs. This allows the user to acknowledge the alarm and disable any lights, sirens or buzzers attached to the relays. The relays will remain de-energized until another alarm event begins and is linked to that relay.

5.6.2 Setting Alarm Limits

The parameters for the four alarms can be set from the **1.0 ALARM CONFIG** menu (reached from the Main menu) as shown in Figure 5.9.

	1.0 ALARM CONFIG	
>	1	ALARM NO.1
	2	ALARM NO.2
	3	ALARM NO.3
	4	ALARM NO.3

Figure 5.9 - Alarm Configuration Menu

From the alarm configuration menu, select the alarm number that is to be configured and press the **ENT** key. This will bring up a menu such as the one shown in the following figure.

	1.1 ALRM 1 CONFIG		
>	1	VARIABLE	PAYOUT
	2	ALARM TYPE	HIGH
	3	LIMIT	20.00 M
	4	DEADBAND	1.00 M

Figure 5.10 - Alarm 1 Configuration Menu

From the individual alarm configuration menu the operator can set the parameters for that alarm. The **VARIBALE** item links the alarm with either the **PAYOUT** or **SPEED** variable; the **ALARM TYPE** item specifies if the alarm is triggered when the variable is **HIGH** or **LOW;** and the **LIMIT** item specifies the value of the variable at which the alarm will trigger.

The **DEADBAND** item is used to prevent alarm bouncing or chattering. The alarm will turn on when the variable reaches the specified limit, and will remain on until the variable drops below LIMIT – DEADBAND for high alarms, or until the variable rises about LIMIT + DEADBAND for low alarms.

6.0 Hardware Configuration

6.1 Security Lockout

The LCI-80 contains a security lockout system to prevent accidental changes to system settings. Once security has been enabled the operator is unable to change any setting within the LCI-80 until a security code has been entered.

The security system is accessed through the **4.0 SYSTEM CONFIG** menu; this menu is shown below.

	4.0 SYSTEM CONFIG		
>	**1**	**SECURITY OFF**	**0**
	2	**FACTORY SETUP**	
	3	**DIG I/O CONFIG**	
	4	**COMMUNICATIONS**	

Figure 6.1 - System Configuration Menu

When the security feature is not active the menu will appear as shown in Figure 6.1. Here, the first menu item states that the security system is **OFF**. Editing this menu item will prompt the user for an integer between 0 and 255; this number is the new security code. Once the number is complete, pressing the **ENT** key will set the number as the security key and lock the display.

While locked, most keypad and menu functionality is disabled. The **ALM** key can still be used to suppress active alarms, the **RST** key remains functional and the diagnostic screen is still available. All other functions are disabled and will route the operator to a security code screen as shown in Figure 6.2. From this screen the user can enter the security code (the same integer as was used to lock the display) which will then unlock the display.

	4.0 SYSTEM CONFIG		
>	**1**	**SECURITY ON**	**0**

Figure 6.2 - Locked Menu

6.2 Count Sensor Configuration

The LCI-80 is capable of receiving count signals for a variety of sensor types. Section 4.1.2 of this manual describes the methods for connecting to a number of sensor types and Appendix B lists the required DIP switch settings to enable pull-ups or pull-downs for the various sensors.

In addition to this, the LCI-80 can accept sensors in the following configurations.

6.2.1 Count and Direction

In count and direction mode, one counter input provides the pulse train of counts (this connects to TB1 Channel A) while the second input sets the counting direction (connects to TB1 Channel B). The direction input is active low, so a logic level 0 results in upwards counting while a logic 1 makes the device count downwards.

Count A	**Count B**	**Counter**
Rising edge	High (typ. > 3.6V)	Decrement
Rising edge	Low (typ. < 1.2V)	Increment

Figure 6.3 - Count and Direction Mode

6.2.2 Up/Down Counter

In Up/Down mode the two counter inputs are independent of each other. A rising edge on the Count A input (TB1-A) results in a increase in counter value, while a rising edge on the Count B input (TB1-B) results in a decrease in counter value.

Count A	**Count B**	**Counter**
Rising edge	Low	Increment
Low	Rising Edge	Decrement

Figure 6.4 - Up/Down Counter Mode

6.2.3 Quadrature Counter

In one of the three quadrature modes, the LCI-80 expects to receive pulses generated by a pair of offset sensors that see the targets in sequence (or quadrature pulses generated by an encoder). The quadrature signal allows the count to increment or decrement depending on the direction of motion. The quadrature outputs of the two sensors (called A and B) look like two superimposed square waves that are 90 degrees out-of-phase (i.e. partially overlapped).

There are three different quadrature modes available in the LCI-80: **QUAD 1X**, **QUAD 2X**, **QUAD 4X**. In 1X mode, the two rising edges and two falling edges of a quadrature pulse are counted as a single pulse (the counter only increments once). This method is applicable to proximity or Hall Effect sensor setups as it ensures that counts are received at a constant and regular rate.

In 2X mode the LCI-80 will count each sequence of two rising and two falling edges (a single quadrature count) as two counts.

In 4X mode, the LCI-80 counts each edge, both rising and falling, as an independent count. Thus, the unit will receive four counts for every pair of quadrature pulses. This scheme is recommended for shaft encoder applications as the increased number of pulses produces smoother speed measurements at low speed and higher resolution payout measurements (Note: these benefits only apply to encoders with 50% duty cycle pulse streams. If the “off time” between pulses is different to the “on time” of the pulses then 4X mode will result in higher noise in the speed calculations).

6.2.4 Setting the Counter Mode

The counter mode is set using the **2.1 PAYOUT CALIB** menu as shown in Figure 5.3. The third item in this menu, **MODE**, sets the payout system (counter inputs) to one of the counter modes discussed in the above sections.

6.3 Digital Input and Output Configuration

From the **4.0 SYSTEM CONFIG** menu, enter the third menu item to navigate to the **4.3 DIG I/O CONFIG** menu. This menu allows the operator to configure the two relay outputs and the two digital inputs.

	4.3 DIG I/O CONFIG		
>	**1**	**RELAY NO.1**	**AL1**
	2	**RELAY NO.2**	**AL2**
	3	**DIG IN NO.1**	**NONE**
	4	**DIG IN NO.2**	**NONE**

Figure 6.5 - Digital I/O Configuration Menu

6.3.1 Relay Output Configuration

The LCI-80 contains two relays for alarm outputs. As described in Section 5.6, four software configurable alarms are used within the device and can be set to trigger when either the payout or speed variable exceeds a setpoint. Items 1 and 2 of the **4.3 DIG I/O CONFIG** menu link the output relays with one of these alarms. The user can set the relays to be triggered by one of the following: **AL1**, **AL2**, **AL3**, **AL4**, or **NONE**.

For example, if alarm number 1 is configured to trigger when the payout exceeds 1000 meters, setting the **RELAY NO.2** menu item to **AL1** will cause the second relay output to also be triggered by the alarm at 1000 meters.

6.3.2 Digital Input Configuration

The LCI-80 is equipped with two CMOS level digital inputs on TB3. These inputs are monitored by the unit and can be used to remotely trigger events in the LCI-80. The third and fourth menu items in the **4.3 DIG I/O CONFIG** menu shown above are used to specify the functionality of the two digital inputs. The following table lists the input functions available in the factory default LCI-80 unit. If you require an input function not listed here, please contact the manufacturer to discuss your needs.

The input pins are tolerant of voltages between 0 VDC and 60 VDC. The switching point between logic low and logic high levels is 2.5V (CMOS logic).

Digital Input Type	**Function**
NONE	No function, input is disabled.
RRSET	Remote reset: a logic high signal on the input pin will reset the current payout to zero.

Figure 6.6 - Digital Input Functions

6.4 Factory Setup Utility

When first received the LCI-80 unit will be in a factory default mode. This entails a full set of default settings; for both hardware and software. At any time it is possible to reset the unit to these default settings. This should only be necessary in cases where the LCI-80 does not appear to be functioning correctly and the operator wishes to return the unit to a known state. All configuration and calibration information will be lost when such a function is performed.

Additionally, the LCI-80 has four individual sets of system parameters, known as FSETs. Each FSET is a completely separate set of settings and parameters for the display. This can be used in situations where a single display unit is to be used with multiple winches or in multiple settings; an FSET can be created for each application with the settings and calibration data appropriate for that use and the operator can switch between FSETs as the display is moved about.

The LCI-80 has a default FSET ID stored in memory that is loaded when power is first applied to the unit.

To load or save FSETs, and to perform a factory reset, navigate to the **4.2 FACTORY SETUP** menu – this menu is shown in the following diagram.

	4.2 FACTORY SETUP		
>	1	SAVE FSET	1
	2	LOAD FSET	1

Figure 6.7 - Factory Setup Menu

The first item of this menu will save the current settings of the LCI-80 to one of the non-volatile FSETs. Selecting this menu item will give the operator a choice from 1 to 4, corresponding to the FSET number where the settings are to be saved. Note that saving an FSET does not change the default FSET ID in the LCI-80 so the previous FSET in use will remain the default.

Item 2 of this menu will load an FSET from non-volatile memory into the working memory of the LCI-80. Also, the unit will switch its default FSET ID to the newly loaded one so that this FSET will be loaded whenever the unit powers up. Thus, the new FSET will remain in use until another FSET is loaded at a later time. This is the only way to change the default FSET ID.

To load an FSET, select the **LOAD FSET** item and choose the desired number: **1**, **2**, **3**, **4**, or **FACT**. The **FACT** directive is a special case: instead of loading an FSET from non-volatile memory, the unit will load the factory default values into the unit's memory. This is a factory reset.

Note that after a factory reset the LCI-80 does not change its default FSET ID. If power is removed and then brought back, the unit will reload the previous FSET from memory and the factory reset will have been undone. To complete the factory reset the user must first load the **FACT** FSET to get the factory default settings into memory, save the resulting settings to one of the FSETs so that the settings go into non-volatile memory, and then load that FSET back again to switch the default FSET ID to the new FSET. This will ensure that the factory default settings remain in the device and are loaded at power up.

6.5 Communications

The LCI-80 has four communications ports for the purposes of data logging, remote monitoring, and troubleshooting. The following table lists the standard use of each port.

Port	Function
Ethernet	Flexible interface for data logging and data monitoring on a PC or PLC. Can be used to monitor the LCI-80 from a remote location over a LAN or the internet. Remote troubleshooting.
USB	Local data logging. For monitoring the LCI-80 with a PC in close proximity.
RS-232	Local data logging. For monitoring the LCI-80 with a PC in close proximity.
RS-485	Long distance data logging. Remote display connection.

Figure 6.8 - Communications Ports

Settings for all four communications ports are accessed through the **4.4 COMMUNICATIONS** menu as shown below. The USB, RS-232 and RS-485 systems are accessed through the **SERIAL** menu item.

	4.4 COMMUNICATIONS		
>	1	ETHERNET	
	2	SERIAL	
	3	SET DATE/TIME	
	4	LAN ID.	1

Figure 6.9 - Communications Menu

6.5.1 LAN ID Number

The fourth menu item in the **4.4 COMMUNICATIONS** menu lets the operator specify the LAN ID for the LCI-80 unit. This is intended to be a unique identifier that the unit can use to identify itself in any outgoing packets (I.e. it is address used for communicating with the LCI-80 unit). When connecting multiple units together on a single network, the LAN IDs must be unique in all units.

6.5.2 Setting the Date and Time

The LCI-80 can append timestamps to outgoing packets for data logging purposes. To set the current date and/or time, enter the **4.43 SET DATE/TIME** menu. An example of this menu is shown in Figure 6.10. Both the time and date are editable in the same manner as other numbers with the LCI-80's menu system. Once the value is correctly set, pressing the **ENT** key will store the value into the unit's clock and the clock will begin counting correctly immediately.

	4.43 SET DATE/TIME		
>	1	DATE	08-12-2009
	2	TIME	12:49:40

Figure 6.10 - Set Date and Time Menu

The date is stored in the format MM-DD-YYYY. The time is stored in the format HH:MM:SS.

6.5.3 Terminal Mode

From the **4.4 COMMUNICATIONS** menu the user can access the **SERIAL** menu item. Doing so will bring up the following menu:

	4.42 SERIAL		
>	1	USB	
	2	RS-232	
	3	RS-485	
	4	TERMINAL	OFF

Figure 6.11 - Serial Communications Menu

The **TERMINAL** menu item in the **4.42 SERIAL** menu is used to force the LCI-80 into terminal mode. Terminal mode is typically used for debugging/troubleshooting purposes and it should typically be turned off. However, while in terminal mode, any error messages generated by the LCI-80 will be transmitted on the RS-232 and USB ports which allows for error trapping during a data logging operation.

6.5.4 Ethernet Communications

The LCI-80 has a 10Base-T Ethernet port which can be used for datalogging. The port has three independent communications channels which can operate simultaneously to achieve a number of tasks.

Any Ethernet network, including the internet at large, can be used by the LCI-80 so the unit can easily be integrated into any existing network. The network administrator should be made aware of the LCI-80 so that the communications settings can be appropriately configured. In wide area networks, where packets from the LCI will need to be passed through routers and intermediate LANs, it may be necessary for the network administrator to enable port forwarding so that the LCI-80 can be connected to from the external networks.

The LCI-80 uses a static IP address (which can be changed through the menus).

Data packets sent from the LCI-80 will be of the same format as though transmitted by the serial communications systems, as described in section 6.5.9 of this manual.

6.5.4.1 Datalogging/TCP

The primary communications channel uses TCP (transmission control protocol) to send data packets to a single remote device such as a PC or Ethernet enabled datalogger. This system ensures data transmission and packet integrity (I.e. so long as a connection can be maintained between the two devices, all data packets will be fully transmitted without errors) which makes this channel ideal for datalogging. The LCI-80 will act as a TCP client, thus, the datalogger must operate as a TCP server in order to communicate with the display.

The TCP channel can be configured through the **4.412 TCP ETHERNET** menu as shown below.

	4.412 TCP ETHERNET		
>	1	ACTIVE	ON
	2	MODE	POLLED
	3	PORT	24
	4	DEST. IP	

Figure 6.12 - TCP Ethernet Menu

The first menu item is used to enable and disable the TCP datalogging system. Setting this to the **ON** state will enable datalogging.

The second row of the menu is used to put the datalogging system into **POLLED** or **BROADCAST** modes, as per the serial communications systems (see section 6.5.5 for details).

The third row of the menu is used to select the **PORT** that is used for both incoming and outgoing TCP communications. The TCP server that the LCI-80 is to communicate with will specify which communications port is to be used. Additionally, in a WAN, the port number will be specified by the network administrator as the intervening routers will need to be configured so that packets using this port are forwarded to the appropriate IP addresses (I.e. the IP address of the LCI-80).

The final row of the menu specifies the IP address to which the LCI-80 is to send its data packets.

6.5.4.2 Multipoint/UDP

In networks where the data packets from the LCI-80 must be sent to multiple devices, the second Ethernet channel can be used. This channel uses UDP (user datagram protocol) to send messages. This protocol has much less overhead than TCP and thus puts significantly less load on the network, however, data transmission and integrity is not guaranteed in any way. That is, packets can be lost or corrupted without any recourse for correction (note however that all outgoing packets include a checksum so that errors can be detected, but not corrected).

The principal advantage of this system is that it can be used with multicast addresses. These are special IP addresses which can be used to address multiple targets at once so a single data packet can be received by numerous monitoring devices. An example of the use of this channel could be where the LCI-80 has a dedicated TCP connection to a datalogging PC (datalogging is critical so data integrity must be ensured), and a second connection using UDP which communicates with a remote LCI-80 display elsewhere in the facility and a monitoring PC in the control room. As it is not critical for the remote display or control room PC to receive every data packet, the UDP connection is the preferred option.

The UDP system is configured via the **4.413 UDP ETHERNET** menu as shown below.

	4.413 TCP ETHERNET		
>	**1**	**ACTIVE**	**ON**
	2	**MODE**	**POLLED**
	3	**PORT**	**25**
	4	**DEST. IP**	

Figure 6.13 - UDP Ethernet Menu

As per the description in section 6.5.4.1 of this manual, the user can enable the channel, select the transmission mode, specify the Ethernet port to be used for all operations, and set the IP address to which the UDP data packets will be sent.

6.5.4.3 Basic Ethernet Settings

The **4.412 BASIC ETH** menu is used to configure the Ethernet system's basic parameters. The menu is shown in the following figure.

	4.412 BASIC ETH.		
>	**1**	**IP ADDRESS**	
	2	**PROTOCOL**	**MTNW 1**
	3	**DIAGNOSTICS**	**OFF**

Figure 6.14 - Basic Ethernet Settings Menu

From this menu it is possible to set the IP address of the LCI-80 (this address must be unique on the network, ask your network administrator for details if an appropriate address is not known), the protocol used for data packets (see section 6.5.9 for details), and the Automatic Diagnostics system can be enabled or disabled (see section 6.5.4.5 for details).

6.5.4.4 Advanced Ethernet Settings

The **4.413 ADVANCED ETH** menu is used to configure the advanced settings of the LCI-80's Ethernet system. For information on appropriate values for these settings, discuss your application with your network's administrator.

The settings which can be configured here are the Subnet Mask, Default Gateway IP Address, Primary DNS Server IP Address, and Secondary DNS Server IP Address.

6.5.4.5 Automatic Diagnostics

The LCI-80 comes equipped with a diagnostics system which can be used by Measurement Technology NW staff to remotely diagnose any issues with the device. This system will only be used under the guidance of a trained MTNW representative. It is possible to disable the diagnostics system if it is causing conflicts in your network through a menu item in the **4.412 BASIC ETH** menu.

6.5.5 USB Communications

	4.421 USB		
>	**1**	**ACTIVE**	**ON**
	2	**PROTOCOL**	**MTNW 1**
	3	**MODE**	**BRDCST**

Figure 6.15 - USB Communications Menu

The USB communications port is designed to be used for data logging to a PC (or other device) in close proximity to the LCI-80. Any device further than three meters from the LCI-80 should connect using a different medium. The LCI-80 is capable of transmitting data packets, error messages and status reports on the USB port.

Item number one on the USB menu, shown in Figure 6.15 and labeled **ACTIVE**, enables or disables the USB port. Note: when the USB port is not being used it is highly recommended that it be deactivated here as this will enable the LCI-80 processor to operate at maximum speed.

The second menu item, **PROTOCOL**, selects the data logging protocol used by the USB port when transmitting data packets. See Section 6.5.9 of this manual for a description of the available protocols.

The third menu item, **MODE**, selects the current data logging mode for the port. The available options are **BRDCST**, where data packets are continuously transmitted by the LCI-80, and **POLLED**, where the LCI-80 waits until it receives a polling string before transmitting a data packet. See Section 6.5.8 for further details.

6.5.6 RS-232 Communications

	4.422 RS-232		
>	**1**	**ACTIVE**	**ON**
	2	**BAUD**	**115200**
	3	**PROTOCOL**	**MTNW 1**
	4	**MODE**	**BRDCST**

Figure 6.16 - RS-232 Communications Menu

The LCI-80's RS-232 port is a mirror copy of the USB port. As such, it is primarily used for short-range data logging, error logging, and troubleshooting. The maximum transmission distance of an RS-232 network is typically 50 feet, although this can be improved if an appropriate grade of cable is used (and a low baud rate is used).

See Section 6.5.5 for a description of the **ACTIVE**, **PROTOCOL**, and **MODE** menu items.

The **BAUD** menu item is used to select the baud rate for the RS-232 port. Available rates range from 2400 baud to 230400 baud.

6.5.7 RS-485 Communications

	4.423 RS-485		
>	**1**	**BAUD**	**115200**
	2	**PROTOCOL**	**MTNW 1**
	3	**MODE**	**BRDCST**

Figure 6.17 - RS-485 Communications Menu

The RS-485 port on the LCI-80 is an isolated, half-duplex communications port. It is primarily designed to be used for connecting the LCI-80 to remote data logging equipment or other remote equipment that wishes to read the current data from the display (for example, remote displays or PC monitoring equipment). The RS-485 standard allows for 32 devices to be connected on a single cable with a total cable run of up to 4000 feet. This allows for multiple LCI-80 units to be connected on the same network and monitored by a single datalogger or monitor at a remote location (note that for multi-drop networks the LAN ID of each LCI-80 must be unique).

As per the USB and RS-232 ports, the operator can set the **PROTOCOL** and **MODE** for the RS-485 port. See Section 6.5.5 for details of this. It should be noted that the RS-485 port can not be disabled at any time.

The **BAUD** item is used to select the baud rate of the port. Available baud rates range from 2400 baud to 19200 baud.

6.5.7.1 RS-485 Termination

RS-485 networks require special attention be paid to cable terminations: the first and last devices on a local area network must have termination resistors between the T+/R+ and T-/R- wires. The DIP switches labeled as SW2 on the rear of the LCI-80 unit activate this termination. Thus, the DIP switches must be correctly set on each unit to ensure that only the first and last devices on the network are terminated. See Appendix B for details.

6.5.8 Datalogging Methodology

The LCI-80 calculates new values of payout and speed at regular intervals (payout is calculated every 10ms, the update rate of the speed algorithm is determined by the speed calibration settings). Once new data values have been calculated the device attempts to transmit the data to all active data logging ports that are in broadcast (**BRDCST**) mode.

If multiple ports are active, for example if both the USB and Ethernet ports are turned on, then the unit may not be able to transmit the data fast enough to keep up with its calculations. In this event, some data values will not be transmitted to the datalogger. Similarly, using multiple different protocols will slow down the unit. Thus, in order to maximize the data output rate and to ensure that all data is transmitted, the operator must ensure that any unused communications ports are disabled and the minimum number of protocol formats are used.

If the data logging device does not need to receive data at the maximum available data rate (100Hz) then the LCI-80 can be configured for **POLLED** operation. When in polled mode the LCI-80 waits for a specific polling string to be received on the communications port. Once the string is detected the unit will respond with the most up-to-date data packet. This allows the data logging device to control the data transmit rate.

In the factory default LCI-80, the required polling string is a carriage return character (ASCII 13).

6.5.9 Datalogging Protocols

The following data protocols are defined in the LCI-80's firmware:

6.5.9.1 MTNW 1 Protocol

The MTNW 1 Protocol has the following format:

"RD,YYYY-MM-DDTHH:MM:SS.hh,SSSSSSSS,DDDDDDDD,CCC"

- In this protocol, commas are used to delimit all fields.
- The string "RD," is the packet header.
- "YYYY-MM-DDTHH:MM:SS.hh" is the timestamp generated by the LCI-80 for this packet in ISO-8601 format with the addition of a hundredths of seconds field ("hh").
- "SSSSSSSS" is the speed data in the current units used by the display.
- "DDDDDDDD" is the payout data in the current units used by the display.
- "CCC" is the checksum.

The two data fields are fixed length, eight character ASCII strings. A minus sign and/or decimal point are included within the eight characters where necessary.

The checksum field is a three character ASCII representation of an 8-bit integer (0-255) that is calculated as the complement of the sum of all ASCII values in the packet up to and including the comma before the checksum. To verify the checksum, calculate an 8-bit sum all of the ASCII values in the string except for the checksum characters and then add the checksum value as a single 8-bit number. The result of this sum should be exactly zero if no errors were present in the string.

6.5.9.2 MTNW 2 Protocol

The MTNW 2 Protocol has the following format:

"01RD,YYYY-MM-DDTHH:MM:SS.hh,SSSSSSSS,DDDDDDDD,CCC"

This protocol is mostly identical to the MTNW 1 protocol described above. The only difference being the addition of the LCI-80's **LAN ID** to the beginning of the string (in this case the ID was "01"). The ID is added to the packet as a fixed length, two character number in ASCII character format.

7.0 Troubleshooting

The LCI-80 was designed with the user in mind. Using full language menus and a minimum of abbreviations makes the programming and operation much easier to understand. Additionally, a diagnostics screen is easily accessible by the user where raw input signals can be checked; this screen is described in the section below. Most apparent malfunctions of the instrument can usually be traced to incorrect wiring, jumper settings, or programming. Consult the troubleshooting chart in Section 7.2 to diagnose apparent problems.

7.1 Diagnostics Screen Utility

Pressing the **DIA** key from the Run mode display will bring up the Diagnostics screen. This display, shown in Figure 7.1, provides the operator with important feedback on the raw counter input, and scaled display value for payout, along with feedback on the internal temperature of the LCI-80 and the state of the digital input lines. From the diagnostics screen, the same button, which is now labeled **RUN**, will return the system to the main display mode.

While in diagnostic mode, the instrument continues normal operation, including calculating new payout and speed values, checking alarm limits, and transmitting data logging packets in the background.

INPUT	VALUE
COUNT	30 P
PAYOUT	0.23 M
TEMP	26 DEG
DIG IN	OFF OFF

Figure 7.1 - Diagnostics Screen

The first value on the diagnostics screen is the number of pulses counted by the unit. This is the raw sensor data and gives an indication of the validity of the sensor and associated circuitry. The second value, **PAYOUT**, shows the scaled value of payout as calculated by the LCI-80. This is the same value as would be displayed on the Run screen.

Below this is displayed the current internal temperature of the unit in degrees Celsius. This temperature is measured on the LCI-80's circuit board near to the CPU so as to give a good indication of the operating temperature.

The last element on the diagnostics screen shows the current status of the two digital input lines. The values will show either **ON** or **OFF** and will be updated dynamically as the inputs change.

If a malfunction occurs in the system, the diagnostics screen is a useful way to find the source of the problem. For example, comparing the raw sensor data with real world measurements can be used to quickly determine the location of the fault (I.e. to determine if the fault lies in the sensor output circuitry, the interconnecting wiring, or in the software settings of the LCI-80).

7.2 Troubleshooting Procedures

Problem Blank Screen

Possible Causes	Diagnosis	Remedies
Screen saver is on	Activate display by pressing any key or by changing payout	Disable screen saver if screen visibility is required during periods of inactivity
Input power problem	Check voltage between TB2 +V and COM. If below 9VDC then the problem is not in the display	Repair or replace power source to provide 9-36 VDC
Fuse is blown	Check for voltage between TB1 +12 and COM, or +5 and COM. If unit has power and there is no voltage, then the fuse is suspect. A visual check of the fuse can confirm this.	Check and replace fuse
Screen is faulty	Listen closely for high frequency hum coming from the within the LCI-80	Contact supplier
Display brightness adjustment set too low	If an external potentiometer is connected to the Dimming port (TB3), disconnect the potentiometer temporarily.	Set potentiometer to desired brightness level for normal operation
Internal power supply failure	Measure voltage between TB1 +12 and COM, or +5 and COM. If voltage is incorrect and fuse appears to be functional then supplies are suspect.	Contact supplier
CPU failure	Check for communication with data logging/monitoring devices. If no data is being transmitted and the LCI-80 has power, then the CPU is suspect	Contact supplier

Problem	Zero Speed/Payout Not Changing	
Possible Causes	**Diagnosis**	**Remedies**
Scale Factor is zero or very small	Check Menu 2.1, Item 1 for an incorrect value.	Recalibrate the payout based on true physical values.
LCI-80 not receiving pulse inputs	Press **DIA** to view diagnostics screen. Turn sheave to increment pulse counter and look for updates on screen.	
	Measure voltage between TB1 A and COM, and B and COM as the sheave is turning. There should be a significant voltage change between on-target and off-target.	Independently check operation of count sensors and replace if faulty. If voltages do not switch between approx. 1V and 4V or more but are still functional, contact supplier.
	Check DIP switch settings on SW3 to ensure that correct switches are set for the count sensors being used.	Set correct values. See Appendix B.
Input sensors not in quadrature configuration	If counter is in one of the quadrature modes, ensure that there is an overlap between on-time of channels A and B on the payout sensor.	Adjust sensor mounting or target width to guarantee overlap.
Incorrect counter mode	Check Menu 2.1, Item 3 for an incorrect value.	Set counting mode of LCI-80 to match sensor system.

Problem	Erratic Payout Values	
Possible Causes	**Diagnosis**	**Remedies**
Electrical noise	Check input signal quality with oscilloscope. For some frequencies, an AC voltmeter can be used to measure the presence or absence of noise on a DC signal.	Use shielded cabling and/or conduit for sensor wiring
	Check that cable shields are grounded near the LCI-80 for best noise immunity.	Try variations on shield grounding. Try both ends, or no grounding.

Problem	"Jumpy" Speed Values	
Possible Causes	**Diagnosis**	**Remedies**
Poor choice of speed filter coefficients	Change settings in Menu 2.2 to see if quantization noise can be reduced.	Use different speed filter settings
Using QUAD 4X mode in a quadrature system with uneven on and off times.	Change counting mode in Menu 2.1 to QUAD 1X to see if noise can be reduced.	Use QUAD 1X mode

Problem	No Outputs from Alarm Channels	
Possible Causes	**Diagnosis**	**Remedies**
Incorrect menu configuration	Check the alarm configuration in Menu 4.3 to make sure that the relay is connected to the correct software alarm.	Review manual Section 5.6 for alarm use and configuration
Incorrect alarm settings	Check to see if alarm message is display on the LCI-80's display. If it is not then the alarm is configured incorrectly.	Adjust settings in Menu 1.0 to correctly configure alarms

7.3 Technical Support

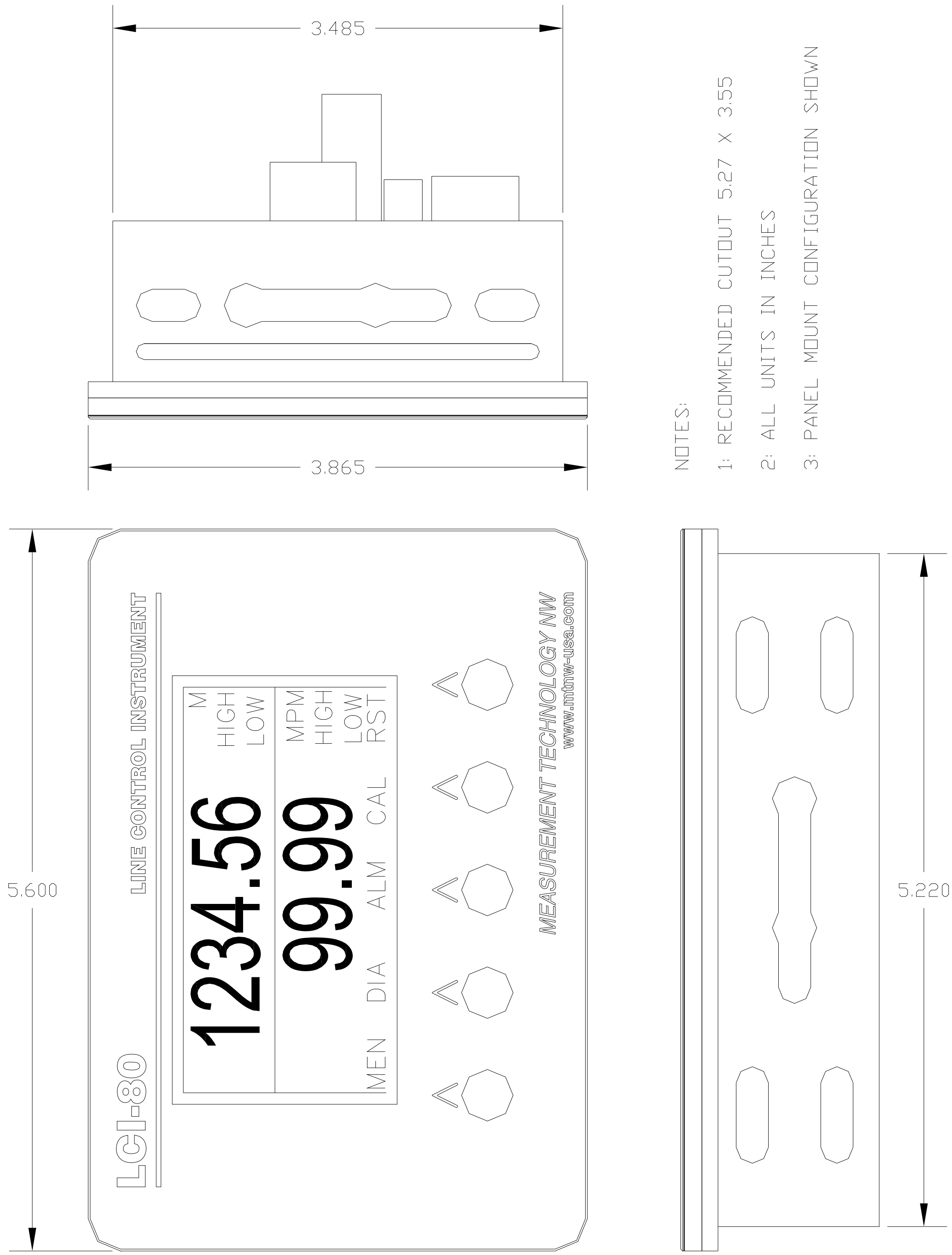
The resolution of technical problem should first be attempted using the Troubleshooting Guide in Section 7.2 or by reading the appropriate sections of this manual. If this fails, either contact the supplier from whom you purchased the display, or the manufacturer, for additional technical support. When seeking technical support, please fax or e-mail notes including a description of the problem, all relevant menu and DIP switch settings, plus a description of the field devices in use and how they are terminated on the LCI-80.

Measurement Technology Northwest
4211 24th Ave West
Seattle, WA 98199 USA

Ph: (206) 634-1308
Fax: (206) 634-1308
e-mail: LCI@mtnw-usa.com

Office Hours: 8:30 AM to 5:30 PM - Pacific Time

8.0 Appendix A – Dimensional Drawing



9.0 Appendix B – DIP Switch Settings

SW2: RS-485 Termination

Function	SW2-1	SW2-2
RS 485 Term OFF	OFF	OFF
RS 485 Term ON*	ON	ON

SW3: Count Sensor Configuration

Sensor Config	SW3-1	SW3-2	SW3-3	SW3-4
CH A NPN	OFF	ON	•	•
CH B NPN	•	•	OFF	ON
CH A PNP	ON	OFF	•	•
CH B PNP	•	•	ON	OFF
Encoder*	OFF	OFF	OFF	OFF
Magnetic Pickups	OFF	OFF	OFF	OFF

- Denotes switch setting does not affect parameter configuration.

* Denotes factory default settings

10.0 Appendix C – LCI-80 Specifications

LCI-80	PHYSICAL/POWER	Std/Option
Temp.	-40˚C to 70˚C	Std
Environmental	Weatherproof front panel (watertight when correctly mounted in existing panel)	Std
	Optional watertight rear enclosure	01
Dimensions	5.6” wide x 3.9” high x 2.5” deep	Std
	Cut out: 5.27” wide x 3.55” high	Std
Weight	1.7 pounds	Std
Materials	Stainless Steel 316 front panel	Std
	Polycarbonate display window	Std
	Silicone front panel gasket	Std
Power	9-36 VDC, 13W maximum, fused/filtered	Std

LCI-80	DISPLAY	Std/Option
Type	Graphic electro-luminescent, 160 x 80 pixels	Std
View Angle	160 degrees	Std
Viewing Area	3.15” wide x 1.57” high	Std
Brightness	High brightness – 79 cd/m2	Std
Contrast	Adjustable	Std
Characters	6 digits for both payout and speed	Std

LCI-80	COUNT SENSOR INTERFACE	Std/Option
Type	Inductive proximity, quadrature, PNP, NPN, 2 or 3 wire	Std
	Quadrature encoder, CMOS or TTL	Std
	Magnetic pickup	Std
	NAMUR (requires external power supply)	Std
Frequency	0.05 Hz to 30 kHz	Std
Excitation	Regulated 12 VDC, 250 mA (total for device)	Std
	Regulated 5 VDC, 250 mA (total for device)	Std
Thresholds	3.4 V Low-High transition, 1.2 V High-Low transition	Std
	Factory adjustable	

LCI-80	DIGITAL I/O – ALARMS	Std/Option
Channels	Two relay outputs	Std
Type	SPDT Normally open and Normally closed outputs	Std
	125VAC, 60VDC, 1A	

LCI-80	SERIAL COMMUNICATION	Std/Option
Type	USB Serial Port	Std
	Ethernet Port	Std
	RS-232 Serial Port (non-isolated)	Std
	RS-485 Serial Port (isolated, half-duplex)	Std
Baud Rate	USB: USB1.0, 12Mbps	Std
	RS-232: 230400 baud	Std
	RS-485: 19200 baud	Std
Protection	RS-485: 2500 V rms	Std

LCI-80	DIGITAL INPUT	Std/Option
Channels	Two channels	Std
Type	CMOS input (trigger level is 2.5V)	Std
Voltage Range	0-60VDC	Std

11.0 Appendix D – LCI-80 Wirelist

Function	Manual Reference	CPU Terminal Block Designator
5VDC Output	TB1 +5	TB1-1
5VDC Output	TB1 +5	TB1-2
12VDC Output	TB1 +12	TB1-3
12VDC Output	TB1 +12	TB1-4
Count A	TB1 A	TB1-5
Count B	TB1 B	TB1-6
DC Common	TB1 COM	TB1-7
DC Common	TB1 COM	TB1-8
DC Common	TB2 COM	TB2-1
DC Common	TB2 COM	TB2-2
9-36VDC Input	TB2 +V	TB2-3
9-36VDC Input	TB2 +V	TB2-4
Dimming +ve connection	TB3 D+	TB3-1
Dimming –ve connection	TB3 D-	TB3-2
Relay 1 Normally Closed Output	TB4 OUT 1 – NC	TB4-1
Relay 1 Common Output	TB4 OUT 1 – C	TB4-2
Relay 1 Normally Open Output	TB4 OUT 1 – NO	TB4-3
Relay 2 Normally Closed Output	TB4 OUT 1 – NC	TB4-4
Relay 2 Common Output	TB4 OUT 1 – C	TB4-5
Relay 2 Normally Open Output	TB4 OUT 1 – NO	TB4-6
Digital Input Channel 1	TB4 IN 1	TB4-7
Digital Input Channel 2	TB4 IN 2	TB4-8
RS 232 Transmit	TB5 TX	TB5-1
RS 232 Receive	TB5 RX	TB5-2
RS 232 Ground	TB5 COM	TB5-3
RS 485 T-/R-	TB6 T-/R-	TB6-1
RS 485 T-/R-	TB6 T-/R-	TB6-2
RS 485 Shield	TB6 SHLD	TB6-3
RS 485 Shield	TB6 SHLD	TB6-4
RS 485 T+/R+	TB6 T+/R+	TB6-5
RS 485 T+/R+	TB6 T+/R+	TB6-6
USB-B Connector	J2	J2
Ethernet Connector (RJ-45)	J6	J6