WEB TENSION TECHNOLOGY

BLH NOBEL
A VPG Brand

BLH

LCt-104
HTU Web Tension Transmitter
Operator's Manual

TM056
RevD
2/12/15
Doc 35109

NOTICE

BLH Nobel makes no representation or warranties of any kind whatsover with respects to the contents hereof and specifically disclaims any implied warranties or merchantability or fitness for any particular purpose. BLH Nobel shall not be held liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this publication or its contents.

BLH Nobel reserves the right to revise this manual at any time and to make changes in the contents hereof without obligation to notify any person of such revision or changes.

Table of Contents

Trademark Usage Acknowledgments

SECTION 1. General Information

1.1 SYSTEM DESCRIPTION

The LCt-104 system's patented synchronous digital measurement of multi-cell systems establishes the new benchmark in web tension technology. Systems individually digitize each HTU transducer'(s) signals and display the resultant force, tension, or angle data, live on the console display. Measuring each individual HTU load cell provides greater system resolution and accuracy.

The LCt-104 'Expert Technology' process web tension system (Figure 1-1) consists of two modules designed to convert the mV/V signal from strain gage type force transducers (load cells) into a high resolution digital signal representing force or tension. HTU load cells connect directly to the smart junction box located in the immediate vicinity of the web tension machinery being used. Resultant force/tension/angle signals are communicated from the smart junction box directly to the console display module located up to 200 to 20001 feet away. Console units operate at either 115 or 230 VAC and provide regulated, fault protected 10 VDC excitation for HTU strain gage transducers. Standard features include an RS-422/485 serial port with PC interface or simplex output ASCII, a sigma delta type A/D converter for each transducer, and dynamic digital filtering. Options include up to four high-resolution analog outputs, eight programmable set points, Profibus, DeviceNet, Allen-Bradley Remote I/O, and Modbus Plus, Modbus RTU Protocol, communication and serial ACSII digital communication interfaces.

The Smart Junction Box enclosure is constructed entirely of stainless steel and rated NEMA 4X. Available cable glands provide access for load cell connection while maintaining NEMA integrity.

Console Display Modules are housed in an aluminum case with a powder coated aluminum panel mounting bezel. NEMA 4/4X wall mount enclosures are available as options. Simple entry of calibration data, and filter selections is accomplished using the front panel keypad. All electrical connections are made at the rear panel with unpluggable screw terminal connectors.

1.1.1 Introducing the Plug-n-Web-it Concept

The BLH Plug-n-Web-it concept takes advantage of technology to minimize start-up time and the operator learning curve. Intuitive configuration menus, self configuration of many set-up parameters, and simple pushbutton type digital calibration combine together to make the LCt-104 one of the easiest process instruments to configure and operate.

Figure 1-1. Both Modules of the LCt-104 System

1.1.2 The Safe-Weigh Software System

Safe-Weigh software system benefits include ExpertSystem, Dynamic Digital Filtering, and a wide range of proven DCS/PLC connectivity options. Expert System Diagnostics provides on-line preventative maintenance information that quickly identifies electrical and/or mechanical

[1] J-box jumper required for distances greater than 200 ft.

problems. Dynamic Digital Filtering ensures precise, repeatable set point control in 'noisy' web environments. Proven connectivity with Allen-Bradley, Modicon (AEG Schneider) General Electric, Johnson Yokogawa, Honeywell, and other PLC/DCS devices eliminates the risks associated with digital integration of data information into the process control environment.

1.1.3 The LCt-104 Front Panel

All configuration, calibration, and operation transactions are performed using the front panel push buttons and the high intensity vacuum fluorescent display (Figure 1-2). The user-friendly design separates the operating push buttons (Force/Tension, Zero, L/R, and Print) from the configuration menu keypad. The two line alphanumeric display indicates Force or Tension data and status while in the operate mode and provides instructions etc. during the configuration mode.

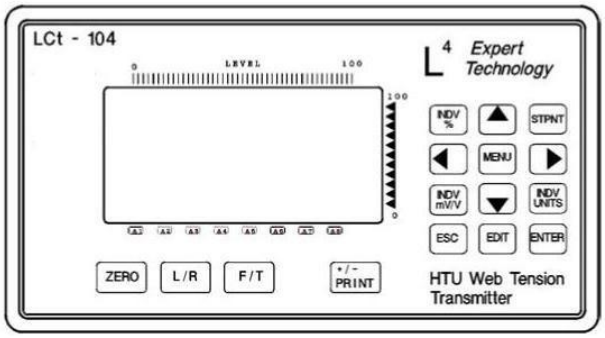


Figure 1-2. The LCt-104 Console Front Panel.

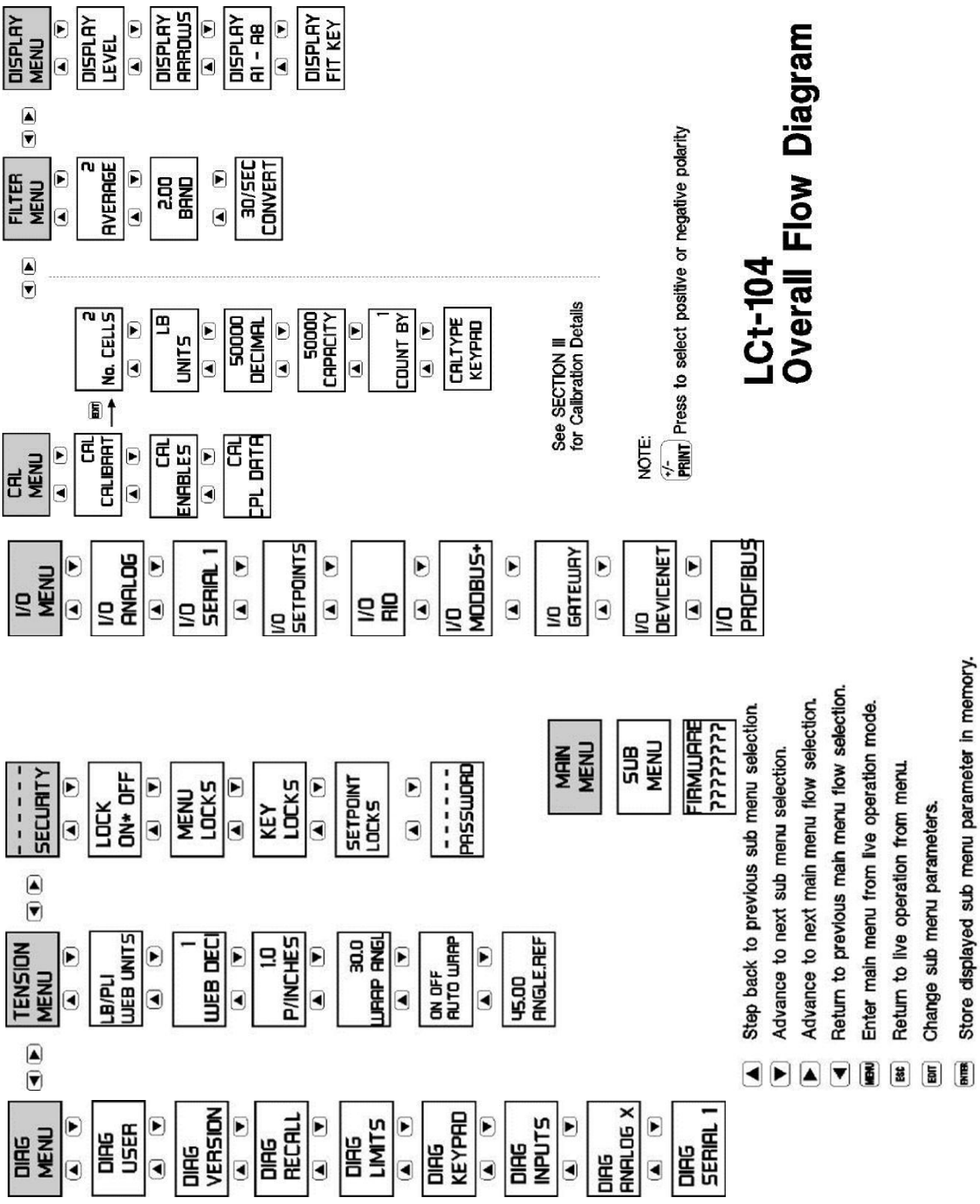


Figure 1-3. The LCt-104 Main Flow Diagram

1.1.4 Main Configuration Flow Diagram

LCt-104 configuration is performed using the menu driven keypad on the right side of the front panel and follows the flow diagram presented in Figure 1-3. This diagram shows the overall structure and general guidelines of LCt-104 set-up, calibration, filter, display, I/O, diagnostic, and security configuration routines. Detailed explanations of sub menu parameter selections are provided in sequential chapters, starting with Section III.

To browse through the menus, press MENU and use thearrow keys to move across menu subjects, or up anddown within a menu. Parameters are not actually changed until the edit and enter keys are used.

1.1.5 Serial Communication

Standard LCt-104s are equipped with a single serial communication port that can be selected to operate as an RS-422 full duplex, or RS-485 half-duplex port. The type selection is made using a series of DIP switches, Console Display, rear panel. Protocol selection is made within the keypad menu structure. Standard units ship with ASCII protocol for communication with a printer, PC, remote display, or data logger. This port can be selected for continuous or demand operation. Extensive diagnostics verify transmit and receive, proper parity and framing, and a visualization function allows the user to view the actual serial transmit and receive characters. See Section II forwiring information and Section VI for protocol information.

1.2 OPTIONS

LCt-104 units are available with several different application enhancement options. Options include various mounting enclosures, analog output selections, and customnetwork interfaces/protocols. All options will be fully defined later in this manual.

1.2.1 Mounting Options

For units located in a general factory/plant floor, or if corrosive, hose down, or sanitary requirements are a factor,a NEMA 4X stainless steel enclosure is available (Console Display). For Div. 2 hazardous locations, units areavailable with CSA approval as non-incendive devices.

1.2.2 Analog Output Options

Systems are available with a 16 bit analog output withindustry standard 4-20 mA operation. Set-up and calibration of this output is accomplished using the menu keypad and can be configured to track force or tension data. Loop diagnostics are also provided to verify that the ana- log connection is intact. See Section II for wiring information and Section VI for configuration details.

NOTE: Four analog outputs are available for trackingforce and tension data simultaneously (paragraph 1.2.7).

1.2.3 Allen-Bradley Remote I/O Network

The Allen-Bradley Remote I/O interface is a communication link that supports remote, time critical I/O control communications between a master processor anda remote I/O slave. It is typically used to transfer I/Obit images between the master and slave. Each LCt104 system represents a quarter (1/4) Rack of discreteI/O with 32 bits of input and output image files to the scanning PLC. All data and status information uses discrete reads and writes to communicate scale information to the PLC in the shortest time possible. Blockdata transfers are used to communicate non-time critical diagnostic and calibration data, and remotely configure web feature limits and digital filter parameters.

1.2.4 MODBUS RTU Protocol

MODBUS is often recognized as an industry standardmethod of digital communication protocol between amaster or host computer and a slave device. This protocol was originally developed by Modicon to communicate discrete and analog information between a PLCand a master host. As implemented in the LCt-104,this protocol efficiently communicates force and diagnostics information to a MODBUS Master Driver equipped host.

1.2.5 MODBUS RTU Protocol on UART board

Same as implemented above RTU but on a separate board freeing up communications on serial port to drive a printer or remote display, or for communications forthe PC interface mode. Also supplies a RS232 connection.

1.2.6 MODBUS Plus Protocol

MODBUS Plus protocol allows the LCt-104 systemsto communicate on a peer-to-peer network link withModicon 984 and Quantum PLC devices.

1.2.7 DeviceNet Protocol

DeviceNet is a low cost industrial network designed to easily connect up to 64 "cell" type devices to a PLC/ PC. Information in this Section XIII defines the LCt-104 DeviceNet register allocations and interface instructions.

1.2.8 PROFIBUS Protocol

Profibus is a Siemens industrial network designed toeasily connect up to 127 "cell" type devices to a PLC/PC. Information in the Profibus defines the LCt-104Profibus register allocations and interface instructions.

1.3 LCT-104 PERFORMANCESPECIFICATIONS

Performance

Internal Resolution	4,194,304 total counts
Max. Display Resolution	3,000,000 total counts
Max. Res. Per Channel	1,000,000 counts
Conversion Speed	selectable 7.5, 15, 30, and 60 conversions per second
Sensitivity (Noise)	0.001 1% full scale (max +/-16 counts w/o filter)
Full Scale Range	+/-35 mV/channel
Dead Load Range	100%
Input Impedance	10 M-ohms, min. per channel
Load Cell Excitation	10 V (65 mA/channel max)
Remote Sense	user configurable, each channel
Linearity	+/-0.0015% of full scale
Calibration Repeatability	0.3 µV per count

Temperature Coefficient

Span/Zero	+/-2ppm/°C

Environment

Operating Temperature	-10 to 55°C (12 to 131°F)
Storage Temperature	-20 to 85°C (-4 to 185°F)
Humidity	5 to 90% rh, non-condensing
Voltage (Console)	17/230 +/-15% 50/60 Hz
(Jbox)	16 VDC
Power	12 watts max

Display/Operator Interface

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

Approval

CSA	C22.2 (Class l, ll,III; Div.2; Groups A-G)

Isolated Analog Output

Type	16 bit digital to analog
	Current 4-20 mA (600 ohm max load)

DC Set point Outputs - 8 (Optional)

Type	open collector (current sinking)
Operating Voltage	5 - 35 VDC
ON Voltage	1.2 VDC @ 40 mA
	0.8 VDC @ 1 mA
OFF State Leakage	0.04 µA @ 40 VDC
Power	external supply required

AC Set point Outputs - 8 (Optional)

Type	triac
Operating Voltage	12 - 240 VAC
AC Frequency	20 - 500 Hz
ON State Voltage Drop 1.2	Vrms
Min - Max Load Current	5mA - 1A
Leakage Current	1mA @ full rated load voltage
Power	external supply required

Digital Inputs

Logic'0' (Low)	less than 0.5VDC, sink 3mA (min)
Logic'1' (High)	10 to 28 VDC (TTL open collector)
Mechanical Relay'0'	closed (one side = digital
	common, the other side = input)
Mechanical Relay'1'	open (input internally pulled up)

Network Serial Communication (Std)

Type	RS-485 Half Duplex (Multi-Drop)
Baud	9.6K, 28.8K' and 56.7k

Simplex Data Output (Standard)

Type	RS-485 (Simplex)
Baud	1200 or 9600
Data Format (Selectable) ASCII	7 data bits, even parity, stop bit

Terminal/Computer Interface (Optional)

Interface Type	RS-485 half duplex (standard)
Baud	1200 or 9600
Protocol	duplex command/response format
ASCII	7 data bits, even parity, stop bit

Special Protocols (Optional)

Modbus	RTU Protocol

Special Interface (Optional)

Allen Bradley Remote l/O -	1/4 logical rack

Modbus Plus	peer-to-peer (with global data)
DeviceNet	ODVA specified
Profibus	Siemens protocol

1.4 LCT-104 ORDERING SPECIFICATIONS

Designator	Option Numbers	Option Definition
[M]Mounting		NEMA 4X Panel Mount
		NEMA 4X Stainless Steel Wall Mount Enclosure
[A] Expansion Slot A		None (nothing installed)
		Uart Card (R76)
		Modbus Plus
		Allen-Bradley Remote I/O
		Profibus
		ODVA DeviceNet
[P] Process Outputs		Remote Inputs (standard)
		#1 with Analog Output
		#1 with (4) Individual Analog Outputs
[C] Communication		RS-485, RS-422, or Multi-Drop RS-422 with PCInterface - ASCII Print Format
		#1 with Modbus RTU Protocol
[B] Expansion Slot B		None (standard)
		8 Open Collector DC Outputs
		8 Solid State Relay Outputs
[M]Cable		Standard Length Cable - 200 ft
		Special Length Cable Over 200 ft

Interconnecting cable part number is 149971-8. Specify length when ordering.

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

Authorized BLH Field Service Engineers are available around the world to install LCt-104 based web tension measurement 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. Field service phonenumbers are listed below.

Factory: (Main Number)

(781) 298-2000

Canada: (416) 251-2554 or

(800) 567-6098

SECTION 2. System Installation

2.1 INTRODUCTION

This chapter provides LCt-104 system mounting and electrical installation information. Instruments will operate accurately (to specification) in locations with temperatures ranging from -10°C to +55°C (+14°F to + 130°F). The installation location should be free of vibration. Unless equipped with the proper enclosure option, instruments should not be located in areas containing explosive or corrosive vapors. In all installations, ac (mains) power should be supplied from a clean (transient free) instrument power source.

2.2 MOUNTING

2.2.1 Display Console Mounting

The LCt-104 Display Console is shipped with the necessary hardware for panel mounting. Outline and panel cutout dimensions are depicted in Figure 2-1. Installation of panel mount adapters is shown in Figure 2-2. Display Console units can be located up to 200 feet from the junction box.

2.2.2 Smart Junction Box Mounting

Locate the NEMA 4X junction box centrally, within cable reach of the HTU load cells, to ensure maximum system performance. Figure 2-3 shows the j-box outline dimensions and mounting hole designations. Four pre-punched holes enable wall or bracket mounting in the immediate load cell vicinity.

2.3 ELECTRICAL CONNECTIONS

2.3.1 The LCt-104 Rear Panel

Figure 2-4 (page 2-3) shows the LCt-104 Display Console rear panel where most connections are made.

2.3.2 Module Interconnection

Connect the Smart Junction Box to the Display Console Module using the four lead cable supplied by BLH. Carefully connect this cable to both modules as designated in Figure 2-5. Be certain to connect the cable shield to the SHIELD terminal on BOTH modules. Cable length will be determined per sales order instructions.

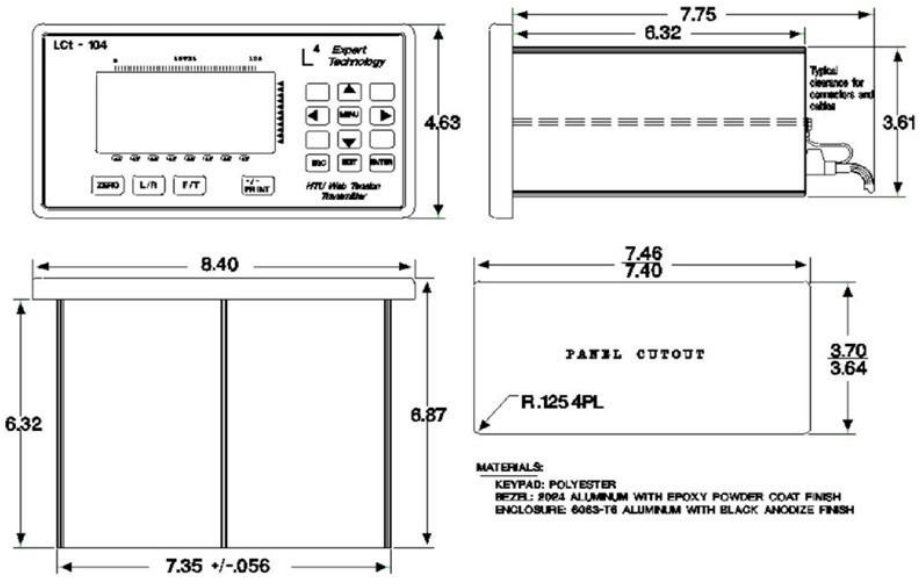


Figure 2-1. LCt-104 Display Console Outline Dimensions

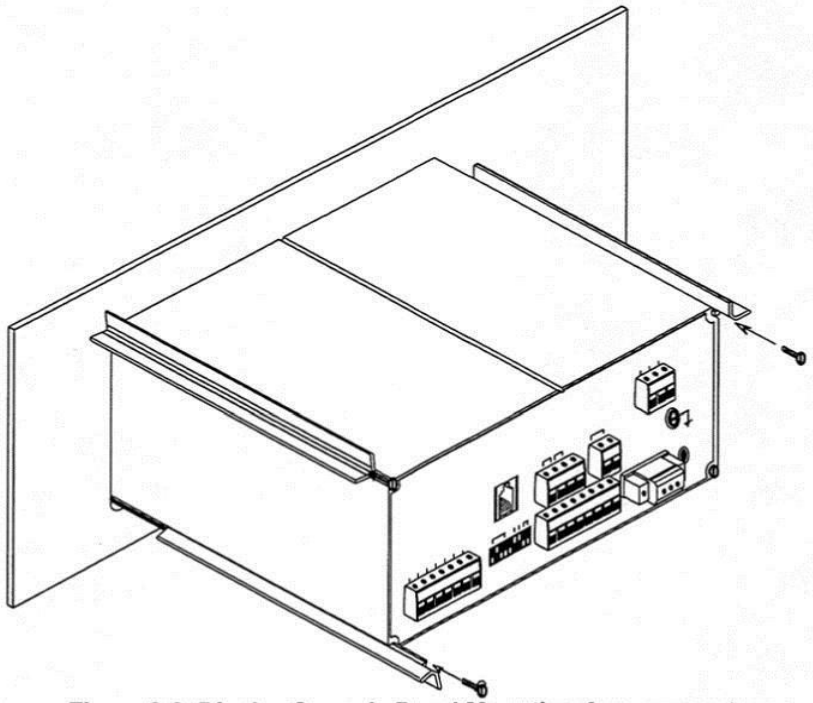


Figure 2-2. Display Console Panel Mounting Arrangements

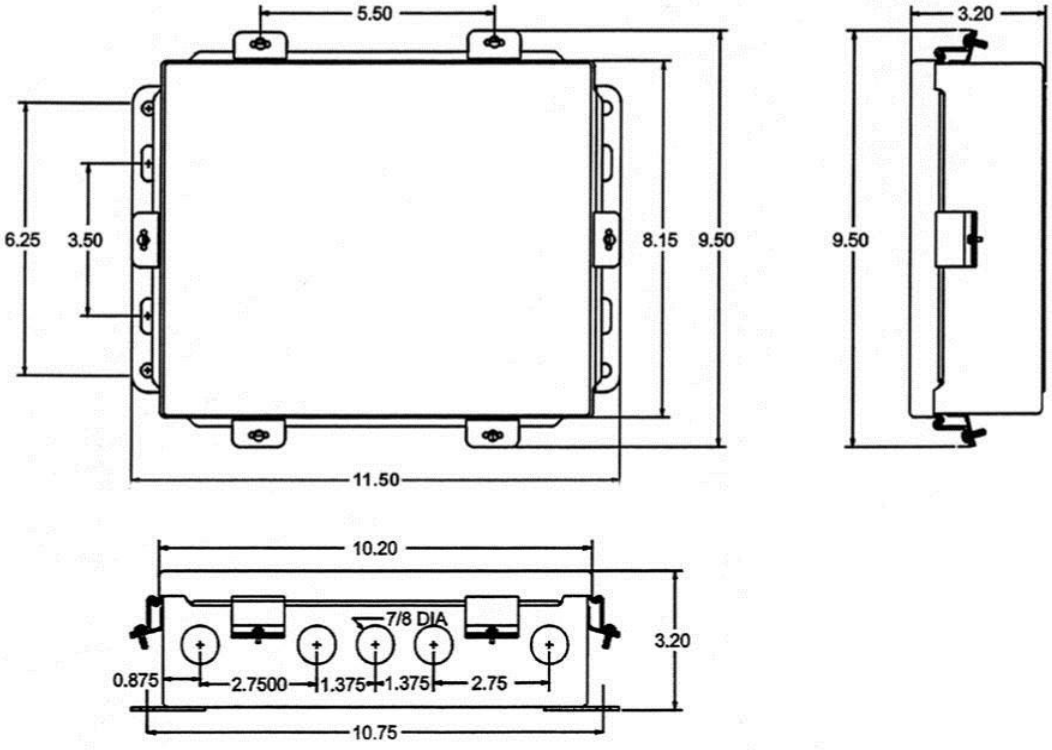


Figure 2-3. LCt-104 Smart Junction Box Outline Dimensions

HTU	Channel	Wire

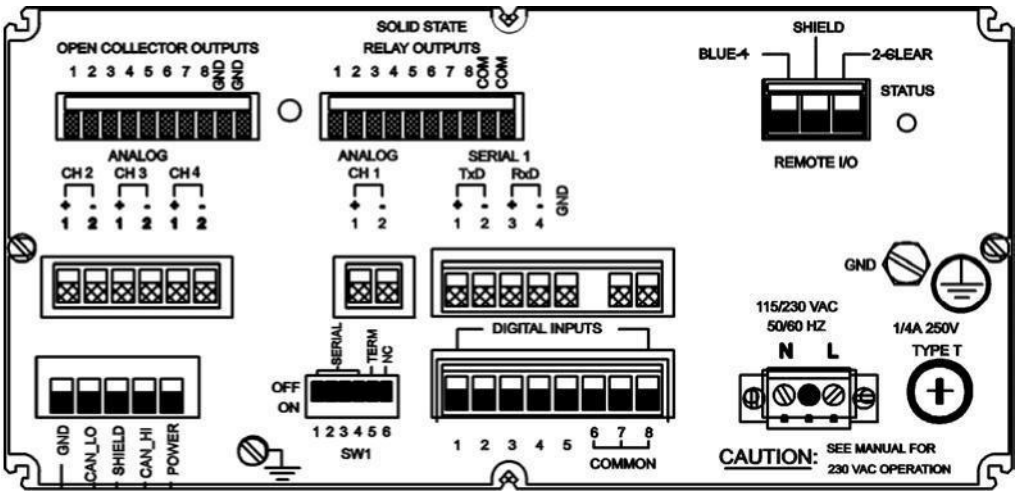


Figure 2-4. Display Console Rear Panel Electrical Connections - Remote I/O Option Shown

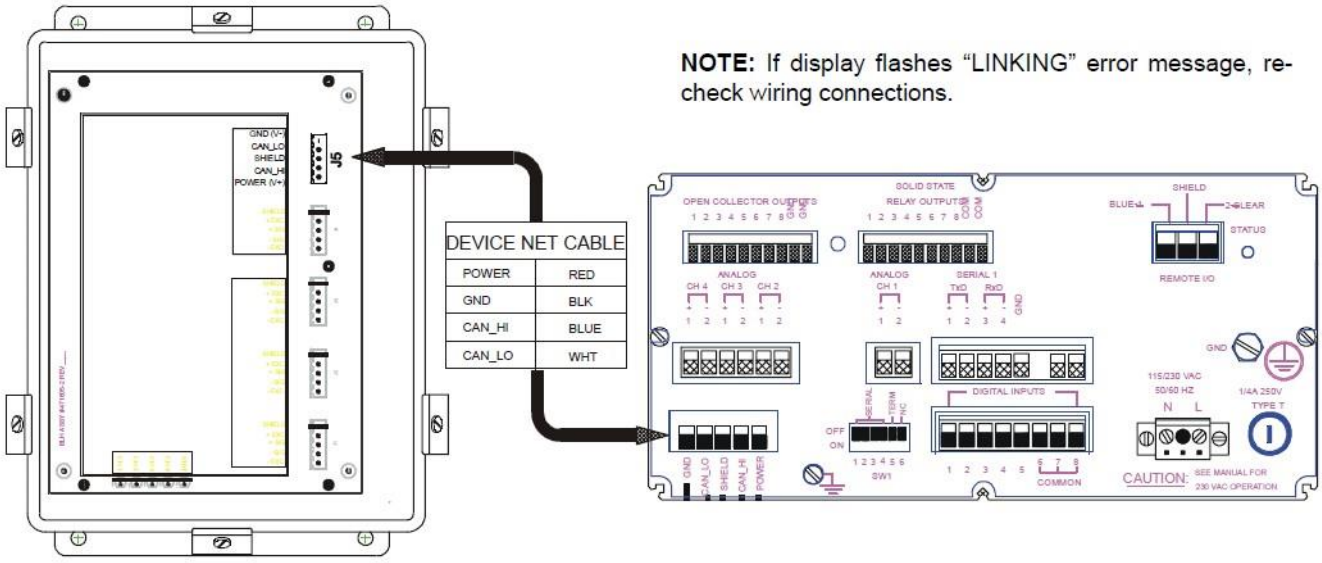


Figure 2-5. Display Console to Smart Junction Box Interconnect Wiring Diagram

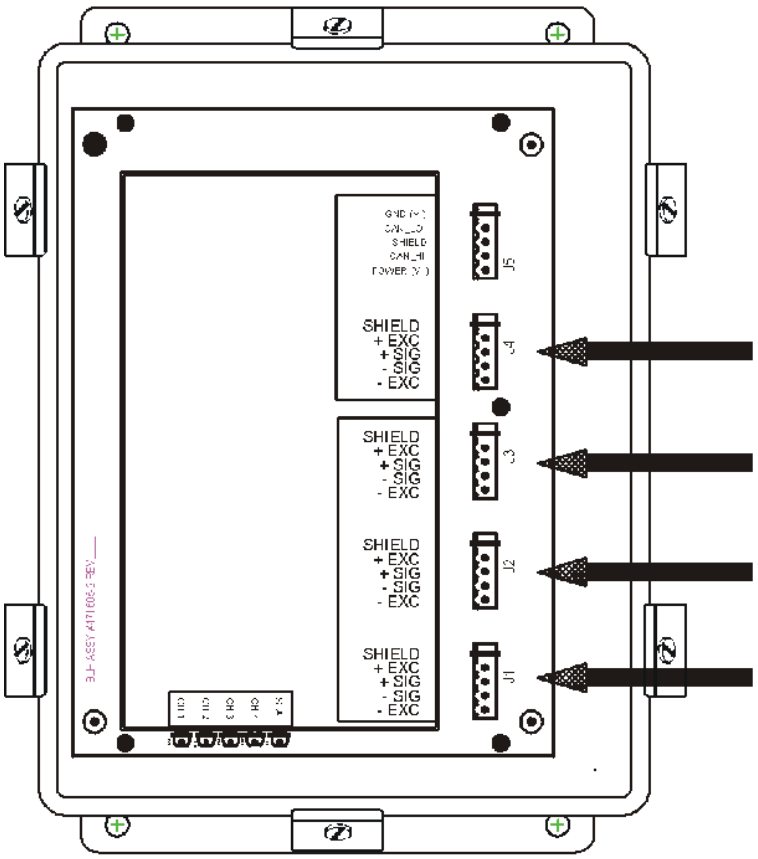
2.3.3 Transducer Signal Inputs

Transducer (load Cell) input leads from HTU's are wired directly to the junction box circuit board as shown in Figure 2-6. HTU load cells and junction box cables are shipped with pre-stripped, tinned leads so that leads need only be inserted in the proper terminal location and the screw above tightened securely. Lead designations are clearly labeled for standard BLH color coded load cell cables.

2.3.4 Mains (AC) Power

LCt-104 instruments are shipped ready to connect to115 VAC (50 or 60 Hz) as shown in Figure 2-7. If requested, units will be factory configured for 220-VAC operation, otherwise, remove the rear panel and change the internal voltage selection switch as shown in Figure2-8.

Each instrument is protected with a 1/4 amp, 250 volt'T' type fuse located adjacent to the ac power socket.If the fuse opens, replace it with the same type, current, and voltage rating.



Channel 4 Horizontal Cell 2	SHIELD	
	+EXC	
	+SEN	
	+SIG	Blue
	-SIG	Orange
	-SEN	
	-EXC	
Channel 3 Vertical Cell 2	SHIELD	
	+EXC	Green
	+SEN	Orange
	+SIG	White
	-SIG	Red
	-SEN	Blue
	-EXC	Black
Channel 2 Horizontal Cell 1	SHIELD	
	+EXC	
	+SEN	
	+SIG	Blue
	-SIG	Orange
	-SEN	
	-EXC	
Channel 1 Vertical Cell 1	SHIELD	
	+EXC	Green
	+SEN	Orange
	+SIG	White
	-SIG	Red
	-SEN	Blue
	-EXC	Black

Figure 2-6. Load Cell Connection Designations

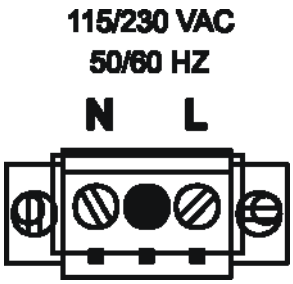


Figure 2-7. Ac 'Mains' Power Connection

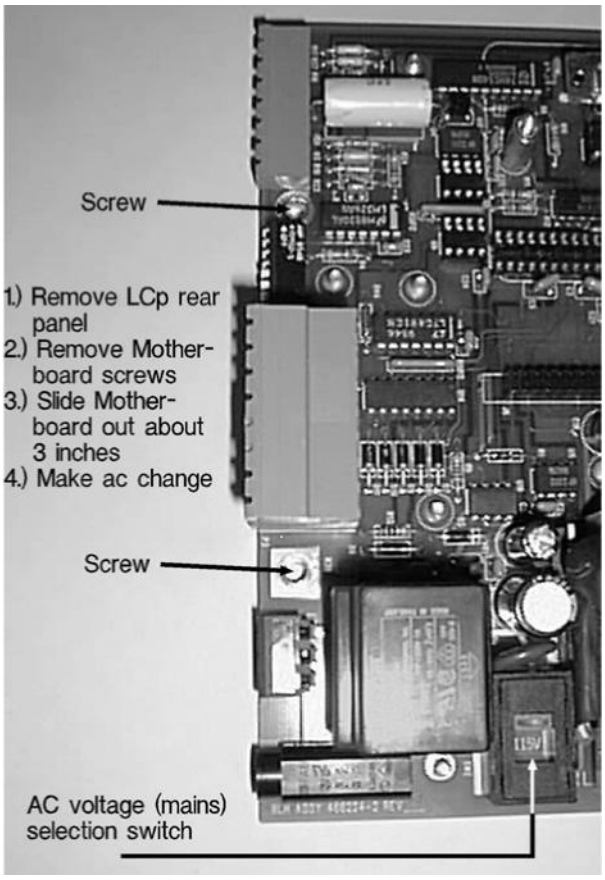


Figure 2-8. Ac Power Selection Switch

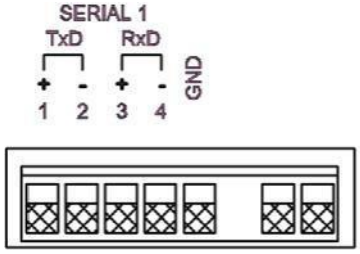
2.3.5 Serial Communication

A 4-socket mating half connector is provided for serialcommunication wiring. Connect wires for either RS-485 or RS-422 operation as shown in Figure 2-9. Note that connector position 5 is a ground terminal and should be used for three-wire, RS-485 communication networks. Set DIP switch S1 positions 1-4 for desired interface function (Figure 2-9 lower section). See Section VI for details concerning serial interfacing.

2.3.6 Analog Output (Option)

Analog current output is optional on LCt-104 instruments. Units are factory prepared for either 0-24 or 4- 20 mA operation, depending upon sales order instruction. Use the two-socket mating half terminal connector to attach plus and minus signal wires as shown in Figure 2-10. Route wires away from ac power lines and other EMI sources to prevent interference. Section VI provides analog output configuration procedures.

2.3.7 Digital (Remote) Inputs

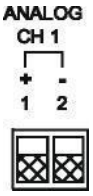


DIP SWITCH SETTING				
SW 1.1	SW 1.2	SW1.4	SW1.4	SERIAL FUNCTION
ON	OFF	OFF	OFF	422 MULTI-DROP
OFF	OFF	OFF	OFF	422 FULL DUPLEX
ON	ON	ON	ON	485 STANDARD

SW 1.5	TERMINATION RESISTOR
ON	RECEIVER TERMINATED 120 OHM
OFF	NO TERMINATION
SW 1.6	UNUSED

RS 422/ 485 COMMUNICATION			
PIN NO	SIGNAL NAME	SIGNAL	
		RS 422	RS 485
1	TxD+	TRANSMIT DATA +	NOT USED
2	TxD-	TRANSMIT DATA -	NOT USED
3	RxD+	RECEIVE DATA +	DATA +
4	RxD-	RECEIVE DATA -	DATA -
5	GND		

Figure 2-9. The Serial Communication Interface



ANALOG OUTPUT OPTION /SINGLE/QUAD		
RANGE	LOAD RESISTANCE	NOTE: SWITCHES FOR 4-20 ARE FACTORY PRE-SET
4-20 MA	600 OHM	
0-24 MA	500 OHM	

Figure 2-10. Analog Output Configuration

Certain front panel key functions can be initiated remotely using the rear panel digital inputs. Figure 2-11 gives wiring designations for remote operation of the ZERO, Left/Right (L/R), Force/Tension (F/T), and PRINT keys. Interconnecting wire/cable length should not exceed 50 feet. Route wires/cable away from ac power lines and other EMI sources to prevent interference.

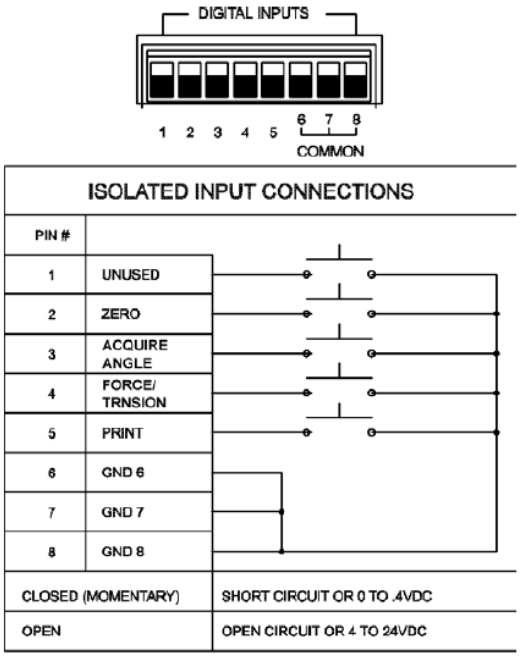


Figure 2-11. Remote Input Switch Configuration

2.3.8 llector Set point Outputs (Optional)

Units with eight open collector type set point outputs (optional) can be configured for main or dribble operation with inflight compensation (see Section VI). Outputs are open collector type, capable of sinking 35 mA at 1.2 VDC. Wire set point outputs as shown in Figure 2-12.

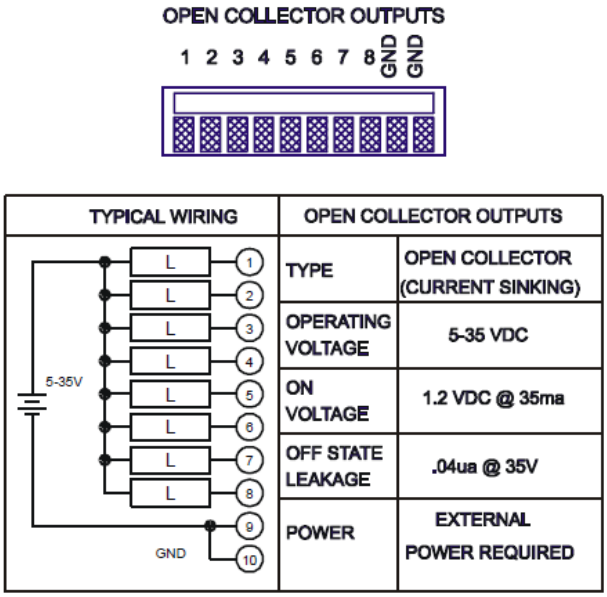


Figure 2-12. Open Collector Relay Wiring

2.3.8 Triac Set point Relay Outputs (Optional)

When installed, optional solid state triac outputs operate at 12 to 240 VAC and handle loads of 50 mA to 1 amp. Operationally, they are identical to the open collector set point outputs defined in paragraph 2.3.7. Wire outputs in accordance with Figure 2-13.

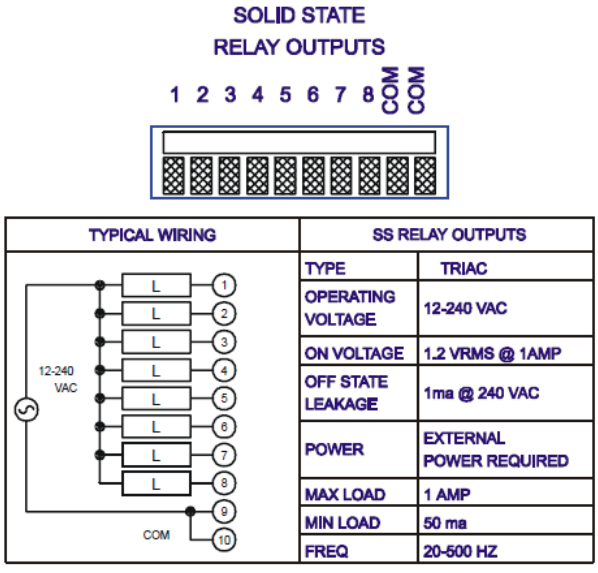


Figure 2-13. Triac Relay Wiring Arrangements

SECTION 3. Calibration

System calibration consists of three features; system calibration (CALIBRAT), Cell Enable (OFF/ON), and Compliment Cell Data. To begin with parameter entries, press the MENU key until CAL MENU is displayed. Press the 'down' arrow key for a display of CAL CALIBRAT.

3.1 SYSTEM CALIBRATION (CALIBRAT)

After installation, setup and calibration are the next steps in preparing an LCt-104 system for operation (see main menu diagram, Figure 1-3). Setup and calibration parameters are established easily using the front panel display and eight configuration keys. Figure 3-1 (page 3-2) presents details for setup parameter entry and Figure 3-2 (page 3-3) shows procedures for LCt-104 keypad calibration.

3.2 Setup SYSTEM PARAMETERS

Setup establishes system operating parameters such as system capacity, decimal point location, display units, count by, etc. Follow the flow diagram presented in Figure 3-1 to enter or alter setup parameters.

3.2.1 Number of HTU Load Cells

The first parameter entry requests the number of system load cells. Simply enter the number of HTU system cells (1 or 2). This value defines the system for the LCt-104 and will affect subsequent parameter entries as well as system performance.

3.2.2 Display Units

Designate the desired display units as pounds (LB) or Newtons (NT). Selection also appears on print outs and other serial communication transactions.

3.2.3 Decimal Point Location

Position the decimal point as desired for tension/force display and serial communication.

3.2.4 Capacity

Enter the HTU load cell capacity value.

NOTE: Even if the system uses two HTU load cells enter only the value of a single cell, not the combination of both.

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). Note that before the count value is selected, the LCt-104 will automatically attempt to achieve the best possible resolution.

3.3 KEYPAD CALIBRATION

LCt-104 system calibration is extremely simple. Entry parameters are located on the label of each cell and on the accompanying Calibration Certificate sheet (Figure 3-3).

LCt-104 instruments are factory calibrated with a very precise mV/V measurement device. The keypad calibration method establishes a relationship between force and mV/V, resulting in an extremely accurate electrical type of calibration. Keypad calibration requires a calibration sheet (Figure 3-3, page 3-4, or side of physical cell) for each HTU load cell. The cal. sheet presents the load cell mV/V output reading for both vertical (Z) and horizontal (X) values. Sheets also include a zero balance (no load) mV/V reading. Keypad calibration allows for the entry of zero balance and a single span point. On dual-cell systems (typical), zero balance and span points must be entered for both bridges, vertical and horizontal, of EACH cell. Thus a typical HTU calibration requires four passes through the cal 'loop' (see Figure 3-2).

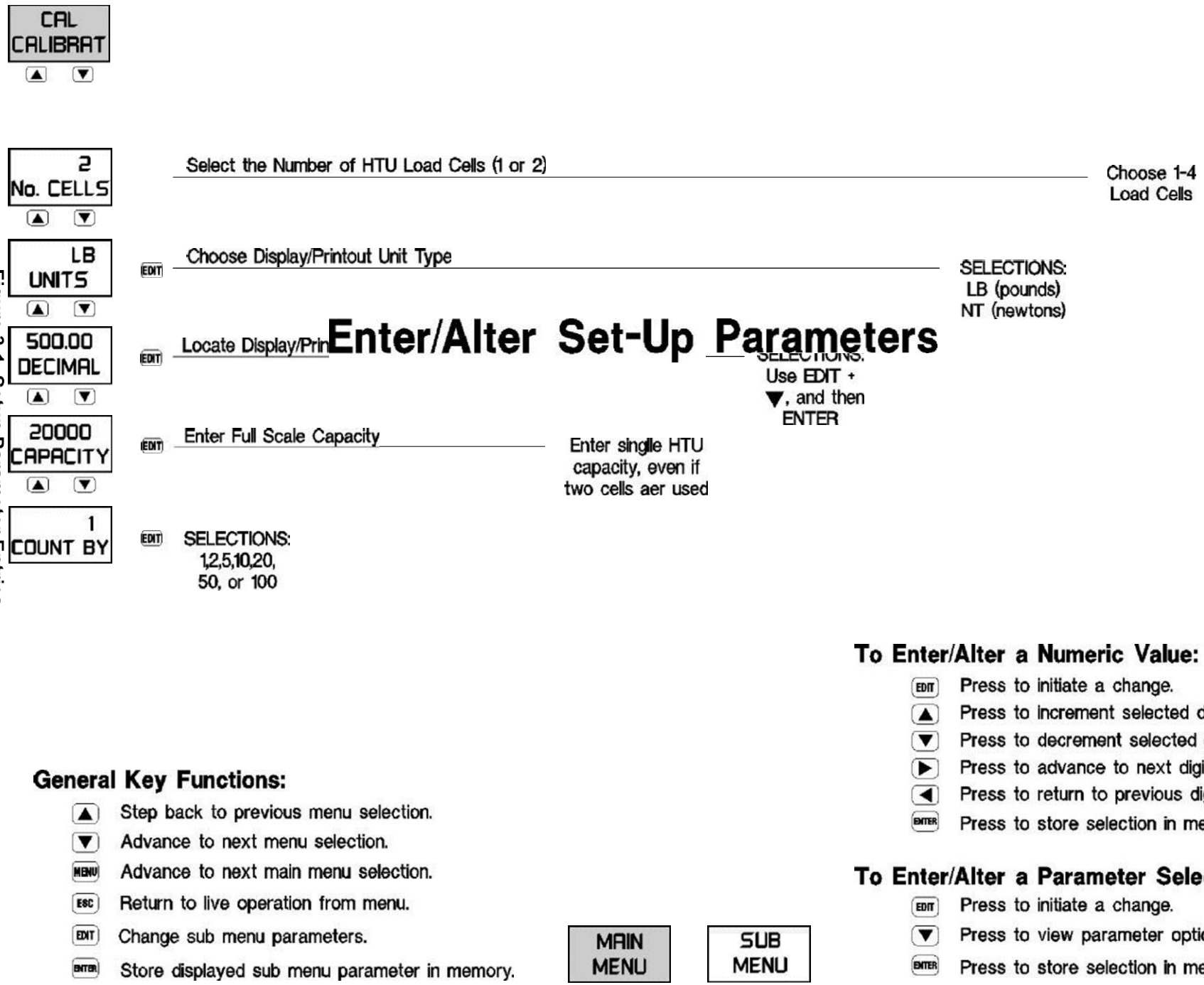


Figure 3-1. Setup Parameter Entries

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

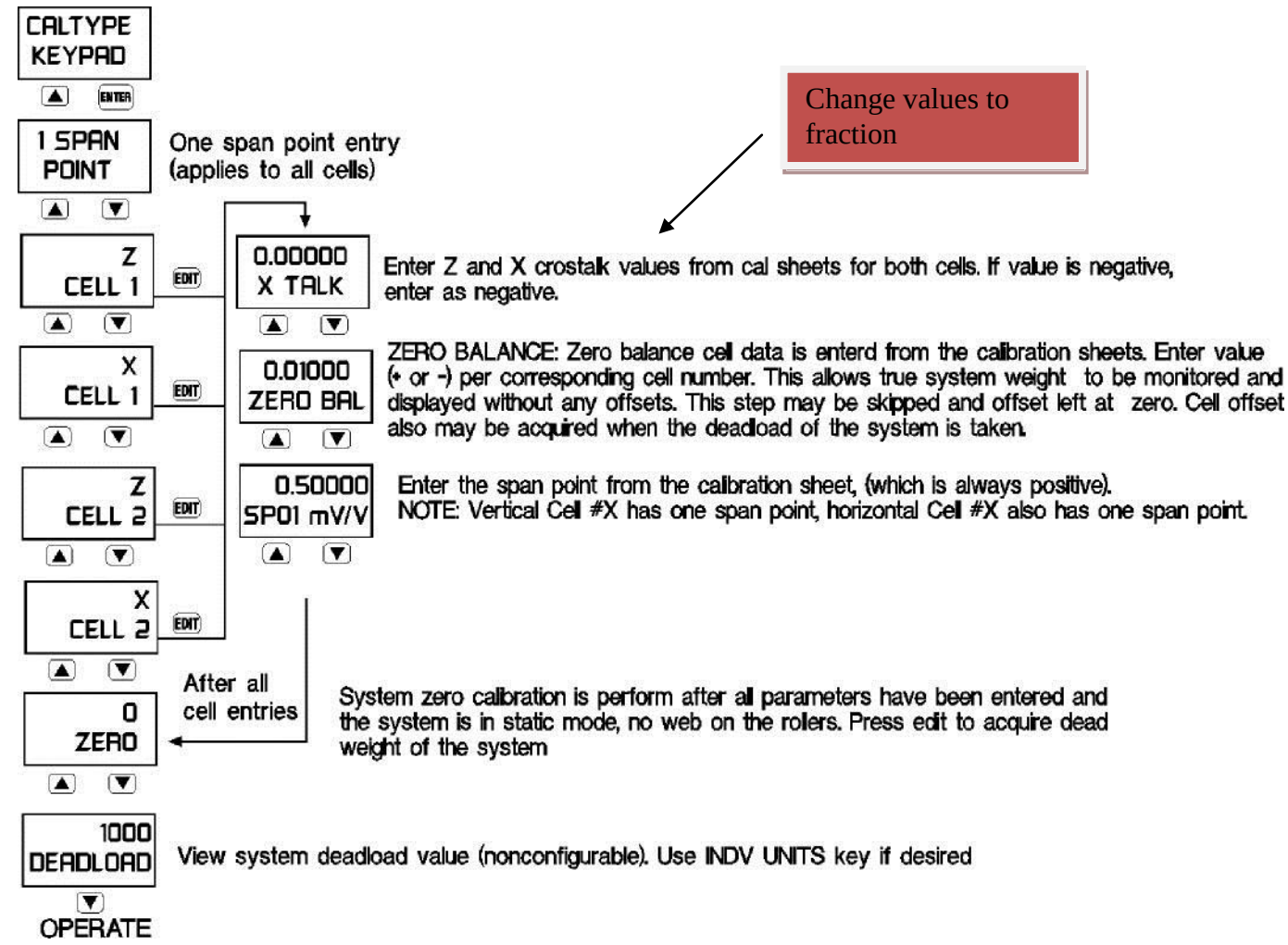
To Enter/Alter a Numeric Value:

- 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.

Keypad Calibration - Flow Diagram



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.

MAIN MENU

SUB 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.

Figure 3-2. Calibration Methods and Procedures

HTU Transducer
Calibration Certificate

PART NUMBER	CAPACITY	SERIAL NO.
473480	20,000 lb	01105

Z (Vertical)			X (Horizontal)		
A.	Input Resistance	183.4 Ω	A.	Input Resistance	183.4 Ω
B.	Output Resistance	501.3 Ω	C.	Output Resistance	501.0 Ω
D.	Zero Balance	-0.0013 mV/V	E.	Zero Balance	-0.0018 mV/V
F.	Insulation Resistance	< 10 GΩ	F.	Insulation Resistance	< 10 GΩ
G.	Span Value	2.0000 mV/V	J.	Span Value	2.0006 mV/V
H.	X- Cross Talk	-0.0453 mV/V	K.	Z- Cross Talk	-0.1847 mV/V
	DIVIDED BY			DIVIDED BY	
G.	Span Value	2.0000 mV/V	J.	Span Value	2.0006 mV/V
L.	Equal X-Cross Talk Fraction	-0.0226 (Unitless)	M.	Equal Z-Cross Talk Fraction	-0.0923 (Unitless)

Force Calibration: Test equipment used is certified to be in current calibration and traceable to the National Institute of Standards and Technology. The loads applied are on the basis of attraction of the earth's gravitational field at a point where the value of gravity equals 980.356 cm/sec² on masses standardized against brass standards in air

Calibration Date:

Certified:

Certified:

Figure 3-3. Sample HTU Load Cell Calibration Certificate

3.4 ENABLE MODE FUNCTION

3.4.1 CELL ENABLES DESCRIPTION

During normal HTU system operation, all enables should be on; this means that the HTU system is fully operational.

There are two enables for each HTU cell (vertical and horizontal), four for two HTU's as follows:

Cell #1 - on the display console, is the off/on enable for the vertical input from the first HTU.

Cell #2 - on the display console, is the off/on enable for the horizontal input from the first HTU.

Cell #3 - on the display console, is the off/on enable forthe vertical input from the second HTU.

Cell #4 - on the display console, is the off/on enable forthe horizontal input from the second HTU.

3.4.2 DEGRADE MODE

In degrade mode, shutting off the enables of a defective HTU cell allows continued operation until the cell can be replaced. This only applies to a two cell (left right measurement system. In a single cell system, the faulty cell must be replaced.

Degrade mode decreases the force measurement by approx. 50% but allows system operation until the (faulty cell) swap is made and all enables are turned back on.

3.4.3 SYMMETRICAL SYSTEM CHECK

Enables can be used to quickly isolate a problem on one side of web. The system operator simply turns off the enables for a single cell to see if one side has more mechanical or electrical noise that the opposing side. In a symmetrical system each side should be showing the same force and angle measurement so with ability to turn either side on/off will reveal differences immediately.

3.4.4 SYMMETRICAL SYSTEM CROSS CHECKING

A two sided system (with two HTU's) works symmetrically. This allows system cross checking to be appliedin order to achieve a model or profile of system performance, if desired.

This profile combines a vertical component of one HTUwith the horizontal component of the other HTU (system will run at Vs. the force) and shows the resultant of the two opposite HTU's acting as one HTU. This modelcan be used anytime to check for mechanical or electrical noise problems during system operation.

3.5 COMPLEMENTING DATA

Complemented data routines are used for setting up correct polarity on vertical and horizontal channels and is only used to correct for resultant signals generated by web tension applied to the tension roll.

See Figure 3.4 and 3.5 for convention

3.5.1 Vertical inputs: Channels One and Three

Vertical channel can produce positive signals, indicating that force is being applied in a downward direction on both (or a single HTU transducer) causing positive mV/V signal(s) display(s). Or an upward force can be applied resulting in a negative force causing negative mV/V signal(s) display(s). In either case, signals are always in phase with each other and bipolar feature will allow calibration mode to zero out the roll weight . See Figure 3.3 for convention

3.5.2 Horizontal Inputs: Channels Two and Four

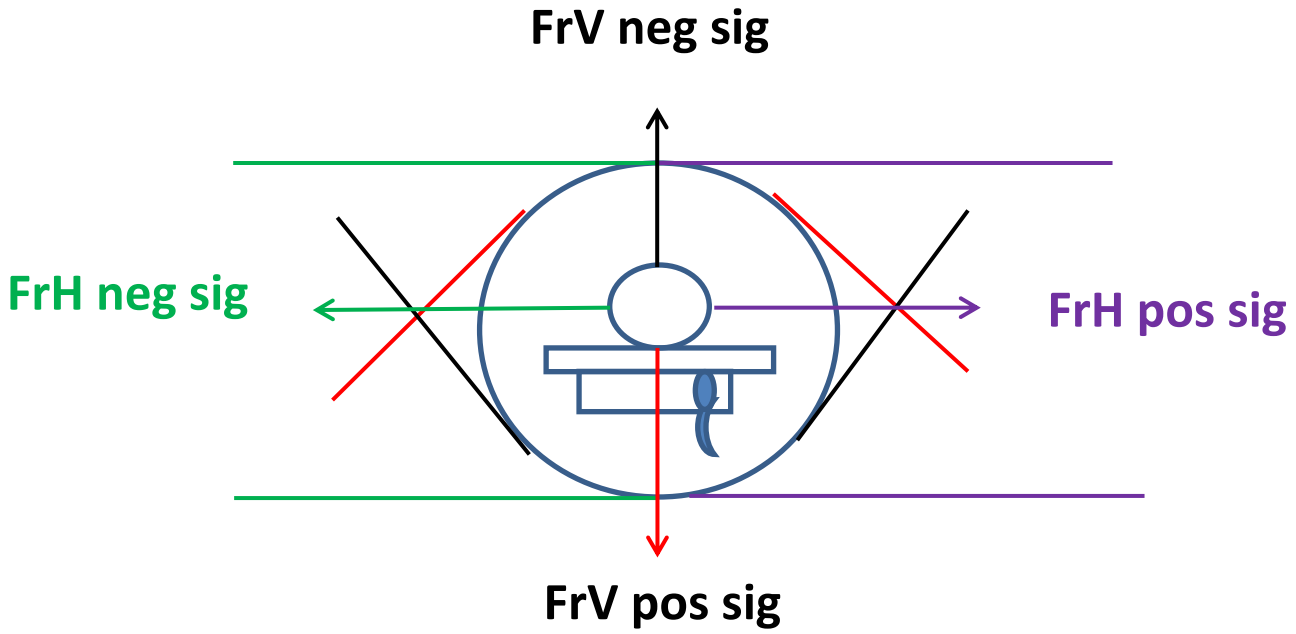
Horizontal components are sometimes out of phase because layout of application of HTU'(s). For this reason channel 4 automatically reverses the polarity of the incoming signal due to web tension applied to the roll. Calibration mode will again zero out any polarity due to roll weight. See Figure 3.3 for convention

3.5.3 Hardware Correction of Vertical or Horizontal Inputs:

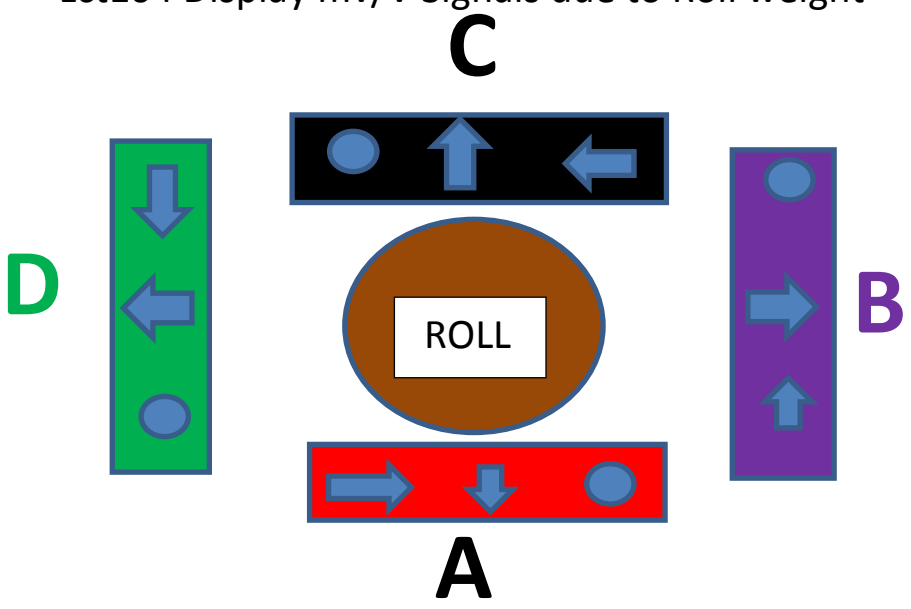
Wiring should be consistent with standard wiring shown on page 2-4 Figure 2-6.

Complementing data allows system wiring to remain consistent with manual designated instructions (no swapping signal (+,-) wiring).

HTU Polarity Convention



Lct104 Display mv/V Signals due to Roll weight



HTU Location	A	B	C	D
Vertical CHNL 1	+	-	-	-
Horizontal CHNL 2	?	-	?	+
Vertical CHNL 3	+	-	-	-
Horizontal CHNL 4	?	+	?	-

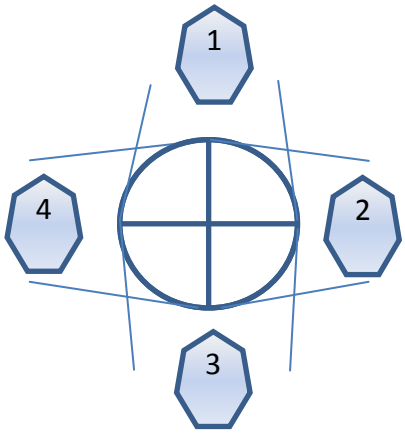
Figure 3.3

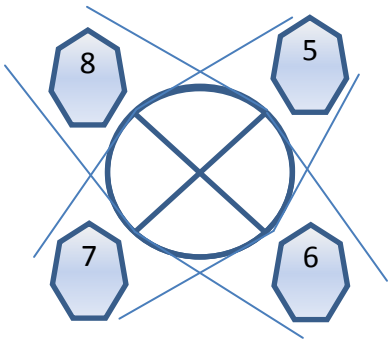
Note : Display readings are sequentially selected by pressing the mv/V button on the keypad. For channel 4 (only) readings are inverted from actual signal polarity. Use this chart relative to your HTU and Roll orientation . Compare Display signals with chart for validation.

The following charts establish polarity of resultant mv/V signal change due to geometrical wrap in web path tension relative to HTU orientation. V = vertical H = horizontal signals

The objective for using the compliment parameter is to establish positive force readings on the display of the Lct104 for these signal changes.

Select the HTU orientation A,B,C, or D and the geometrical wrap (1-8), that relates to your installation for the associated complement parameter from charts 3.4 and 3.5.





A

B

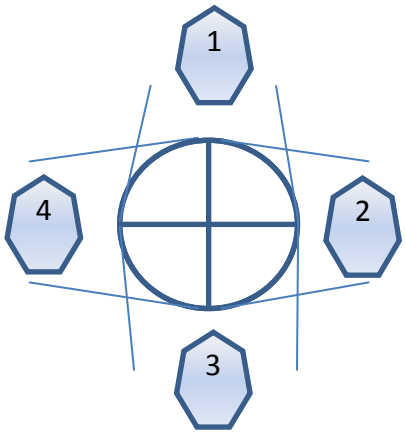
C

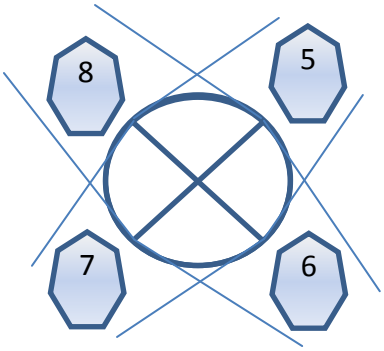
D

HTU A			Comp.		HTU B			Comp.		HTU C			Comp.		HTU D			Comp.	
Fr	V	H	CH1	CH2	Fr	V	H	CH1	CH2	Fr	V	H	CH1	CH2	Fr	V	H	CH1	CH2
1	P	0	OFF	OFF	1	0	N	OFF	ON	1	N	0	ON	OFF	1	0	P	OFF	OFF
2	0	N	OFF	ON	2	N	0	ON	OFF	2	0	P	OFF	OFF	2	P	0	OFF	OFF
3	N	0	ON	OFF	3	0	P	OFF	ON	3	P	0	OFF	OFF	3	0	N	OFF	ON
4	0	P	OFF	OFF	4	P	0	OFF	OFF	4	0	N	OFF	ON	4	N	0	ON	OFF
5	P	N	OFF	ON	5	N	N	ON	ON	5	N	P	ON	OFF	5	P	P	OFF	OFF
6	N	N	ON	ON	6	N	P	ON	OFF	6	P	P	OFF	OFF	6	P	N	OFF	ON
7	N	P	ON	OFF	7	P	P	OFF	OFF	7	P	N	OFF	ON	7	N	N	ON	ON
8	P	P	OFF	OFF	8	P	N	OFF	ON	8	N	N	ON	ON	8	N	P	ON	OFF

Figure 3.4 Channels 1 & 2

Note: Comp.= complement, P=positive, N=negative, 0=no change in signal due to the absence of resultant force in that direction.





A

B

C

D

HTU A			Comp.		HTU B			Comp.		HTU C			Comp.		HTU D			Comp.	
Fr	V	H	CH3	CH4	Fr	V	H	CH3	CH4	Fr	V	H	CH3	CH4	Fr	V	H	CH3	CH4
1	P	0	OFF	OFF	1	0	N	OFF	OFF	1	N	0	ON	OFF	1	0	P	OFF	ON
2	0	N	OFF	OFF	2	N	0	ON	OFF	2	0	P	OFF	ON	2	P	0	OFF	OFF
3	N	0	ON	OFF	3	0	P	OFF	OFF	3	P	0	OFF	OFF	3	0	N	OFF	OFF
4	0	P	OFF	ON	4	P	0	OFF	OFF	4	0	N	OFF	OFF	4	N	0	ON	OFF
5	P	N	OFF	OFF	5	N	N	ON	OFF	5	N	P	ON	ON	5	P	P	OFF	ON
6	N	N	ON	OFF	6	N	P	ON	ON	6	P	P	OFF	ON	6	P	N	OFF	OFF
7	N	P	ON	ON	7	P	P	OFF	ON	7	P	N	OFF	OFF	7	N	N	ON	OFF
8	P	P	OFF	ON	8	P	N	OFF	OFF	8	N	N	ON	OFF	8	N	P	ON	ON

Figure 3.5 Channel 3 & 4

SECTION 4. Dynamic Digital Filter

4.1 GENERAL

The LCt-104 uses a two stage digital filter. Each stage requires parameter entries as shown in Figure 4-1 (next page). Also required is selection for the conversion speed of the analog to digital signal which will affect filter length time (response). Make parameter entries while viewing live tension force changes on the front panel display. This unique feature allows editing of parameters to 'fine tune' precision settings.

4.1.1 Digital Averaging

The filter first stage calculates a running average of tension input readings. Available selections are OFF, and 1 - 12 (see Figure 4-1). With averaging OFF the response time will be maximum and noise reduction will be least. With higher settings, response time increases and noise levels are diminished.

Using a `first in - first out' algorithm, running averaging provides display updates every A/D cycle regardless of the number of readings averaged. However, since each conversion averaged adds one more A/D cycle to the filter length, the larger the averaging selection, the longer the filter length becomes.

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 differences for all cells fall within the BAND setting, a mathematical filter attenuates the conversion to conversion variation. Once the difference for any cell (between conversions) exceeds the BAND selection, the BAND filter is canceled and the display tracks live tension 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 tension changes will be reduced.

4.1.3 Conversion Selection

Conversion speed selection plays a role in filtering. If the conversion speed is decreased, the length of the filter response time will be longer. When adjusting filter parameters, try a slower conversion speeds first since they usually generate less noise. If, however, the response time is not appropriate then increase the conversion rate and repeat filter procedure.

4.1.4 Filter Set-Up Procedures

Setting filter parameters requires a balance between achieving maximum noise reduction and maintaining quick response and good sensitivity to real tension 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 tension changes may be hindered. Using the six steps presented below, tune the system to its maximum performance level.

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. +/- 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 tension change sensitivity reduction) and averaging (longer response time).
6. If a stable tension display cannot be achieved with reasonable selections, it

may be necessary to change the instrument set-up to reducesensitivity, or select a different conversion rate.

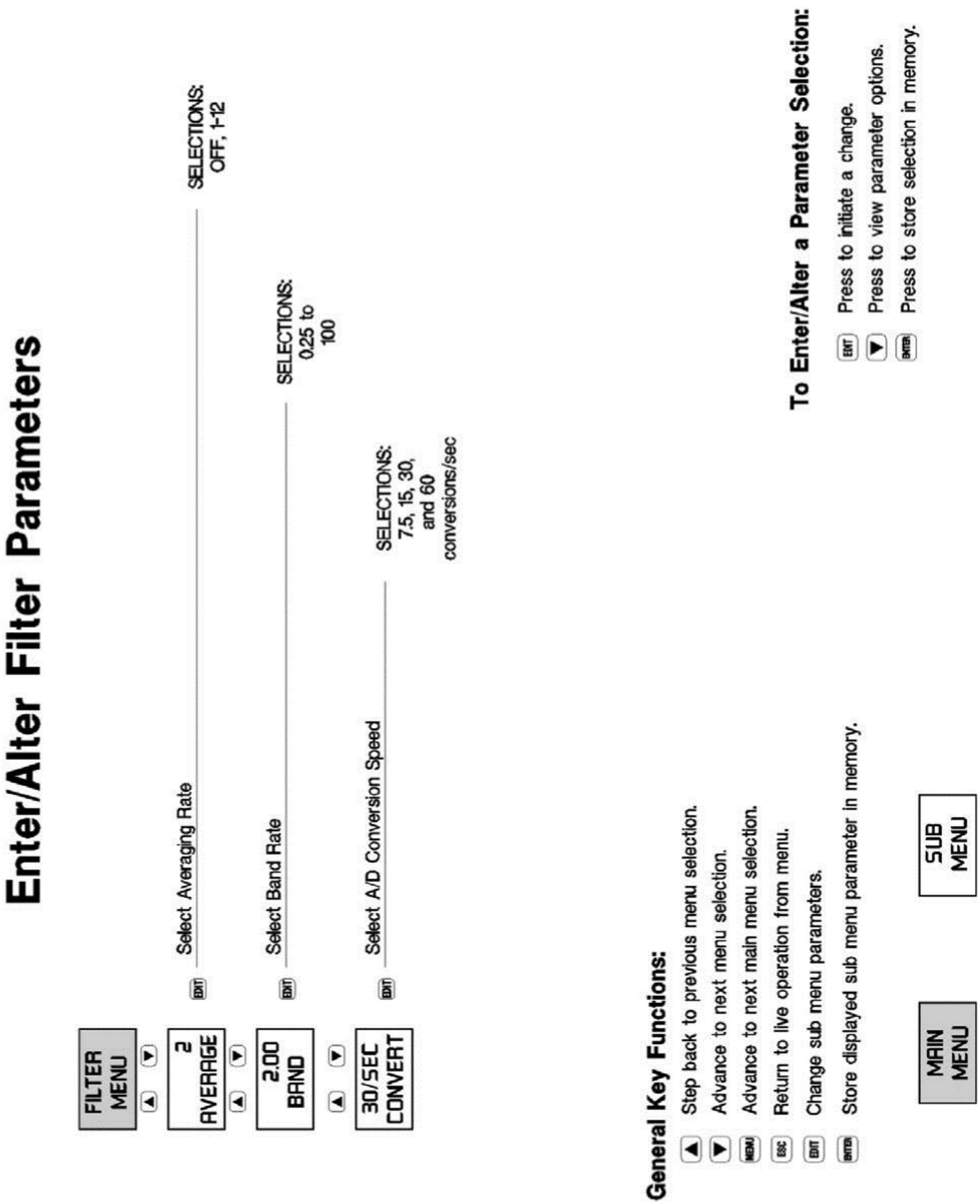


Figure 4-1. Filter Parameter Selections

SECTION 5. Front Panel Display Functions

5.1 FRONT PANEL FUNCTIONS

The front panel display of the LCt-104 (Figure 5-1) includes a two line alpha numeric digital display for tension and status information as well as horizontal and vertical bar graphs and diagnostic alarm annunciators. The bar graphs and alarm annunciators can be used for several different functions as defined in the following paragraphs. Use the display menu flow diagram (Figure 5-2) to configure the front panel functions for desired system operation.

5.1.1 Horizontal Bar Graph

The horizontal bar graph is considered the primary levelindicator and is typically used to monitor horizontal web balance. vacuum fluorescent segments located under the 0 to 100% bar graph give instant visual reference to “pulling” effects. Select ON to use; OFF for no function. Choose force, tension, or percent tracking and then enter the starting and ending tension values.Note that this indicator also can be configured for reverse polarity depending upon the starting and endingvalues.

5.1.2 Vertical Bar Graph

The vertical bar graph indicates vertical tension balance. Located to the right of the tension display area, this indicator provides a graphical representation of 0 to 100% in 10% increments (each arrow = 10% capacity). Select ON to use; OFF for no function. Choose force, tension, or percent tracking and then enter the starting and ending tension values. Note that this indicator also can be configured for reverse polarity depending upon the starting and ending values.

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 11 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, analog output under low selection, Allen-Bradley Remote I/O, DeviceNet, Profibus, or Modbus Plus 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.

5.1.4 Configuring the L/R Key

The L/R side key is used when two HTU’s are used. Pressing this key when Force or angle is displayed will show the forces or angles for each side. This key shouldbe used to view the right or left side of the web roll.The typical association is left HTU = Channel #1 and#2 and right HTU = tChannel #3 and #4. Of course, right or left can depend on position of operator, so it isgood to setup the Web roll for correct observation byuser.

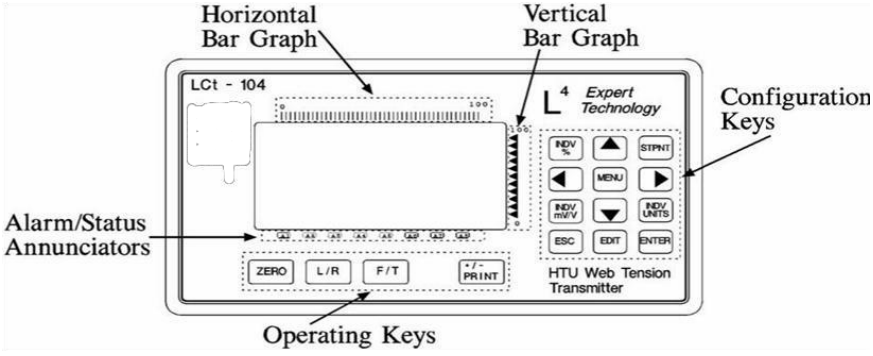
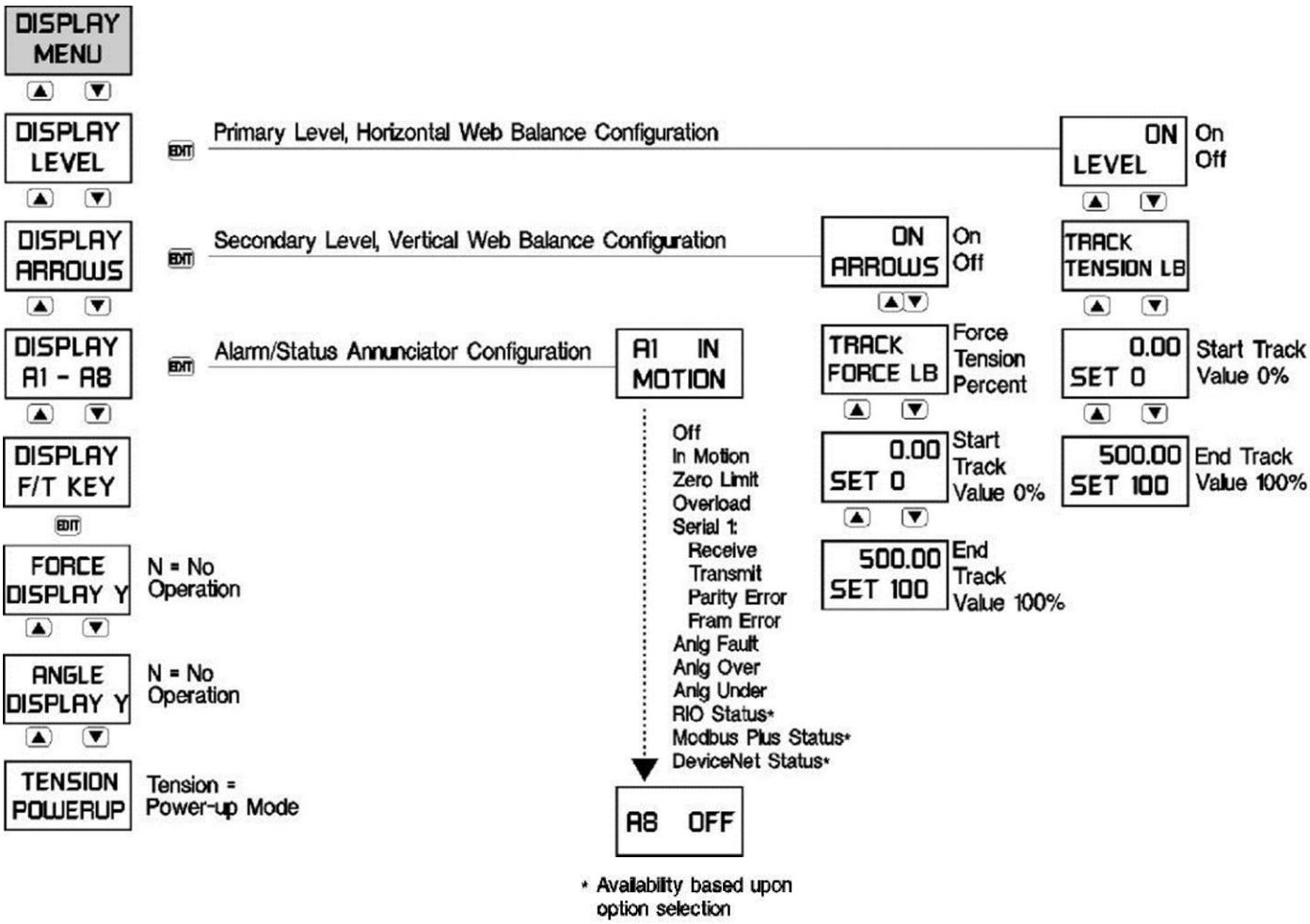


Figure 5-1. LCt-104 Front Panel Functions



MAIN MENU

SUB 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.
- 0 — 9 Key in desired numeric value.

...or in some cases

- ▲ 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 5-2. LCt-104 Front Panel Function Configuration Menu

When L/R is pressed, selection of A or B blinking will be displayed for left or right reading.

The reference angle is shown only if the auto wrap feature is turned on. Acquiring a new angle can be perform by pressing the EDIT key, as soon as this is done new reference will be displayed.

NOTE: There is no side display for tension; total tension is the only displayed value, if auto wrap is on.

5.1.5 Configuring The ZERO Key

The zero key allows the canceling of roll weight associated with vertical and horizontal inputs. When zero is pressed, the dead weight of each input is subtracted and the displayed data reads zero lb/nt.

The **true weight** reading, associated with each channel **(without crosstalk** applied), can be viewed by pressing the INDV key and then pressing EDIT key.

Trueweight values for each input are displayed by continued pressing of the INDV key.

5.1.6 The F/T Key

The F/T (force/angle/tension) key typically toggles the system between its three modes of operation (see SECTION IX) when pressed. Menu configuration allows angle and tension modes to be deselected (Y = no for tension or angle modes of operation), if desired. If angle and tension modes are turned off, the instrument will display only force data at all times, otherwise the key will toggle between all operational modes.

A second selection determines the power-up mode of operation. Select FORCE, ANGLE, or TENSION to establish the default power up mode.

NOTE: If angle and/or tension modes are deselected, they cannot be designated for power-up default.

SECTION 6. Process Outputs

6.1.1 Output Definition

LCt-104 systems provide up to four high-resolution analog current outputs, representing either force or tension, for driving external process equipment/recorders. Units are configured for either 4-20 or 0-24 mA operation (note: 100 ohm load resistance reduction with 0-24 mA) depending upon sales order instructions. Output(s) is based upon a 16-bit digital to analog (D-A) conversion, which represents up to one part in 65536 of analog precision. Output scaling is performed after calibration and can be ranged for any portion of the force or tension output curve.

6.1.2 Set-Up Procedure

Connect a current meter to the rear panel analog output points (see Figure 2-10 for +, - designations) and proceed with ANALOG I/O configuration as shown in Figure 6-1

6.2 SERIAL COMMUNICATION

LCt-104 units come with a versatile, bi-directional, serial communication port. Electronically, this port can

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. Selection is made via rear panel DIP switch positions 1-4 (see Figure 2-9). 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 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. MODBUS RTU, Modbus Plus, Profibus, Allen-Bradley Remote I/O, and DeviceNet options are defined in later Sections of this manual.

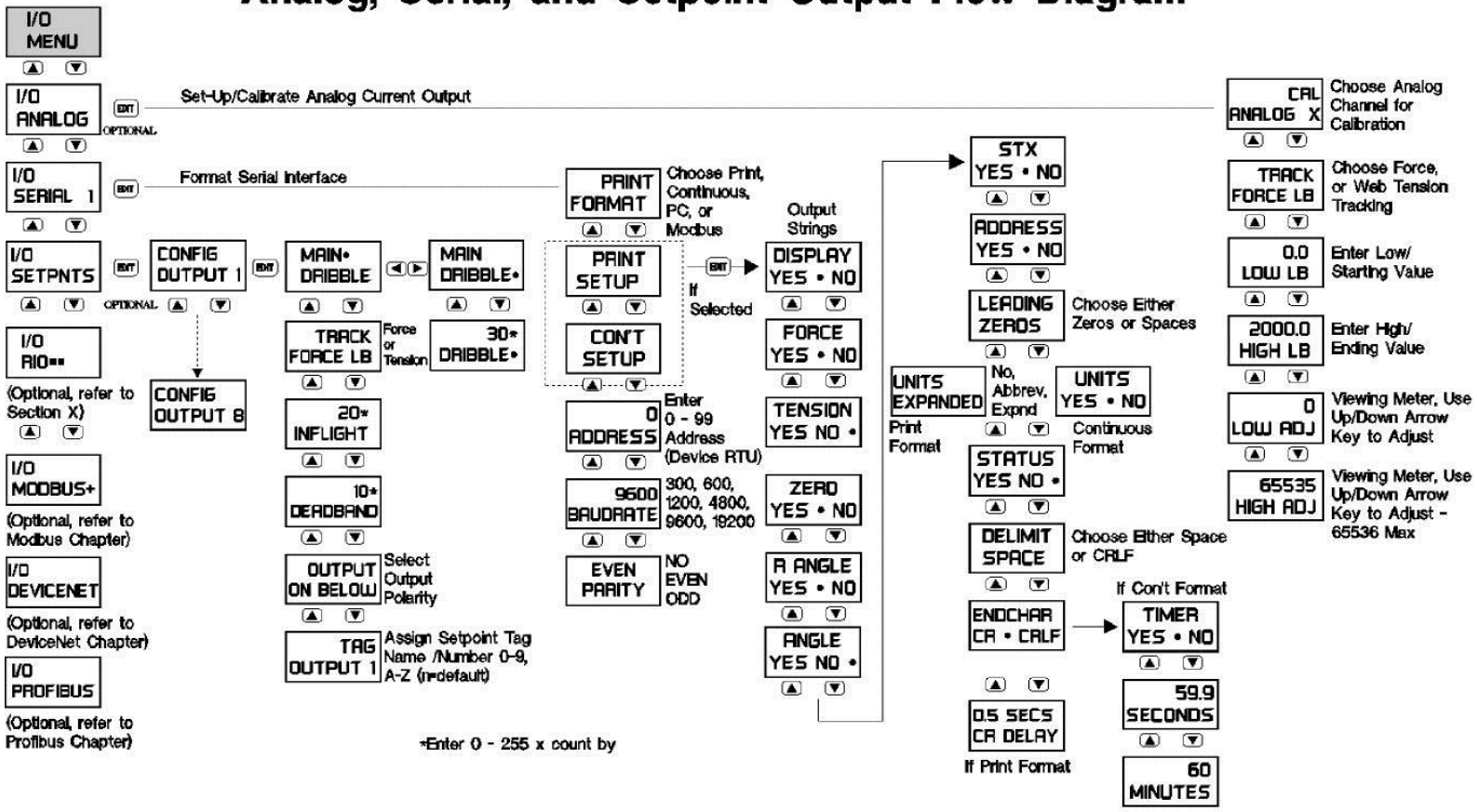
6.2.1 Transmit Only Output Formats

Both the PRINT and CON'T 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 to the printer. Table 6-1 shows the printer output format used for each transmitted data string.

Table 6-1. The Printer Output Format

Printer Output String Format	
String Format: stx~adr~data~units~status~crlf	
Command	Definition
stx	start of text character, hex 02
adr	address; 3 ASCII characters: first 2 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 units	two characters; first character is 'L', 'N', or 'spaces' for pounds or newtons. The second character is 'Z ' for zero
expanded units	ten characters; first three characters are a space plus a two character units abbreviation ' LB', ' NT', or 4 spaces for pounds or newtons. The last seven characters are a space plus the data type spelled out with added spaces ' GROSS ', ' FORCE', ' TENSION ', or 'ANGLE '.
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 ODH OAH
Character Format (bits): 1 start, 1 even parity, 7 data, and 1 stop	

Analog, Serial, and Setpoint Output Flow Diagram



General Key Functions:

- Step back to previous menu selection.
- Advance to next menu selection.
- Advance to next main menu selection.
- Return to live operation from menu.
- Change sub menu parameters.
- Store displayed sub menu parameter in memory.

To Enter/Alter a Parameter Selection:

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

To Enter/Alter a Numeric Value:

- Press to initiate a change.
- Key in desired numeric value.

...or in some cases

- Press to increment selected digit.
- Press to decrement selected digit.
- Press to advance to next digit.
- Press to return to previous digit.
- Press to store selection in memory.

Figure 6-1. Analog and Serial Communication Parameter Entries

Serial Output Flow Diagram Block Explanations

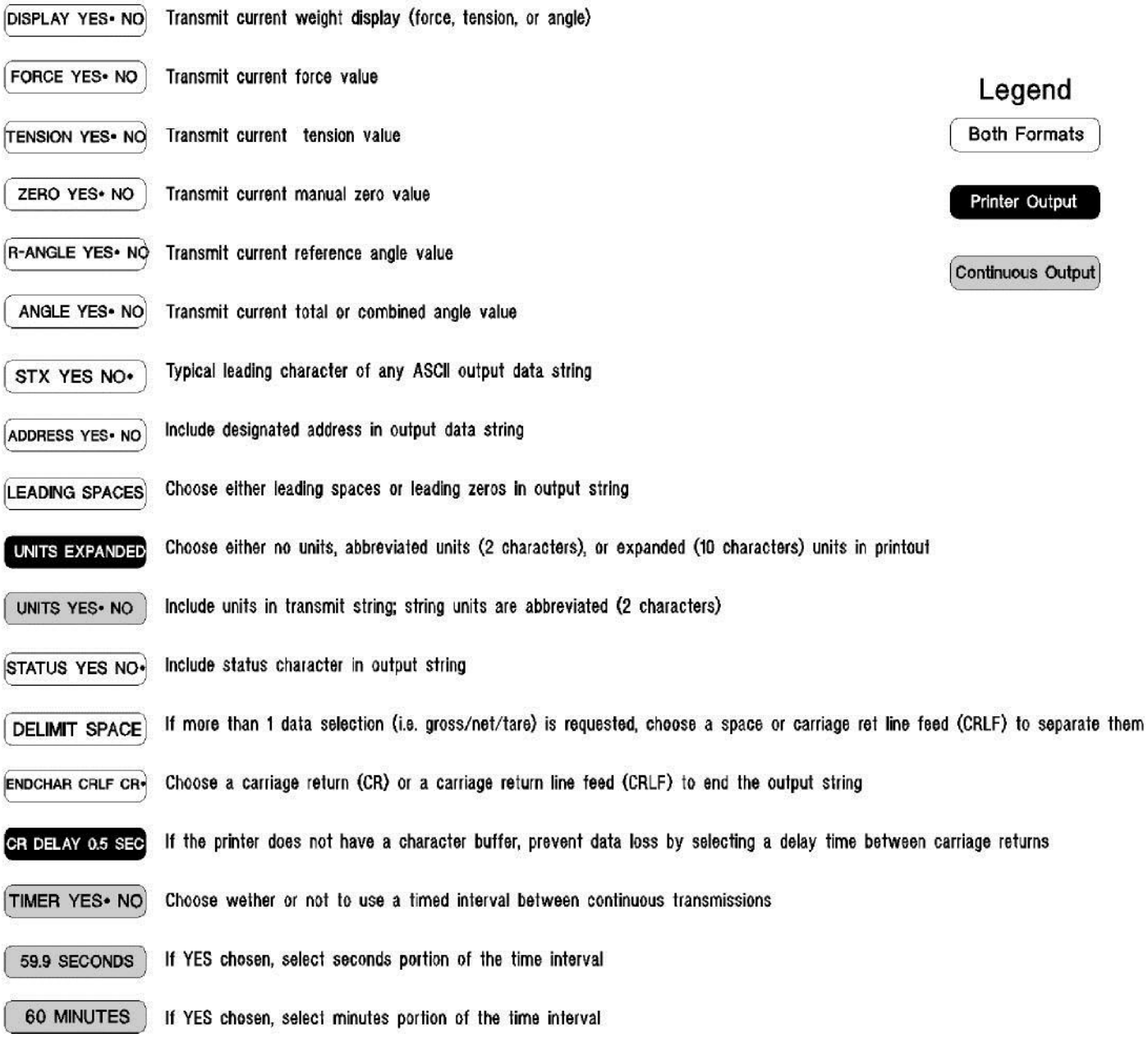


Figure 6-2. Definition of Serial Communication Terms

The CON'T output string is defined in Table 6-2. Continuous output transmissions occur at the time rate selected in Figure 6-1. Continuous outputs 'feed' force tension, 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. STX (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.

6.2.2 Full/Half Duplex Bi-Directional Interface

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

Basically, the LCt-104 has 92 internal (EEPROM) registers that store all calibration, configuration, operation, and live force/tension data parameters. The PC format allows data in these registers to be read or rewritten. By re-writing operating parameters, LCt-104 systems can be quickly reconfigured by a remote host device.

Note: Downloading data to the Model LCt-104 is accomplished by sending a 3 character command, the data enclosed in brackets <>, and a carriage retum as shown in Table 6-3. The response will be staggereddepending upon the time it takes to store the data. First the command will be resumed and then after the data is stored the CRLF (carriage return/line feed) ornext command will be returned.

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 weighttransactions.

6.3 SET POINT CONFIGURATION

Model LCt-104 controllers provide eight outputs for set point operation. Standard units offer open collector/ TTL signals at the rear panel connector. Optionally, triac based analog outputs may be ordered. In either case, the output signals are identical, based upon configuration selections presented in Figure 6-1. Following the flow diagram to select main or dribble function for each output used. Also, select the polarity (valve `ON' above or below set point) and a tag description (name) for each set point.

Table 6-2. The Continuous Output Format

Continuous Output String Format	
String Format: stx~adr~data~units~status~crlf	
Command	Definition
stx	start of text character, hex 02
adr	address; 3 ASCII characters: first 2 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
units	two characters; first character is 'L', 'N', or'spaces' for pounds, or newtons. Second character is 'F', 'T', or 'A' for force, tension, or angle
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 retum linefeed two characters ODH OAH
Character Format (bits): 1 start, 1 even parity, 7 data, and 1 stop	

6.3.1 Main Set point Function and Selections

Main corresponds to the actual desired force or tension set point value. To avoid relay “chatter” (subsequent off/on fluctuations), enter an INFLIGHT value which corresponds to the main value plus a small fluctuation tolerance band. Set point polarity (i.e. valve on below or above selected value) can be configured for each main set point. The TAG selection allows each main set point to be designated by an alphanumeric name or number. Tag designations are communicated through the PC and PLC interfaces to a host device.

NOTE: BLH recommends that set point relays should always "OPEN" when an error condition is detected. This, however, is a customer based decision.

6.3.2 Entering/Altering Main Set points

Main set point values may be entered/ altered at any time by pressing the front panel STPNT key. Use theprocedure shown in Figure 6-3 to enter/alter main set points.

6.3.3 Dribble Set point Function and Selection

Dribble or secondary set points are not used in the LCt104 at this time.

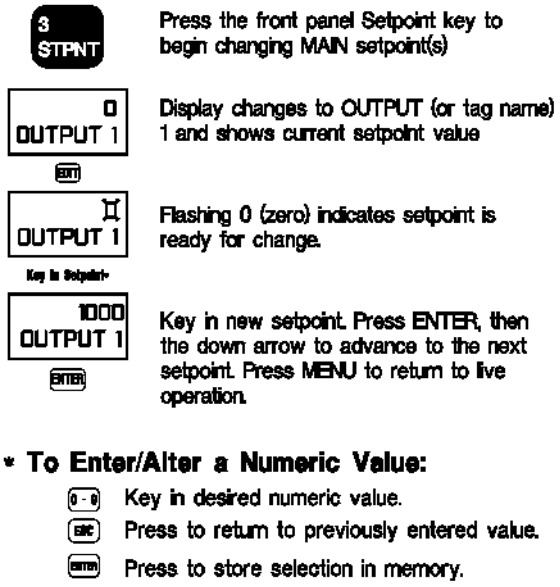


Figure 6-3. Entering or Altering Main Set points

Table 6-3. PC Interface Register Allocations

LCt-104 PC Inteface Register Allocations: Please Read Notes Below			
Code	**Definition**	**LCp Response**	**Explanation**
00	NA		NA = unused (spare)
01;	Serial #	01<1234567>	1 = year, 2-3 = week, 4-7 = instrument number
02;	Ref Date	02<mmddyy>	month-day-year of next due mV/V cal
03;	Analog 2 Low	03* <00000000>	low output weight selection
04;	Analog 2 High	04* <00000000>	high output weight selection
05;	Analog 2 Low Adjust	05* <xxxxx>	low analog output adjustment
06;	Analog 2 High Adjust	06* <xxxxx>	high analog output adjustment
07;	Analog 3 Low	07* <00000000>	low output weight selection
08;	Analog 3 High	08* <00000000>	high output weight selection
09;	Analog 3 Low Adjust	09* <xxxxx>	low analog output adjustment
10;	Analog 3 High Adjust	10* <xxxxx>	high analog output adjustment
11;	Analog 4 Low	11* <00000000>	low output weight selection
12;	Analog 4 High	12* <00000000>	high output weight selection
13;	Analog 4 Low Adjust	13* <xxxxx>	low analog output adjustment
14;	Analog 4 High Adjust	14* <xxxxx>	high analog output adjustment
15-34	NA		
35;	Level Config	35<x>	horizontal bar graph configuration:
36;	Level 0%	36<00000000>	level 0% selection
37;	Level 100%	37<00000000>	level 100% selection
38;	Arrows Config	38 <x>	vertical bar graph configuration:
39;	Arrows 0%	39 <00000000>	vertical bar graph 0% value
40;	Arrows 100%	40 <00000000>	vertical bar graph 100% value
41;	Annunciator A1	41 <xx>	annunciator status selections range from 0-15 where: 0 = off, 1 = in motion, 2 = zero limit, 3 = overload, 4 = ser1 rx, 5 = ser1 tx, 6 = ser1 parity error, 7 = ser1 framing error, 8 = analog fault, 9 = analog over, 10 = analog under, 11 = RIO* status, 12 = spare, 13 = spare, 14 = setpoints, 15 = Modbus Plus status *could also be DeviceNet or Profibus depending upon the option selected
42;	Annunciator A2	42 <xx>	
43;	Annunciator A3	43 <xx>	
44;	Annunciator A4	44 <xx>	
45;	Annunciator A5	45 <xx>	
46;	Annunciator A6	46 <xx>	
47;	Annunciator A7	47 <xx>	
48;	Annunciator A8	48 <xx>	
49;	NA	49 <x>	Spare
50;	NA	50 <x>	Spare
51;	NA		
52;	Analog Low	52 <00000000>	low output weight selection
53;	Analog High	53 <00000000>	high output weight selection
54;	Analog Low Adjust	54 <xxxxx>	low analog output adjustment
55;	Analog High Adjust	55 <xxxxx>	high analog output adjustment
56-61	NA		
62;	Security Lock	62 <x>	0 = lock ON, 1 = lock OFF
63;	Password	63 <AAAAAAA>	security password: 1-0, '-', 'A-Z'
64;	Menu Locks	64 <xxxxx>	0 = off, 1 = on: msd-lsd (bit map) = spare, diagnostics, I/O, display, filter, calibration
65;	Key Locks	65 <xxxxx>	0 = off, 1 = on: msd-lsd (bit map) = edit, print, F/T, L/R, zero
66;	Serial 1 Format	66 <x>	0 = print, 1 = continuous, 2 = pc, 3 = Modbus RTU
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 = off, 1 = on: msd-lsd (bit map) = spare, angle, zero, tension, force, display
*** These registers functional only when the quad analog option [P] [3] is installed, otherwise they are NA**			

Table 6-3. PC Interface Register Allocations (continued)

LCt-104 PC Inteface Register Allocations: Please Read Notes Below			
Code	**Definition**	**LCp Response**	**Explanation**
71;	Print Data Format	71 <xxxxxxx>	1sd = stx (0/1 = no/yes), 2sd = address (0/1 = no/yes), 3sd = leading zeros (0 = spaces, 1 = zeros), 4sd = units (0 = no, 1 = abbreviated, 2 = expanded), 5sd = status (0/1 = no/yes), 6sd = delimiter (0 = space, 1 = carriage return/line feed), 7sd = end character (0 = carriage return/line feed, 1 = carriage return)
72;	Print CRLF Delay	72 <x.x>	0.0 to 9.9 second carriage return/line feed delay time
73;	Continuous Data	73 <xxxxx>	0 = off, 1 = on: msd-lsd (bit map) = spare, angle, zero, tension, force, display
74;	Cont. Data Format	74 <xxxxxxxx>	1sd = stx (0/1 = no/yes), 2sd = address (0/1 = no/yes), 3sd = leading zeros (0 = spaces, 1 = zeros), 4sd = units (0/1 = no/yes), 5sd = status (0/1 = no/yes), 6sd = delimiter (0 = space, 1 = carriage return/line feed), 7sd = end character (0 = carriage return/line feed, 1 = carriage return), 8sd = timer (0/1 = no/yes)
75;	Continuous TX Timer	75 <xx.x>	00.0 to 59.9 seconds
76;	Continuous TX Timer	76 <xxx>	0 - 240 minutes
77;	Tag Number/ID	77 <AAAAAAA>	customer assigned tag number: 1-0, '-', 'A-Z'
78 - 90	NA		
91;	G/N Key Configuration	91 <xxx>	1sd = display powerup (0 = force, 1 =angle), 2sd = tension
92	NA		
VER	Software Version	VER <x.xx>	read only, identify software version 1.00 to 9.99
OPT	Options Installed	OPT <xxxxx>	read only option identification [M]-[A]-[P]-[C]-[B]-[M]

Note - This is an ASCII interface. Requesting data from the LCt-104 is done mainly by sending a 3 character command followed by a carriage return (ODH). These 3 character commands are listed under "Code" in the Table above. The response to these commands is listed under LCt 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 Table.

Note - <00000000> 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,<xxxxxxx> is mV/V data; if negative leading x = '-'.

Note - If unit address is selected, PC must transmit address code as 01A, 02A, etc. to establish communication.

Table 6-4. Interface Error Code Definitions

Interface Error Codes
NA = not allowed NT = no terminator LM = limit BF = input buffer overflow (too many characters transmitted) A/D = a/d error ? = unknown command received

Error Code Examples		
String Sent	**String Received**	**Error Description**
99,CR	99,?CRLF	unknown command
CR	?CRLF	unknown command
00<A1>CR	00<NA>CRLF	not valid value for a/d rev
00<000>CR	00<NA>CRLF	not valid value for a/d rev
41<16>CR	41<LM>CRLF	value limit for annunciator
36<000050000>CR	36<NT>CRLF	no terminator (too many digits)

Table 6-5. PC Interface Live Data Transactions

LCt-104 PC Interface Live Data Transactions: Please Read Note Below			
Code	**Definition**	**LCp Response**	**Explanation**
00,	Force	00(00000000)	current force value
01,	Tension	01(00000000)	current tension value
02,	mV/V vertical	02(x.xxxxxx)	current vertical mV/V data
03	mV/V horizontal	02(x.xxxxxx)	current horizontal 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 connection fault
05,	Analog Status	05(A)	A = analog output status: () = normal, (U) = analog underrange, (O) = analog overrange, (E) = analog open circuit
06,	Analog Value	06(xxxxx)	0 - 65537 analog output
07,	Display	07(A-U)	ABCDEFGH = upper display (alphanumeric) with decimal point or leading space IJKLMNOPQ = lower display (alphanumeric) with decimal point or leading space R = horizontal bar graph (-=off, @=left arrow on, A-Z=segments on, +=right arrow on) S = vertical bar graph (-=off, @=bottom arrow on, A-I=segments on, +=top arrow on) T = annunciators A1-A4 (low four bits of T, T = 1 0 0 0 0 0, for A1-A4 off T =@*, if A3 is on T= B*) U = annunciators A5-A8 (low four bits of U, U = 1 0 0 0 0 0, for A5-A8 off U =@*, ifA6,7 are on U=F*)
08,	Remote Inputs	08(xxxxx)	remote inputs msd-lsd (5-1): print, F/T, L/R, zero, unused (0 = low/1 = high)
09	Rate Data	09(00000000)	current rate data
Convenience Command Codes			
F	Switch to Force	(per print format)	switch to force mode and return current force weight value
T	Switch to Tension	(per print format)	switch to tension mode and return current tension value
R	Switch Angle Aqusiition	(per print format)	switch to angle mode, tare, and return current aquisition angle value
Z	Switch Gross & Zero	(per print format)	switch to gross mode, zero out, and return current gross weight value
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. * hexidecimal equivalent i.e. @ = 40 hex			

Live Data Request Examples	
(1). to get force weight (code 00,) if current force weight is -10.1 lb sent received 00,CR 00(-000010.1)CRLF	
Sent	Received
00,CR	00(1000010.0)CRLF
(2). to get force & tension weights and status (codes 00, 01, 04,) if current force weight is 440.05, tension value is 240.04 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
00-02,CR	00(000440.05)01(000240.04)02(1.200505)CRLF
Live Data Convenience Command Examples	
(1). to switch Model LCt-104 to force mode and get force data (code F), if current force data weight is -10.1 lb, unit # is 01, and scale is in motion:	
Sent	Receiced (print format)
FCR	01-000010.1LFMCRLF
(2). to switch to tension mode, and get tension data (code T), if current tension data weight is -10.1 lb, unit # is 01:	
Sent	Received (print format)
TCR	01 000000.0LTCRLF

Table 6-6. PC Interface Set point Data Transactions

LCt-104 PC Inteface Setpoint Register Format: Please Read Note Below			
Code	**Definition**	**LCp Response**	**Explanation**
00/	Output 1 Main	00[00000000]	output 1 main value
01/	Output 1 Inflight	01[000000]	output 1 inflight compensation value
02/	Output 1 Deadband	02[000000]	output 1 deadband value
03/	Output 1 Configuration	03[000]	output 1 config: msd on below (0)/above, 2sd force (0) tension, lsd main (0)/dribble
04/	Output 1 Tag	04[AAAAAAAA]	output 1 tag: space, 1-0, '-', A-Z
05/	Output 2 Main/Drib	05[00000000]	output 2 main or dribble value
06/	Output 2 Inflight	06[000000]	output 2 inflight if config is main
07/	Output 2 Deadband	07[000000]	output 2 deadband if config is main
08/	Output 2 Configuration	08[000]	output 2 config: msd on below (0)/above, 2sd force (0) tension, lsd main (0)/dribble
09/	Output 2 Tag	09[AAAAAAAA]	output 2 tag: space, 1-0, '-', A-Z
10/	Output 3 Main/Drib	10[00000000]	output 3 main or dribble value
11/	Output 3 Inflight	11[000000]	output 3 inflight if config is main
12/	Output 3 Deadband	12[000000]	output 3 deadband if config is main
13/	Output 3 Configuration	13[000]	output 3 config: msd on below (0)/above, 2sd force (0) tension, lsd main (0)/dribble
14/	Output 3 Tag	14[AAAAAAAA]	output 3 tag: space, 1-0, '-', A-Z
15/	Output 4 Main/Drib	15[00000000]	output 4 main or dribble value
16/	Output 4 Inflight	16[000000]	output 4 inflight if config is main
17/	Output 4 Deadband	17[000000]	output 4 deadband if config is main
18/	Output 4 Configuration	18[000]	output 4 config: msd on below (0)/above, 2sd force (0) tension, lsd main (0)/dribble
19/	Output 4 Tag	19[AAAAAAAA]	output 4 tag: space, 1-0, '-', A-Z
20/	Output 5 Main/Drib	20[00000000]	output 5 main or dribble value
21/	Output 5 Inflight	21[000000]	output 5 inflight if config is main
22/	Output 5 Deadband	22[000000]	output 5 deadband if config is main
23/	Output 5 Configuration	23[000]	output 5 config: msd on below (0)/above, 2sd force (0) tension, lsd main (0)/dribble
24/	Output 5 Tag	24[AAAAAAAA]	output 5 tag: space, 1-0, '-', A-Z
25/	Output 6 Main/Drib	25[00000000]	output 6 main or dribble value
26/	Output 6 Inflight	26[000000]	output 6 inflight if config is main
27/	Output 6 Deadband	27[000000]	output 6 deadband if config is main
28/	Output 6 Configuration	28[000]	output 6 config: msd on below (0)/above, 2sd force (0) tension, lsd main (0)/dribble
29/	Output 6 Tag	29[AAAAAAAA]	output 6 tag: space, 1-0, '-', A-Z
30/	Output 7 Main/Drib	30[00000000]	output 7 main or dribble value
31/	Output 7 Inflight	31[000000]	output 7 inflight if config is main
32/	Output 7 Deadband	32[000000]	output 7 deadband if config is main
33/	Output 7 Configuration	33[000]	output 7 config: msd on below (0)/above, 2sd force (0) tension, lsd main (0)/dribble
34/	Output 7 Tag	34[AAAAAAAA]	output 7 tag: space, 1-0, '-', A-Z
35/	Output 8 Main/Drib	35[00000000]	output 8 main or dribble value
36/	Output 8 Inflight	36[000000]	output 8 inflight if config is main
37/	Output 8 Deadband	37[000000]	output 8 deadband if config is main
38/	Output 8 Configuration	38[000]	output 8 config: msd on below (0)/above, 2sd force (0) tension, lsd main (0)/dribble
39/	Output 8 Tag	39[AAAAAAAA]	output 8 tag: space, 1-0, '-', A-Z
40/	Setpoint Locks	40[xxxxxxxx]	setpoint locks - 0 = off, 1 = on: lsd - msd = setpoint 1 thru setpoint 8
Note - setpoint data uses [] and not <> or () 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.			

Table 6-6 con't. PC Interface Set point Data Transaction Examples

Setpoint Data Request Examples	
(1). to get output 1 main (code 00/) if main = 2000	
Sent	Received
00/CR	00(00002000)CRLF
(2). to get outputs 1 - 4 main values: if 2000, 4000, 6000, and 8000:	
Sent	Received
00/05/10/15/CR	00[00002000]05[00004000]10[00006000]15[00008000]CRLF
Setpoint Data Write Examples	
(1). to download output 1 (code 00/)	
Send	Response Will Be
send (if main = 50000) 00[00050000]CR or 00[50000]CR	00[00050000]CRLF

SECTION 7. System Diagnostics

7.1 OVERVIEW

LCt-104 diagnostics provide easy access to criticaloperating system data, and test/verification proceduresfor many indicator functions. 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, and verify I/Ofunctions.

7.2 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.

7.3 DIAGNOSTIC VERSION

Diagnostic version provides the software version for thefront end and the jbox, the installed option code derived from the ordering specification, the serial number,and the date of the factory calibration. Also included isthe baud rate for the jbox/front end interface.

7.4 ZERO RECALL

Recall allows operating personnel to view current zero values. Press the INDV UNITS key to see values forindividual cell channels.

7.5 SELECTING LIMITS

Diagnostic limits allow operator entry of 'not-to-exceed' values for critical system functions. Most of these selections can be assigned to a front panel annunciator (A1-A8, paragraph 5.1.3) to provide visual indication ofthe error condition.

7.5.1 Zero Limit

The value entered for zero will limit the range of the
front panel zero keys (recommended 2-20%). The zero
keys will not function beyond if the range is exceeded.

7.5.2 Overload Limit

This value is critical for system protection. Repeatedsystem overloading may permanently damage load cellsand other process equipment. Enter a value of up to150% of system capacity.

7.5.3 Motion Limit Selections

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.

7.6 FRONT PANEL KEY TEST

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

7.7 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.

7.8 TEST/VERIFY THE ANALOG OUTPUT

DIAG ANALOG tests the analog output. Test shouldbe performed with a current meter attached. Testingfirstly 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.

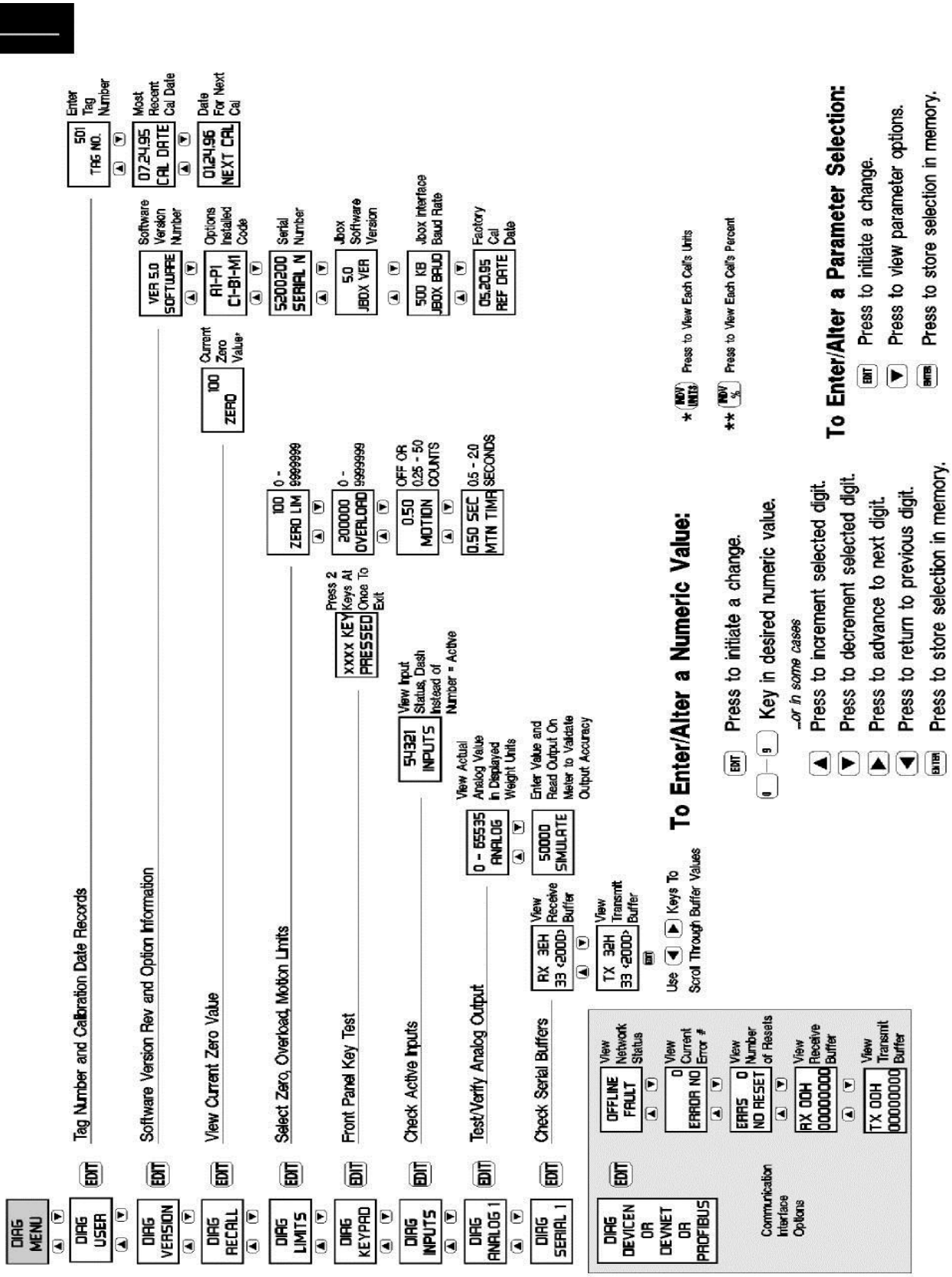


Figure 7-1. LCt-104 System Diagnostic Routines

7.9 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 LCt-104 output responses.

7.10 TEST/TROUBLESHOOT THE OPTIONAL DEVICENET OR PROFIBUS OUTPUT

DIAG DEVICE N provides the means to view the status of the OPTION PROTOCOL interface. After pressing EDIT, scroll through the menu to see the error number (if an error exists), the number of resets, and the current values of the receive and transmit buffers.

SECTION 8. The LCt-104 Security System

8.1 INTRODUCTION

From password access to individually selectable menuand key 'locks', LCt-104 software protects the entiresystem 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 allother menus/keys designated as 'locked'. If locked, the designated password (see paragraph 8.2) must beentered to gain access to the security menu. Units are shipped with the lock 'Off' to allow initial configuration without a password.

8.1.2 Menu Locks

Any or all of the LCt-104 main menus can be 'locked' to prevent parameter changes. To lock a menu, chooseON by pressing the EDIT and RIGHT arrow keys insequence. Then press ENTER to store. Once a menuis 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 toOFF.

8.1.3 Key Locks

Five of the LCt-104 front panel keys can be 'locked' toprohibit key function. Keys that can be locked are;ZERO, L/R, F/T, PRINT, and EDIT. To lock a key, choose ON by pressing the EDIT and RIGHT arrowkeys in sequence. Then press ENTER to store. If akey is designated as locked, it will not function whenpressed. To 'unlock' a locked key, return to the security menu, enter the correct password, and change thestatus 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 entera password. Once a password is chosen, it should bewritten down and stored in a confidential area.

8.2.1 Selecting/Storing a Password

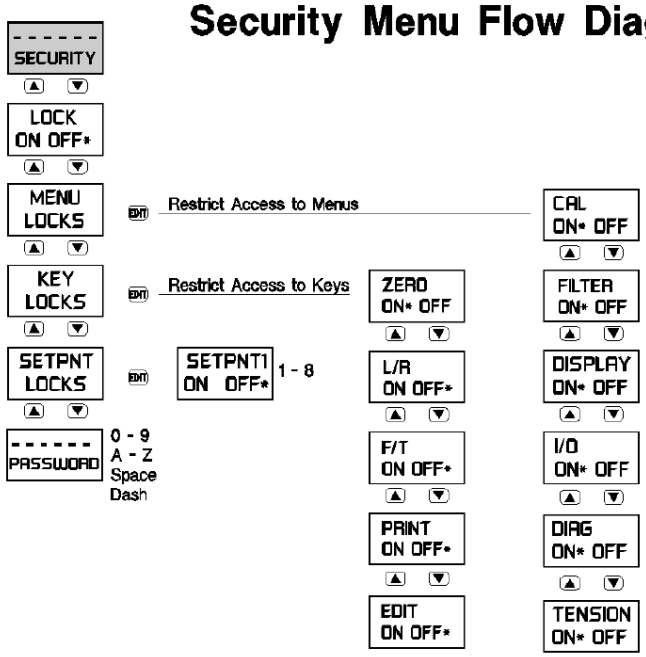
A password can be any combination of alpha-numericcharacters up to seven digits long. It is not necessaryto use all seven digits.

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.

8.3 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.

Security Menu Flow Diagram



MAIN MENU

SUB MENU

General Key Functions:

- Step back to previous menu selection.
- Advance to next menu selection.
- Advance to next main menu selection.
- Return to live operation from menu.
- Change sub menu parameters.
- Store displayed sub menu parameter in memory.

To Enter/Alter a Numeric Value:

- Press to initiate a change.
- Key in desired numeric value.

...or in some cases

- Press to increment selected digit.
- Press to decrement selected digit.
- Press to advance to next digit.
- Press to return to previous digit.
- Press to store selection in memory.

To Enter/Alter a Parameter Selection:

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

Figure 8-1. Security Menu Options.

SECTION 9. Operation and Tension

9.1 GENERAL

LCt-104 indicator/transmitters power up in the force, tension, or angle mode depending upon the selection made in paragraph 5.1.6. If no critical system errors are detected, the front panel display will showthe selected mode current value.

Tension parameter selections (see paragraph 9.8) affect system operation. Therefore, the tension menu,Figure 9-3, is included in this Section.

Figure 9-1 presents the front panel switch functions forthe operating mode. F/T toggles the operating modefrom force to angle to tension (if all enabled). ZEROperforms push to zero and L/R switches the displayfrom cell A to cell B (2 cell system only). PRINT/COMtransmits the current display and status data to a printerif print format is selected. If the LCt-104 is connected to a host computer or PLC; F/T, L/R, ZERO, and PRINT functions can be initiated remotely using the rear panel digital inputs.

9.2 FORCE DISPLAY MODE

In the force mode, all of the live weight of the system isdisplayed on the front panel. Live weight does not include the dead weight of the roll or other mechanicalequipment that is factored out during calibration. Toview individual side force values, press the L/R key.

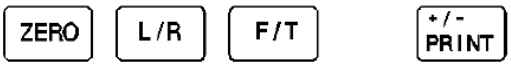


Figure 9-1. Front Panel Operating Keys

9.3 TENSION DISPLAY

Tension displays the actual tension value as combination of both left and right (A and B) cells. To view individual side tension values, press the L/R key.

9.4 ANGLE DISPLAY

Angle displays the actual resultant force angle value (F_R) as a combination of both left and right (A and B) cells. To view individual side angle values, press the L/R key.

9.5 ZERO OPERATION

A new zero can be acquired to compensate for changes in the dead load of the system due to roll changes etc. Acquiring a new zero reference value does not affect the slope of the calibration. The push to zero range in the LCt-104 can be configured from OFF to 100% of system capacity (or 9999999). Zero may be acquired only if the system is not in motion and the zero limit has not been exceeded.

9.6 INDIVIDUAL CHANNEL DISPLAYS

Viewing individual channel (2 per cell) live, throughout the entire process, allows operating personnel to profile system trends or tendencies and adjust equipment for maximum performance. Although the total system may never overload, certain cells may experience overload or underload ‘moments’ which can affect cell integrity, longevity, and ultimately, product quality.

LCt-104 technology allows operating personnel to view individual load cell data in one of three forms. In accordance with Figure 9-2, view either the unit force value (individual units), millivolt per volt signal (individual mV/ V), or the percent of total load (individual %) each cellchannel is carrying.

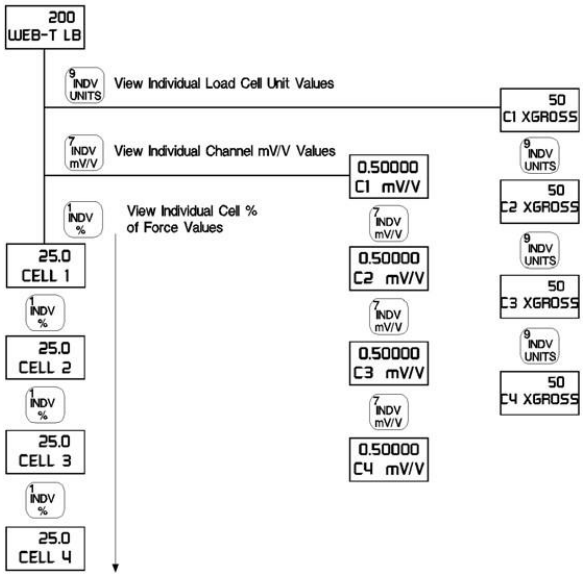


Figure 9-2. Individual Load Cell View Keys

9.7 ERROR DETECTION AND CORRECTION

Should an error condition occur, a scrolling messagewill 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 withrecommended solutions.

Table 9-1. LCt-104 Fault Message Displays

No.	Fault	LCp-104 Display (Scrolling)	Cause	Remedy
1	Spare			
2	Lost Zero	'LOST ZERO VALUE'	Power Up Checksum Error	Acquire New Zero
3	No mV/V Cal	'NO MV/V CAL'	Power Up Checksum Error	Perform mV/V Cal
4	No Engineering Cal	'NO ENGINEERING CAL'	Power Up Checksum Error	Re-enter Calibration Parameters
5	No Temperature Compensation	'NO TEMP COMPENSATION'	Power Up Checksum Error	Consult Factory
6	Jbox EEPROM Error	'JBOX EEPROM ERROR'	Unable To Write To EEPROM (Jbox)	Power Down and Power Up. If Error Persists, Consult Factory
7*	Local EEPROM Error	'LOCAL EEPROM ERROR'	Unable To Write To EEPROM (Console)	Power Down and Power Up. If Error Persists, Consult Factory
8*	A/D Overrange	Upper Display -'OVER RANGE' or 'UNDER RANGE' Lower Display - 'SIGNAL ERROR CELL (1-4) CHECK WIRING'	Input Signal Out of Range	Check Input Signal and Wiring
9*	Excitation Open	'EXCITATION OPEN CELL (1-4) CHECK WIRING'	Wiring Error Most Likley	Check Load Cell Wiring
10*	Excitation Low	'EXCITATION LOW CELL (1-4) CHECK WIRING'	Faulty Load Cell or Shorted Wiring	Check Load Cell Wiring
11*	Overload	'OVERLOAD CELL (1-4)'	Overload Limit Exceeded	Check Load Cell % and Adjust System Installation
12*	Zero Limit	Lower Display -'ZERO' 'LIMIT' 'ZERO' 'LIMIT' CELL (1-4)	Zero Limit Exceeded	Check for System Heel Build-Up
13	Spare			
14	Spare			
15	Interconnect Wiring	'LINKING'	Faulty Wiring between J-Box and Display	Check Interface Wiring and Connections

9.8 TENSION PARAMETER SELECTIONS AND OPERATION

Figure 9-3 presents tension parameter selections and a brief description of each. Parameters entered can affect system operation so please consider options carefully. If LB or NT (calibration parameters) units are selected, operation is unaffected. Choosing PLI (pounds per linear inch) or N/M (Newton meters) changes the display readout and potentially operation. With PLI orN/M selected an additional choice, Auto wrap (OFF/ ON) is available.

Choosing auto wrap automatically changes the tension output as wrap angles change. In winding/rewinding zones, wrap angles change as the roll diameter increases or decreases. This unique feature facilitates smooth winding with consistent tension force as theroll size increases or decreases.

Read the following paragraphs and enter the tensionoperation parameters that offer optimal machine function.

9.8.1 Web Units

Web units are based upon selection of units in calibration routine. If pounds were selected (LB) the choicehere is (LB or PLI) pounds or pounds per Linear inch. If Newtons were selected in calibration routine the choice here is (NT or N//M) Newtons or Newtons per meter. Selecting LB or N requires only entry of wrap angle. Selecting PLI or N/M requires input of next three entries.

9.8.2 Web Decimal Point Adjustment

Displayed tension data can be shifted or corrected.Web length when entered causes displayed tensiondata to decrease. Adjusting the decimal point positioncan increase resolution and enhance the data display.

Three decimal places are available for tension resolution enhancement. Note, however, that this decimal selection is combined with the calibration decimal value previously selected. Therefore, if one decimal place is used for system calibration and two decimal places are used for the tension display, the end result will equal three decimal places.

Note: Setting the tension decimal place too high canresult in a display overrun. Look at the tension datawithout a tension decimal point applied, and then increasetension resolution to desired level.

9.8.3 P/inches or N/meters:

Enter value for inches or meters down to 1/10 of inchor meter. The highest setting can is one thousandinches or meters.

9.8.4 Wrap Angle

Enter the web wrap in degrees; entry must be between 1.0 and 360.0. This measurement is the amount of wrap covering the roll from entry point to exit point.

9.8.5 Auto Wrap - Maintain Constant Tension

Turning the auto wrap feature on allows for constant tension to be monitored and maintained. This featureneeds a reference angle to be acquired first (see nextstep).

Auto wrap increase or decreases the tension automatically as exit or entry angles change on the roll feedingor reeling the product.

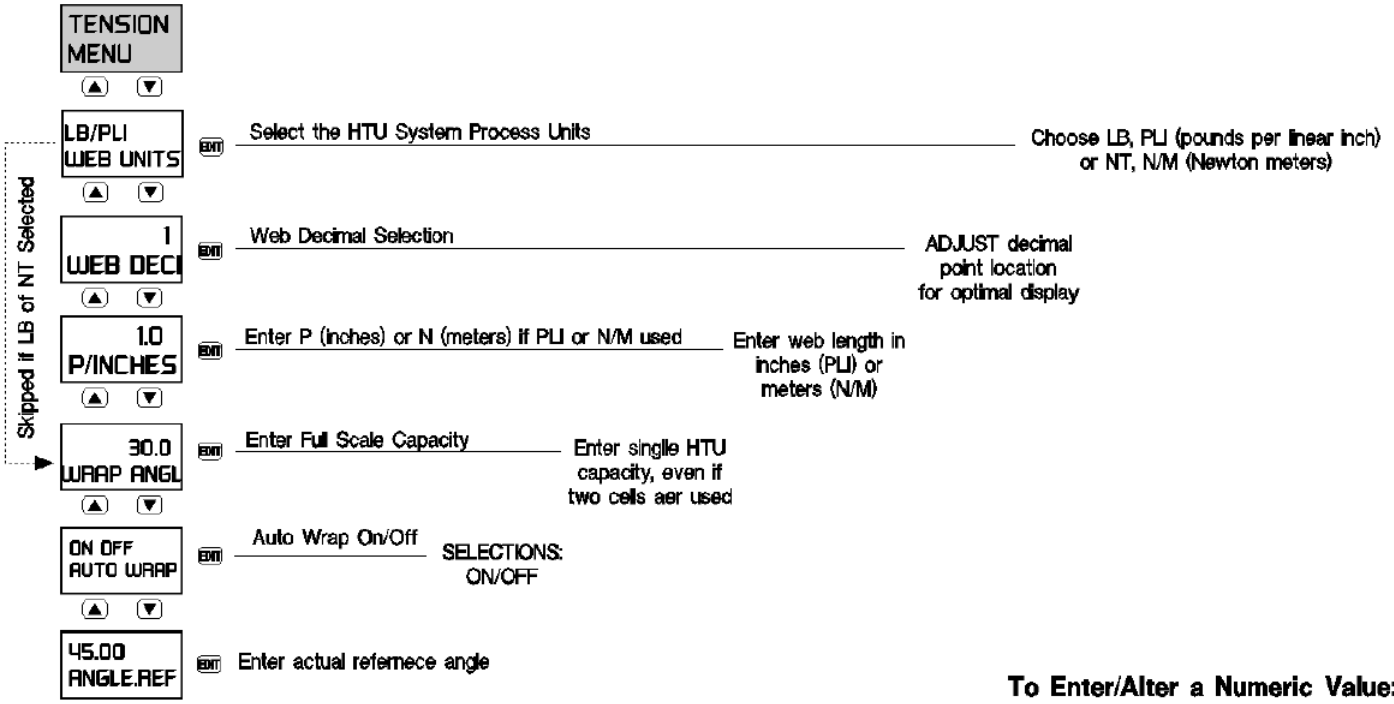
In zones with changing angles, tension needs to be adjusted because accurate measurement is based upon angle or amount of roll wrap.

9.8.6 Angle Reference

Angle reference can be written by inputting the valuehere on this screen or by going to operate mode andselecting the angle display. Viewing the angle display, press the side (L/R) key, till an ‘R’ appears indicatingthe current reference angle. Now press the edit key thenew reference angle is acquired.

Pressing the left arrow key here will also show the difference between the current reading for angle and thereference angle, which is used to calculate the newtension data and keep tension constant.

Enter/Alter Tension 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 9-3. Tensioner Parameter Entries.

SECTION 10. Allen-Bradley Remote I/O

This chapter describes the Allen-Bradley Remote I/O (RIO) communication link between the LCt-104 Process Web Tension System and an Allen-Bradley PLC-5. Remote I/O interfacing uses technologies licensed to BLH from Allen-Bradley. Functionally this simple digital interface expedites the transfer of tension/force data, system status, and diagnostic information. It also significantly simplifies the retrieval and download of filter and other set-up parameters.

10.1 INTERCONNECT CABLE

LCt-104 units ordered with the Allen-Bradley Remote I/ O option have an additional 3-socket mating half connector. Connector and wiring designations are presented in Figure 10-1. Connect 'Blue Hose' cable to the supplied connector as designated.

10.2 RIO OVERVIEW

The Allen-Bradley Remote I/O (RIO) interface is a communications link that supports remote, time critical I/O control communications between a master processor and a remote I/O slave unit. It is typically used to transfer I/O bit images between the master and slave. The LCt104 represents a quarter (1/4) rack of discrete I/O with 32-bit input and output image files. Time critical system information (tension/force and status data) is communicated to the PLC using discrete read and write commands. Block transfers are used to upload and download non-time critical information such as diagnostic, status, and individual channel data.

10.3 THE ALLEN-BRADLEY PLC

Allen Bradley PLC-5 programmable controllers are typically used as part of a distributed process automation architecture. A variety of 1771 series racks and I/O modules are available for local or remote discrete and analog process control. PLC-5 units digitally communicate to other devices using a conventional RS-232 or -423 serial port in addition to special interface ports such as Data Highway Plus, Scanner Communications, and Remote I/O Adapter.

10.4 THE REMOTE I/O INTERFACE

10.4.1 Operational Overview

The Allen-Bradley Remote I/O (RIO) interface is standard on many PLC-2, 3, and 5 series programmable logic controllers. The technology used in the interface and licensed by Allen-Bradley to BLH enables the LCt104 system to communicate tension/force information to the PLC as if it were 1/4 rack of discrete I/O. Using the standard RIO interface port to represent tension/ force data as simple discrete I/O, a low cost reliable communication link between the PLC and system is established. Standard PLC ladder logic instructions convert binary data to an integer or floating point weight value without special software drivers and scan delays that occur when data block transfers are used. The LCt also communicates status information, and diagnostic data to the PLC.

NOTE: Transfer data differs according to mode selection.

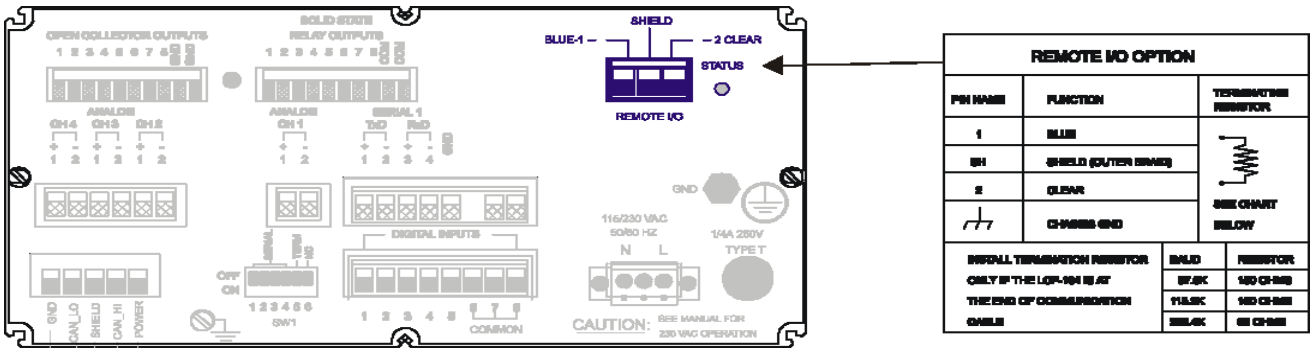
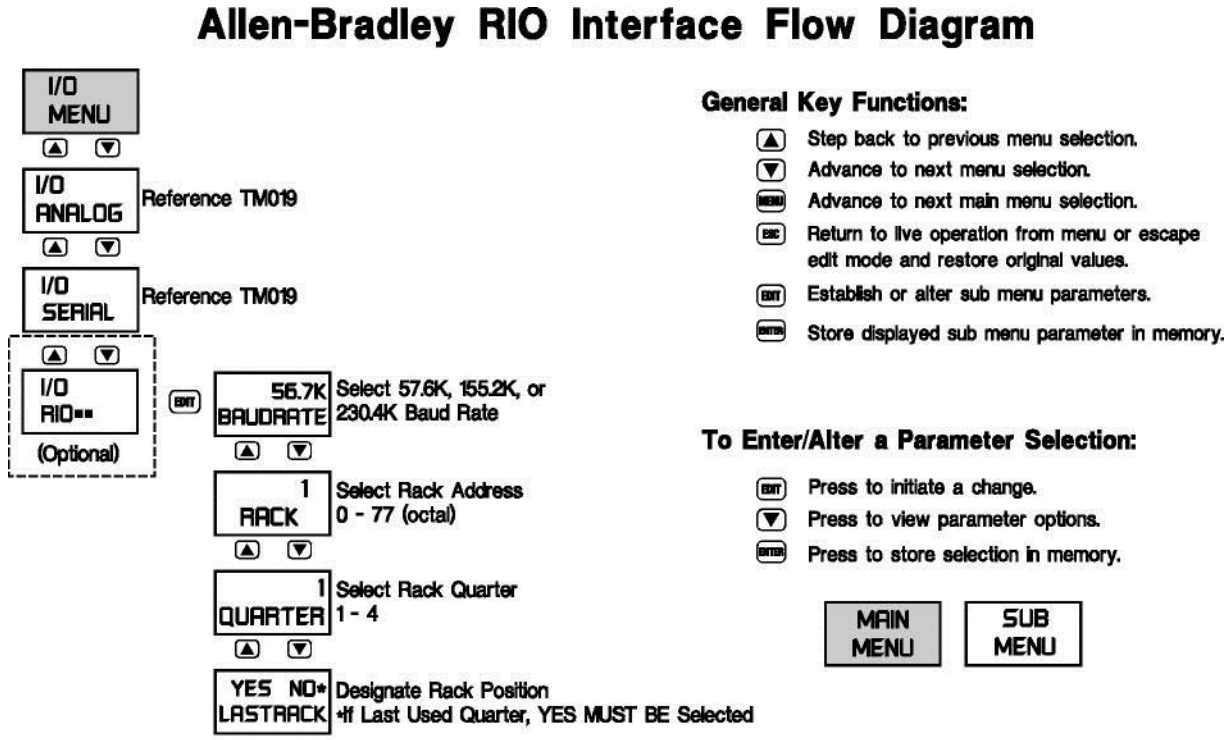


Figure 10-1. Allen-Bradley Remote I/O Cable Connection



Cable Lengths, Terminations, and Maximum # Of LCp Units

BAUD RATE	MAXIMUM CABLE LENGTH	TERMINATION FOR LAST LCp ON CABLE	MAXIMUM LCps PER SCANNER
57.6K	10,000 FEET	150 OHMS	16 Units
115.2K	5,000 FEET	150 OHMS	16 Units
230.4K	2,500 FEET	82 OHMS	32 Units

Figure 10-2. Remote I/O Menu and Cable Considerations

CONFIGURATIONS:

One Quarter Rack. The LCt-104 ¡s configured to act as1/4 rack of I/O using 2 input words and 2 output words in the PLC's I/O image table. Four LCt-104's constitute 1 full rack, each using a different starting quarter.

Discrete Transfer. Tension/force data and operating status information transmitted through discrete transfer using the PLC's Remote I/O image table.

Block Transfer. Block data transfers are initiated by the PLC ladder logic program to obtain more in depth status, diagnostic, and individual load cell data.

Word Integrity Is Ensured. LCt's always transmit both input image table words intact. To ensure word integrity on the PLC side, immediate writes to the output image table should be written low word first.

10.4.2 Interface Configurations

Baud rate, rack address, starting quarter, and last rack designations are all configured through the LCt I/O sub-menu (Figure 10-2). Access the I/O sub menu (reference operator's manual for keypad functions), step to the I/O RIO display, and make selections. The LCt is able to be addressed up to rack number 77 (octal).

Additional Figure 10-2 information provides a relationship table for baud rate, cable length, last rack termination resistance, and the number of LCts on the RIO loop. Careful consideration must be given to all four factors to ensure proper RIO loop operation.

10.4.3 Discrete Data Transfers

10.4.3.1 Output Image Table

The PLC-5 initiates the communication interface by transmitting two words from the output image table (Figure 10-3). The first word is regarded as a 'spare' by the LCt-104.

The second word contains the commands that the PLC-5 expects the LCt-104 system to perform. Word 2 controls set points, filter selection, filter operation, and operating mode status.

Table 10-1 shows the structure and bit definition of eachOutput Image Table word.

10.4.3.2 Input Image Table

After evaluating the contents of the output image table, the LCt-104 responds by transmitting two words to the input image table (Figure 10-4). The first word contains signed integer weight data. The second word contains the upper order data bits, system status, error condition, and set point status information.

Table 10-2 defines the bit structure of both input words.

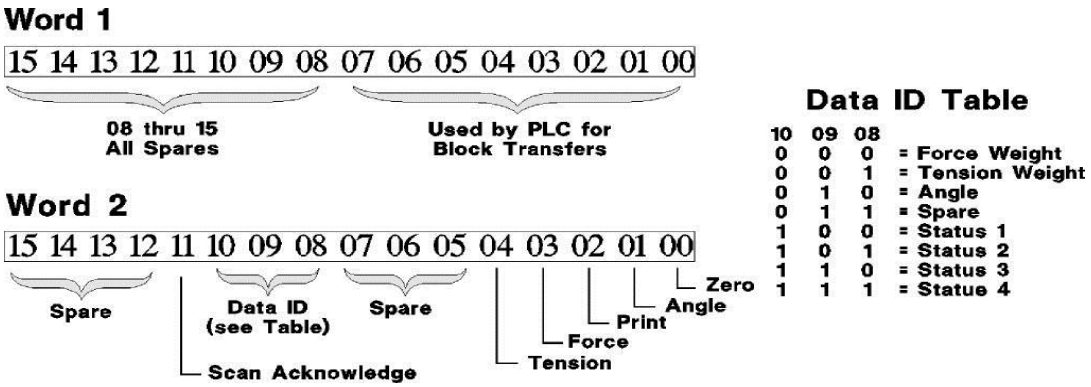


Figure 10-3. and Table 10-1. Remote I/O Output Image Table Bit Designations

Output Image Table Bit Designations			
Word	**Bits**	**Function**	**Definition**
1	0-15	Weight Data	Not used by the LCt-104
2	0	Zero	If this bit changes from 0 to 1, the LCt will zero the gross weight if not currently in "motion" as detemined by the motion status bit or if not outside the selectable zero limit. If not successful, bit (1) UNABLE TO ZERO BECAUSE OF MOTION or bit (2) UNABLE TO ZERO BECAUSE OF LIMIT in STATUS reg (10) of the block transfer registers will be set causing the fault bit (bit 15 of word 2 in the input image table) to be set.
2	1	Acquire Angle	If this bit changes from 0 to 1, the LCt will acquire the reference angle if not currently in "motion" as determined by the motion status bit. If not successful, bit (1) UNABLE TOACQUIRE ANGLE BECAUSE OF MOTION in STATUS reg (10) of the block transfer registers will be set causing the fault bit (bit 13 of word 2 of the input image table) to be set.
2	2	Print	If this bit changes from 0 to 1, the LCt will transmit data in the transmit buffer if the serial port is configured for PRINT:
2	3	Force	If set, switch LCt-104 display to force weight mode.
2	4	Angle	If set, switch LCt-104 display to angle mode.
2	5	Tension	If set, switch LCt-104 display to tension mode.
2	6-7	Spare	Not used.
2	8-10	Data ID	Reauests data to be returned in Word 1 and Word 2 Bits 0-5 input image table.
2	11	Scan Acknowledge	This bit is set or reset by the PLC to achieve data transfer synchronization between the PLC's program scan and the remote I/O scan. When the Ltp receives the output image table data it copies this bit to the same location in the input image table. The PLC can thus know if the LCt has received the Last write to the output image table.
2	12-15	Spare	Not Used

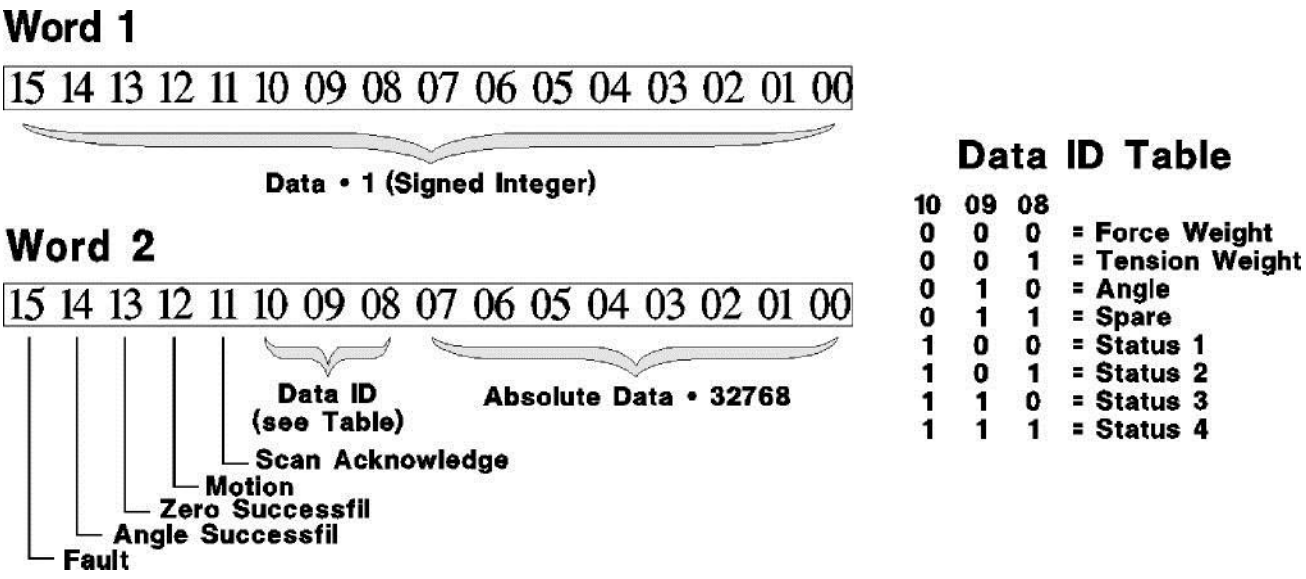


Figure 10-4. and Table 10-2. Remote I/O Input Image Table Bit Designations

Input Image Table Bit Designations			
Word	**Bits**	**Function**	**Definition**
1	0-15	Weight Data	Signed integer
2	0-7	Absolute Overflow Data x 32768	Word 2 bits 0-7 are absolute overflow data from word 1 used if weigh data is greater than 32,767. These 8 bits are combined with the word 1 integer in a floating point register by the following steps. 1. Do a Masked move of Word 2 bits 0 - 7 to an integer register. 2. Multiply the integer register by 32768.0 and put the result in a floating point register. 3. Negate the floating point result if the word 1 integer is negative. 4. Add the word 1 integer to the floating point result.
2	8-10	Data ID	Identifies the data in Words 1/2 bits 0-5
2	11	Scan Acknowlege	This bit is a copy of the same bit in the output image table. When the LCt receives the output image table data it copies this bit to the same location in the input image table. The PLC now knows if the remote I/O LCt has received the last write to the output image table.
2	12	Motion	If set, weight data is in motion (see paragraph 7.5.3)
2	13	Zero Sucessful	Zero OK.
2	14	Angle Sucessful	Angle OK.
2	15	Fault	If set, there is a fault causing weight or status data to be incorrect. Evaluate status registers to determine and correct fault.

10.5 BLOCK DATA TRANSFERS

10.5.1 Interface Basics

Block data transfers are initiated by the ladder logic program write (BTW) and read (BTR) commands. The transfer sequence begins when the PLC sends a one word (1 6-bit integer) write command containing a register location pointer. This pointer is the 16 bit integer value of the first register the PLC wishes to read (factory default upon shipment is register 1).

Table 10-3 presents all available single and double word register locations. After establishing the starting register location, the PLC then transmits a read transfer block command telling the LCt-104 how many words of information are needed.

10.5.1.1 Block Transfer Reads (BTRs)

Once the register location pointer value is established, the PLC logic program must issue a block transfer read command to obtain information. A BTR can request up to 64 words of LCt-104 information (see Table 103). The LCt responds to

the BTR by transmitting the number of words requested, starting at the pointer location.

NOTE: The first word transmitted by the LCt will be theregister pointer value. This word is added at the beginning of the transmission to 'echo' the pointer value priorto transmitting requested data. Therefore, the BTR command MUST add 1 to the number of words requested.If the PLC needs four words of LCt information, theBTR request must be for five words (Figure 10-5).

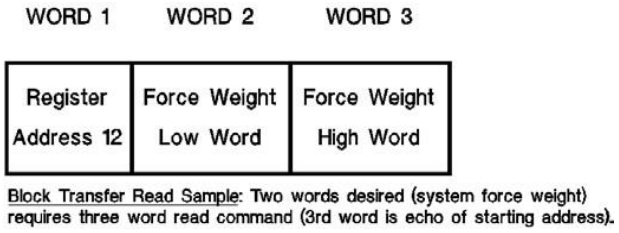


Figure 10-5. A Block Transfer Read Command

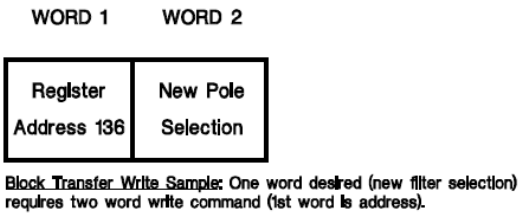


Figure 10-6. A Block Transfer Write Command

10.5.1.2 Block Transfer Writes (BTWs)

Some registers may be written to by the PLC (indicated by a 'W' in the R/W column table 10-3). Thisallows parameters such as filter, set point, and diagnostic values to be down loaded on-the-fly by the PLCladder logic program. When writing to the LCt-104, thefirst word must be the register location pointer. Therefore, the program MUST always add 1 to the BTW command length (Figure 1 0-6). For example, to change the filter value, the BTW length must equal 2 with the first word being the filter register location pointer and the second word being the new pole value.

10.5.2 A Perpetual Pointer

One advantage to block transfers is that the registerpointer is retained in LCt-104 EEPROM memory. Whena write block selects (points to) a register location,that location may be accessed (read) repeatedly without having to re-write the register location word. Ofcourse the register pointer can be changed as often asneeded, but the last written location will always be remembered, even during power down. This feature savesa lot of BTWs when the PLC is monitoring a particularregister or block of registers over a period of time.

10.5.3 Fault Evaluation

Four status words, register locations 1, 2, 3, and 4provide detailed explanations of error conditions experienced by the LCt-104 system. When a fault is detected, bit 15 (fault) in word 2 of the input image table is set to a '1' to alert the PLC of an error condition. The PLC must then perform a BTR of the four status registers to evaluate and correct the error. Table 10-4 gives the status word bit designations.

10.5.4 Remote Filter Configuration

The filter 'pore' parameter can be changed on-the-fly by the PLC. This unique feature allows optimal, predetermined filtering parameters to be implemented at critical moments during system operation. Changing filter parameters throughout the process ensures data stability and maximum system response to actual tension/force changes. The pole parameter is stored at register location 136 (Table 10-3). Make pole selections in accordance with Section IV guidelines.

Table 10-3. Allen-Bradley Remote I/O Register Allocations.

Data	Address	Registers	R/W	Data	Address	Registers	R/W
Status 1	0	1	R	Zero	128	2	R/W
Status 2	1	1	R	Spare	130	2	-
Status 3	2	1	R	Zero Limit %	132	1	R/W
Status 4	3	1	R	Overload %	133	1	R/W
Force	4	2	R	Spare	134	1	-
Tension	6	2	R	Spare	135	1	-
Angle	8	2	R	Filter	136	1	R/W
Vertical mV/V	10	2	R	Motion Band	137	1	R/W
Horizontal mV/V	12	2	R	Motion Timer	138	1	R/W
Gross 1*	14	2	R	Spare	139	1	-
Gross 2*	16	2	R	Setpoint #1	140	2	R/W
Gross 3*	18	2	R	Setpoint #2	142	2	R/W
Gross 4*	20	2	R	Setpoint #3	144	2	R/W
Gross 1**	22	2	R	Setpoint #4	146	2	R/W
Gross 2**	24	2	R	Setpoint #5	148	2	R/W
Gross 3**	26	2	R	Setpoint #6	150	2	R/W
Gross 4**	28	2	R	Setpoint #7	152	2	R/W
mV/V 1	30	2	R	Setpoint #8	154	2	R/W
mV/V 2	32	2	R	Inflight #1	156	1	R/W
mV/V 3	34	2	R	Inflight #2	157	1	R/W
mV/V 4	36	2	R	Inflight #3	158	1	R/W
Spare	38	2	-	Inflight #4	159	1	R/W
Spare	40	2	-	Inflight #5	160	1	R/W
Spare	42	2	-	Inflight #6	161	1	R/W
Spare	44	2	-	Inflight #7	162	1	R/W
% Load 1	46	1	R	Inflight #8	163	1	R/W
% Load 2	47	1	R	Tag #1	164	4	R/W
% Load 3	48	1	R	Tag #2	168	4	R/W
% Load 4	49	1	R	Tag #3	172	4	R/W
Angle Ref	50	2	R	Tag #4	176	4	R/W
Angle Dif	52	2	R	Tag #5	180	4	R/W
Deadload 1	54	2	R	Tag #6	184	4	R/W
Deadload 2	56	2	R	Tag #7	188	4	R/W
Deadload 3	58	2	R	Tag #8	192	4	R/W
Deadload 4	60	2	R	System Tag	196	4	R/W
Zero 1	62	2	R				
Zero 2	64	2	R				
Zero 3	66	2	R				
Zero 4	68	2	R				
Serial #	70	4	R				
Software Ver	74	1	R				
Ref. Date	75	3	R				

* Values without cross talk
** Values with cross talk

Table 10-4. Status Register Bit Definitions

Status Register Number 1		
BIT	**Name**	**Definition**
0	Power Up	JBox Power Up (true for 5 seconds)
1	Spare	
2	Spare	
3	Lost Zero	Checksum Error at Power Up
4	No mV/V Cal	Checksum Error at Power Up
5	No Engineering Cal	Checksum Error at Power Up
6	No Temperature Compensation	Checksum Error at Power Up
7	EEPROM Error	Error Writing EEPROM
8	Comm Power Fault	Serial Output - Power Supply Fault
9	JBox Power Low	Power to JBox is Low
10	Linking	Attempting Communication Link to JBox
11	Unable to Tare/Zero: Motion	System in Motion (true for 5 seconds)
12	Analog #1 Open	Open Connection
13	Analog #2 Open	Open Connection
14	Analog #3 Open	Open Connection
15	Analog #4 Open	Open Connection

Status Register Number 2		
BIT	**Name**	**Definition**
0	A/D Overrange Channel (Cell) 1	Signal Greater Than A/D Range
1	A/D Overrange Channel (Cell) 2	Signal Greater Than A/D Range
2	A/D Overrange Channel (Cell) 3	Signal Greater Than A/D Range
3	A/D Overrange Channel (Cell) 4	Signal Greater Than A/D Range
4	Spare	
5	Spare	
6	Spare	
7	Spare	
8	Excitation Open Channel (Cell) 1	Load Cell Not Connected
9	Excitation Open Channel (Cell) 2	Load Cell Not Connected
10	Excitation Open Channel (Cell) 3	Load Cell Not Connected
11	Excitation Open Channel (Cell) 4	Load Cell Not Connected
12	Excitation Low Channel (Cell)	Check Wiring for Short(s)
13	Excitation Low Channel (Cell)	Check Wiring for Short(s)
14	Excitation Low Channel (Cell)	Check Wiring for Short(s)
15	Excitation Low Channel (Cell)	Check Wiring for Short(s)

Table 10-4 con't. Status Register Bit Definitions

Status Register Number 3		
BIT	**Name**	**Definition**
0	Overload Limit Cell 1	Cell Overload Value Has Been Exceeded
1	Overload Limit Cell 1	Cell Overload Value Has Been Exceeded
2	Overload Limit Cell 1	Cell Overload Value Has Been Exceeded
3	Overload Limit Cell 1	Cell Overload Value Has Been Exceeded
4	Zero Limit Cell 1	Cell Zero Limit Has Been Exceeded
5	Zero Limit Cell 2	Cell Zero Limit Has Been Exceeded
6	Zero Limit Cell 3	Cell Zero Limit Has Been Exceeded
7	Zero Limit Cell 4	Cell Zero Limit Has Been Exceeded
8	Analog Under #1	Analog Has Been Exceeded
9	Analog Over #1	Analog Has Been Exceeded
10	Analog Under #2	Analog Has Been Exceeded
11	Analog Over #2	Analog Has Been Exceeded
12	Analog Under #3	Analog Has Been Exceeded
13	Analog Over #3	Analog Has Been Exceeded
14	Analog Under #4	Analog Has Been Exceeded
15	Analog Over #4	Analog Has Been Exceeded

Status Register Number 4		
BIT	**Name**	**Definition**
0	Output #1	Setpoint is ON if Bit = '1'
1	Output #2	Setpoint is ON if Bit = '1'
2	Output #3	Setpoint is ON if Bit = '1'
3	Output #4	Setpoint is ON if Bit = '1'
4	Output #5	Setpoint is ON if Bit = '1'
5	Output #6	Setpoint is ON if Bit = '1'
6	Output #7	Setpoint is ON if Bit = '1'
7	Output #8	Setpoint is ON if Bit = '1'
8	Input #1	Input is Activated if Bit = '1'
9	Input #2	Input is Activated if Bit = '1'
10	Input #3	Input is Activated if Bit = '1'
11	Input #4	Input is Activated if Bit = '1'
12	Motion	System is in Motion
13	Zero Successful	Zero Acquired Successfuly (active for 5 seconds)
14	Angle Successful	Angle Acquired Successfuly (active for 5 seconds)
15	Key Pressed	Front Panel Key Pressed (active for 5 seconds)

SECTION 11. Modbus Protocols

11.1 MODBUS RTU PROTOCOL

This interface method is applicable to virtually any PC or other process control computer with Modbus RTU Master communication capability. The interface provides tension/force and diagnostic information and allows for remote control of, zero, force/tension, and print functions. Information is transmitted in blocks of data, thereby minimizing polling and response time delays. The interface operates with the LCt-104 configured as the slave device and the host computer as the master. To initiate Modbus RTU protocol, simply select the Modbus format as shown in Figure 6-1 (page 6-2). Modbus RTU uses the standard LCt-104 RS-485/422 communication port and requires no hardware alterations. RTU format also available on UART or with RS232 (see Figure 11-1a).

11.1.1 Common Data Format

Table 11-2 presents a complete overview of Modbusregister and bit allocations. Table 11-2 information which appears in conventional text applies to both ModbusRTU and Modbus PLUS formats. Allocations whichpertain only to Modbus Plus appear in italic text. Inaddition to Table 11-2 information, the following dataformats and definitions are identical for both Modbusprotocol options:

Tension/force Data (BLH format for Modbus Plus) - Two 16 bit signed integers, the first (high) integer mustbe multiplied by 32768 and then added to the second (low) integer.

Status and setup parameters - One 16 bit unsigned integer.

Alpha data - For each register: high byte is first character, low byte is second character.

NOTE: If a decimal point is required the resulting valuemust be multiplied by the appropriate fraction, i.e. 0.01 for hundreds of a unit. In the case of mV/V values the multiplier is 0.000001. The LCt-104 range is (- 999999/+9999999).

NOTE: counts refers to displayed counts. If displayed tension/force is counting by 2 lb increments then presetting a register to 9 would mean 18 lbs.

11.1.2 Modbus RTU Functions Supported

2 Read Input Status
3 Read Holding Registers
06 Preset Single Register
16 (10 Hex) Preset Multiple Registers

11.1.3 Setup

Modbus RTU format, Device address, baud rate, andparity are all selectable under the SERIAL 1 section ofthe I/O MENU.

11.2 MODBUS PLUS INTERFACE

is an official ModConnect® Partner. As such, BLH has been authorized by Schneider Automation to incorporate Modbus Plus Communication Technology in its LCt-104 series product line. Modbus Plus protocol allows the LCt-104 to communicate on a peer-to-peer network link with Modicon 984 and Quantum PLCdevices.

LCt-104 units with the Modbus Plus option have a custom rear panel with a specific MODBUS PLUS connector (see Figure 11-1b next page and paragraph11.2.3). The Modbus Plus interface does not use thestandard LCt-104 RS-485/422 communication port.

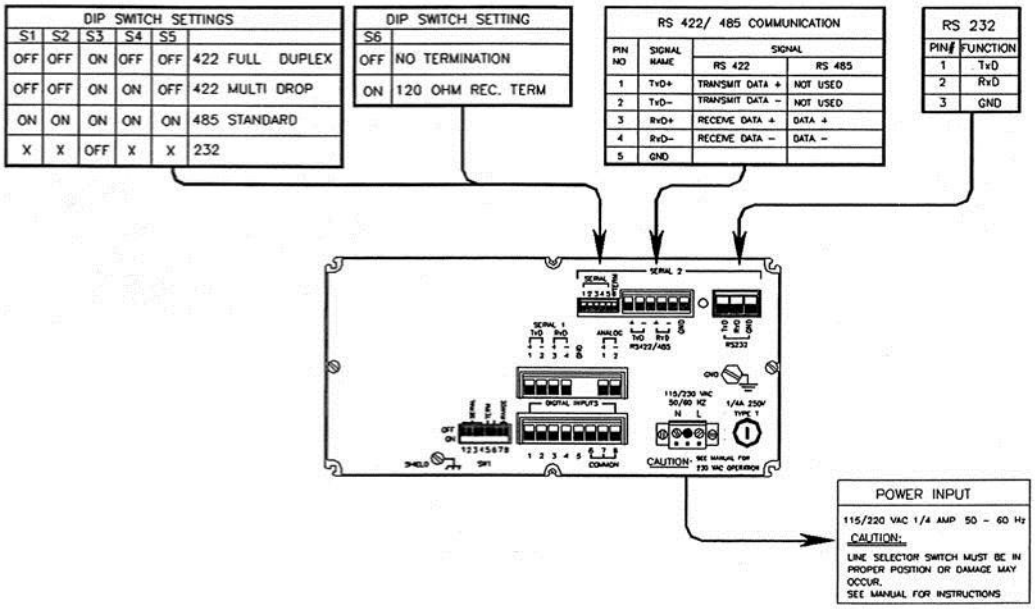
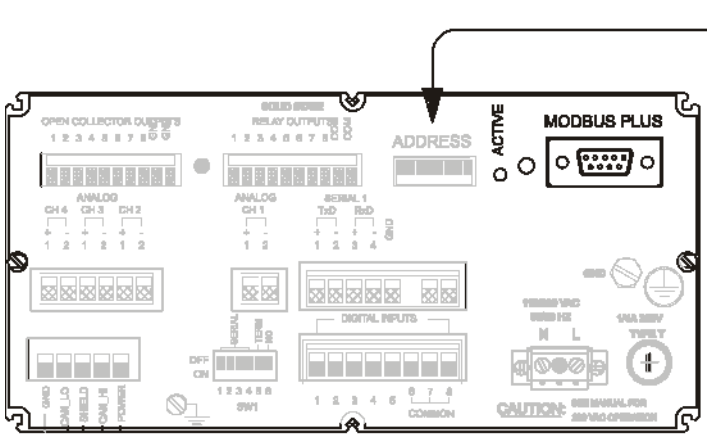


Figure 11-1a. Modbus RTU Rear Panel (UART Version) with Interface Designations



MODBUS PLUS STATION ADDRESS SWITCHES

STATION ADDRESS	SWITCH POSITION 1	2	3	4	5	6	7	8
1	ON	ON	ON	ON	ON	ON		
2	OFF	ON	ON	ON	ON	ON		
* * *								
28	OFF	ON	ON	OFF	OFF	ON		
* * *								
32	OFF	OFF	OFF	OFF	OFF	ON		
* * *								
64	OFF	OFF	OFF	OFF	OFF	OFF		

NOTES
1. SWITCHES 7 AND 8 ARE UNDEFINED (SPARE)
2. ADD ONE TO SWITCH SETTING FOR DESIRED ADDRESS
3. SWITCH SETTINGS TAKE EFFECT ONLY DURING POWERUP

Figure 11-1b. Modbus Plus Rear Panel with Address Designations

Table 11-1. Routing Path Address Designations

Routing Path Example	Five Byte Address
No Bridge Mux Device	12-1-0-0-0
Bridge Mux @ Address 26	26-12-1-0-0
1st Bridge Mux @ Address 26 2nd Bridge Mux @ Address 28 3rd Bridge Mux @Address 30	26-28-30-12-1

11.2.1 Routing Path Addressing

The LCt-104 Modbus Plus node is a Host Computer node with 8 data-slave input paths. When using Read/ Write MSTR operations, or multiple Modbus Plus networks, take note of the message routing format. A routing address is five bytes in length. This allows communication between multiple Modbus Plus Networks over Bridge Mux hardware devices. Since the LCt is a host computer node, two of the five routing address bytes are required to identify it.

The next-to-last non-zero byte specifies the network node station address (1-64). The last non-zero bytespecifies the input path or task number (1-8) to whichthe message is assigned. The other three routing address bytes allow communication through up to 3 Bridge Mux Devices. Table 11-1 depicts the addressrouting path for an LCt device at address 12, using path/task number 1.

NOTE: If multiple devices access the same LCt, BLH recommends using a different task/path number for each requesting device. This will prevent address contention problems.

NOTE: Host device routing path format is different from PLC designated device addressing. When using PLCdesignated devices, the input path/task number is notrequired since it is automatically selected.

NOTE: BLH assumes reader/operator familiarity with Modbus Plus token passing network operation. Readers/operators unfamiliar with Modbus Plus should obtain the 'Modicon Modbus Plus Network Planning and Installation Guide' (GM-MBPL-001) and 'Modicon Ladder Logic Block Library User Guide' (840 USE 101 00) from the Schneider Corporation.

11.2.2 Global Data Transfers

For high speed process control, BLH recommends thatglobal data transfers be used. LCt-104 Global dataallocations are defined in the Figure 11-2 parameterselection menu.

11.2.3 Wiring and Node Addressing

Wiring is simply a matter of connecting the Modiconsupplied, 9 pin D-type connector cable to the LCt-104rear panel Modbus PLUS D-type socket mating half (see Figure 11-1b).

LCt-104 nodes may occupy any station address location from 1 to 64. Selection is made at the rear panel(see table in Figure 11-1b) DIP Switch designated ADDRESS. Add '1' to the switch selection to obtain the actual address (i.e., selection-0 +1 =1). DIP switchpositions 7 and 8 are unused.

NOTE: Switch selections are read only during power-up. If the address selection is changed, the instrumentmust be powered down and then powered up again.

11.2.4 Configuration

Figure 11-2 presents the Modbus Plus configuration menu. Parameters are as follows:

ADDRESS is non-configurable. It simply indicates thatthe network has recognized the LCt-104 device at thedesignated address.

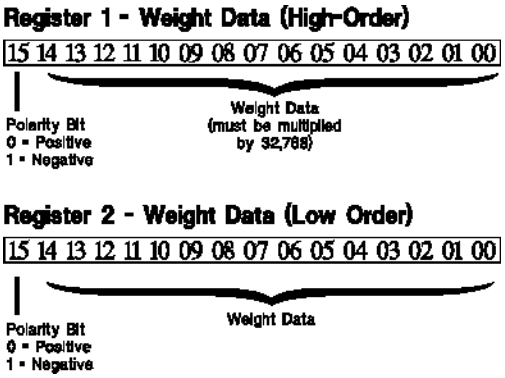
GLOBAL DATA allows up to 7 words of live tension/force and status data to be selected for broadcast with each token pass. Each item selected represents twowords of global data. The first item selected 'YES' becomes the first two words, the second 'YES' becomes words three and four, and so forth. The seven available selections, status 1-4, tension, force, and angleare defined in Figure 11-2.

ROTATION is non-configurable. Rotation shows the time
used for one complete token pass of all network nodes.

11.2.5 Data Formatting

Table 11-2 presents a complete overview of Modbusregister and bit allocations. Table 11-2 information which appears in conventional text applies to both ModbusRTU and Modbus Plus formats. Allocations which pertain only to Modbus Plus appear in ***bold italic*** text.

BLH formatted tension/force data consists of two 16bit signed integers, the first (high) integer must be multiplied by 32768 and then added to the second (low)integer (see illustration, top of next column).



NOTE: If a decimal point is required the resulting valuemust be multiplied by the appropriate fraction, i.e. 0.01for hundreds of a unit. In the case of mv/V values the multiplier is 0.000001. The LCt-104 range is (- 999999/+9999999).

NOTE: counts refers to displayed counts. If displayedtension/force is counting by 2 lb increments then presetting a register to 9 would mean 18 lbs.

11.2.6 Flashing LED Status

A flashing green 'ACTIVE' LED located on the LCt-104rear panel (Figure 11-1) indicates the status of Modbus Plus network operation. To interpret flash patterns, refer to the Modbus Plus Planning Guide (GM-MBPL004).

NOTE: To display flashing status on the LCt-104 frontpanel, configure an Alarm/Status Annunciator for 'Modbus Plus Status' indication (see Section V).

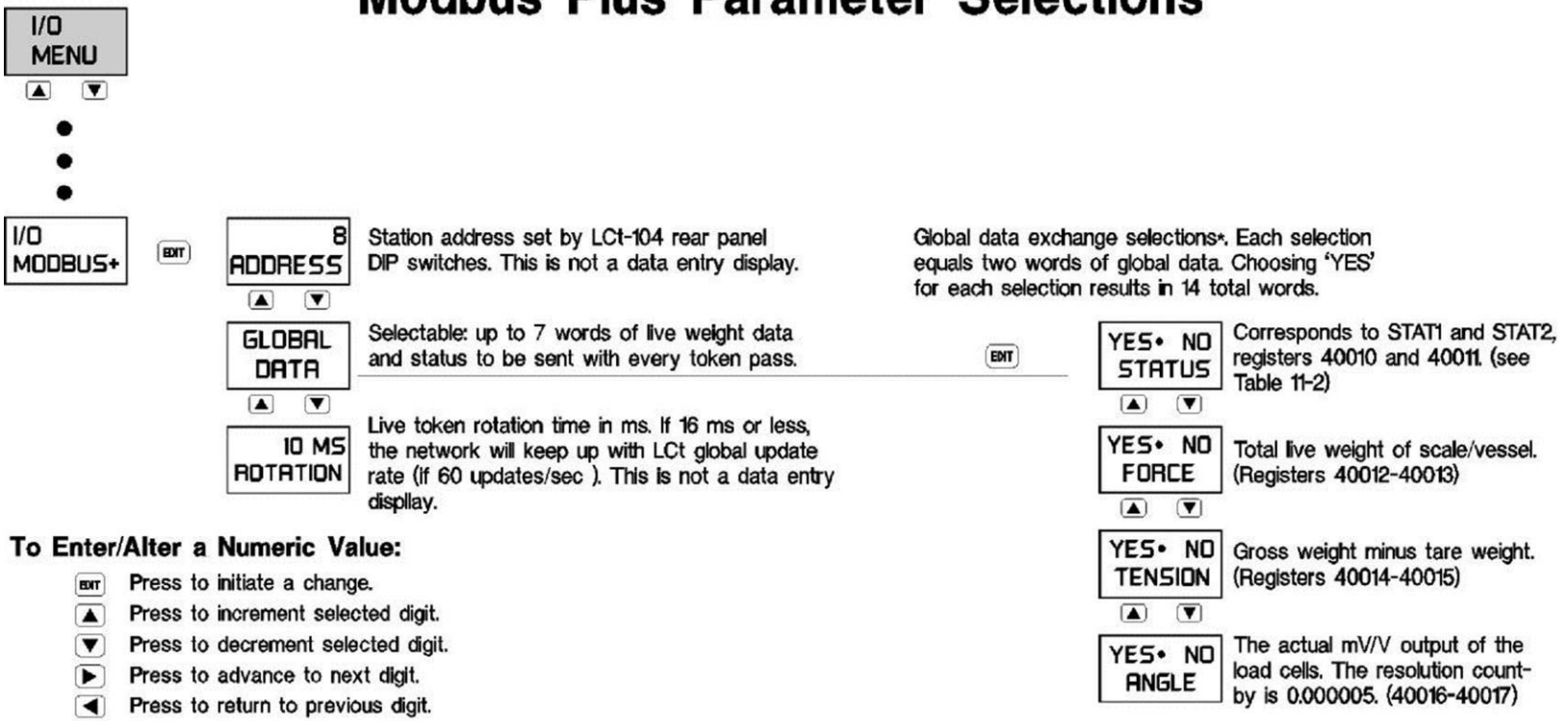
11.2.7 Manipulating The Front Panel Display

Provision has been made for the host PLC to displaymessages on the LCt-104 front panel display. Messages may occupy both the upper (7 character) andlower (8 character) display lines (Figure 11-3, page 11- 8). To send a message, the host PLC transmits themessage coded in conventional ASCII characters* toregisters 40258 thru 40265 along with a display controlword; register 40257. Information written to these LCt104 registers determines not only the message content but also the display time period.

When the host message display time period expires,the LCt-104 will revert to its normal tension/force/status display. See Table 11-2 and Figure 11-3 for a detailed breakout of register allocations and byte designations. Host messages displayed on the LCt frontpanel can be used to alert operators to error conditions, prompt required inputs, etc.

NOTE: Host messages are not displayed if the LCt104 is in any calibration or parameter configuration menumode.

Modbus Plus Parameter Selections



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.

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.

Figure 11-2. Parameter Selection Menu and Global Data Designations

Table 11-2. Modbus RTU and Plus Register Allocations

Data	Address	Registers	R/W
Status 1	40001	1	R
Status 2	40002	1	R
Status 3	40003	1	R
Status 4	40004	1	R
Force	40005	2	R
Tension	40007	2	R
Angle	40009	2	R
Vertical mV/V	40011	2	R
Horizontal mV/V	40013	2	R
Gross 1*	40015	2	R
Gross 2*	40017	2	R
Gross 3*	40019	2	R
Gross 4*	40021	2	R
Gross 1**	40023	2	R
Gross 2**	40025	2	R
Gross 3**	40027	2	R
Gross 4**	40029	2	R
mV/V 1	40031	2	R
mV/V 2	40033	2	R
mV/V 3	40035	2	R
mV/V 4	40037	2	R
Spare		2	-
Spare		2	-
Spare		2	-
Spare		2	-
% Load 1	40047	1	R
% Load 2	40048	1	R
% Load 3	40049	1	R
% Load 4	40050	1	R
Angle Ref	40051	2	R
Angle Dif	40053	2	R
Deadload 1	40055	2	R
Deadload 2	40057	2	R
Deadload 3	40059	2	R
Deadload 4	40061	2	R
Zero 1	40063	2	R
Zero 2	40065	2	R
Zero 3	40067	2	R
Zero 4	40069	2	R
Serial #	40071	4	R
Software Ver	40075	1	R
Ref. Date	40076	3	R

Data	Address	Registers	R/W
Zero	40129	2	R/W
Spare		2	-
Zero Limit %	40133	1	R/W
Overload %	40134	1	R/W
Spare		1	-
Spare		1	-
Filter	40137	1	R/W
Motion Band	40138	1	R/W
Motion Timer	40139	1	R/W
Spare		1	-
Setpoint #1	40141	2	R/W
Setpoint #2	40143	2	R/W
Setpoint #3	40145	2	R/W
Setpoint #4	40147	2	R/W
Setpoint #5	40149	2	R/W
Setpoint #6	40151	2	R/W
Setpoint #7	40153	2	R/W
Setpoint #8	40155	2	R/W
Inflight #1	40157	1	R/W
Inflight #2	40158	1	R/W
Inflight #3	40159	1	R/W
Inflight #4	40160	1	R/W
Inflight #5	40161	1	R/W
Inflight #6	40162	1	R/W
Inflight #7	40163	1	R/W
Inflight #8	40164	1	R/W
Tag #1	40165	4	R/W
Tag #2	40169	4	R/W
Tag #3	40173	4	R/W
Tag #4	40177	4	R/W
Tag #5	40181	4	R/W
Tag #6	40185	4	R/W
Tag #7	40189	4	R/W
Tag #8	40193	4	R/W
System Tag	40197	4	R/W
Command*	40201	1	R/W
Control Data	***40202***	***1***	***R/W***
Upper Display	***40203***	***4***	***R/W***
Lower Display	***40207***	***4***	***R/W***
Global Data	***40211***	***1***	***R/W***

*Command Register

One Shot Write Value	Function
1	Spare
2	Zero
3	Switch to Tension
4	Switch to Force

* Values without cross talk
** Values with cross talk

Table 11-3. Status Word Bit Designations

Status Register Number 1		
BIT	**Name**	**Definition**
0	Power Up	JBox Power Up (true for 5 seconds)
1	Spare	
2	Spare	
3	Lost Zero	Checksum Error at Power Up
4	No mV/V Cal	Checksum Error at Power Up
5	No Engineering Cal	Checksum Error at Power Up
6	No Temperature Compensation	Checksum Error at Power Up
7	EEPROM Error	Error Writing EEPROM
8	Comm Power Fault	Serial Output - Power Supply Fault
9	JBox Power Low	Power to JBox is Low
10	Linking	Attempting Communication Link to JBox
11	Unable to Tare/Zero: Motion	System in Motion (true for 5 seconds)
12	Analog #1 Open	Open Connection
13	Analog #2 Open	Open Connection
14	Analog #3 Open	Open Connection
15	Analog #4 Open	Open Connection

Status Register Number 2		
BIT	**Name**	**Definition**
0	A/D Overrange Channel (Cell) 1	Signal Greater Than A/D Range
1	A/D Overrange Channel (Cell) 2	Signal Greater Than A/D Range
2	A/D Overrange Channel (Cell) 3	Signal Greater Than A/D Range
3	A/D Overrange Channel (Cell) 4	Signal Greater Than A/D Range
4	Spare	
5	Spare	
6	Spare	
7	Spare	
8	Excitation Open Channel (Cell) 1	Load Cell Not Connected
9	Excitation Open Channel (Cell) 2	Load Cell Not Connected
10	Excitation Open Channel (Cell) 3	Load Cell Not Connected
11	Excitation Open Channel (Cell) 4	Load Cell Not Connected
12	Excitation Low Channel (Cell)	Check Wiring for Short(s)
13	Excitation Low Channel (Cell)	Check Wiring for Short(s)
14	Excitation Low Channel (Cell)	Check Wiring for Short(s)
15	Excitation Low Channel (Cell)	Check Wiring for Short(s)

Table 11-3. Status Word Bit Designations (continued)

Status Register Number 3		
BIT	**Name**	**Definition**
0	Overload Limit Cell 1	Cell Overload Value Has Been Exceeded
1	Overload Limit Cell 1	Cell Overload Value Has Been Exceeded
2	Overload Limit Cell 1	Cell Overload Value Has Been Exceeded
3	Overload Limit Cell 1	Cell Overload Value Has Been Exceeded
4	Zero Limit Cell 1	Cell Zero Limit Has Been Exceeded
5	Zero Limit Cell 2	Cell Zero Limit Has Been Exceeded
6	Zero Limit Cell 3	Cell Zero Limit Has Been Exceeded
7	Zero Limit Cell 4	Cell Zero Limit Has Been Exceeded
8	Analog Under #1	Analog Has Been Exceeded
9	Analog Over #1	Analog Has Been Exceeded
10	Analog Under #2	Analog Has Been Exceeded
11	Analog Over #2	Analog Has Been Exceeded
12	Analog Under #3	Analog Has Been Exceeded
13	Analog Over #3	Analog Has Been Exceeded
14	Analog Under #4	Analog Has Been Exceeded
15	Analog Over #4	Analog Has Been Exceeded

Status Register Number 4		
BIT	**Name**	**Definition**
0	Output #1	Setpoint is ON if Bit = '1'
1	Output #2	Setpoint is ON if Bit = '1'
2	Output #3	Setpoint is ON if Bit = '1'
3	Output #4	Setpoint is ON if Bit = '1'
4	Output #5	Setpoint is ON if Bit = '1'
5	Output #6	Setpoint is ON if Bit = '1'
6	Output #7	Setpoint is ON if Bit = '1'
7	Output #8	Setpoint is ON if Bit = '1'
8	Input #1	Input is Activated if Bit = '1'
9	Input #2	Input is Activated if Bit = '1'
10	Input #3	Input is Activated if Bit = '1'
11	Input #4	Input is Activated if Bit = '1'
12	Motion	System is in Motion
13	Zero Successful	Zero Acquired Successfuly (active for 5 seconds)
14	Angle Successful	Angle Acquired Successfuly (active for 5 seconds)
15	Key Pressed	Front Panel Key Pressed (active for 5 seconds)

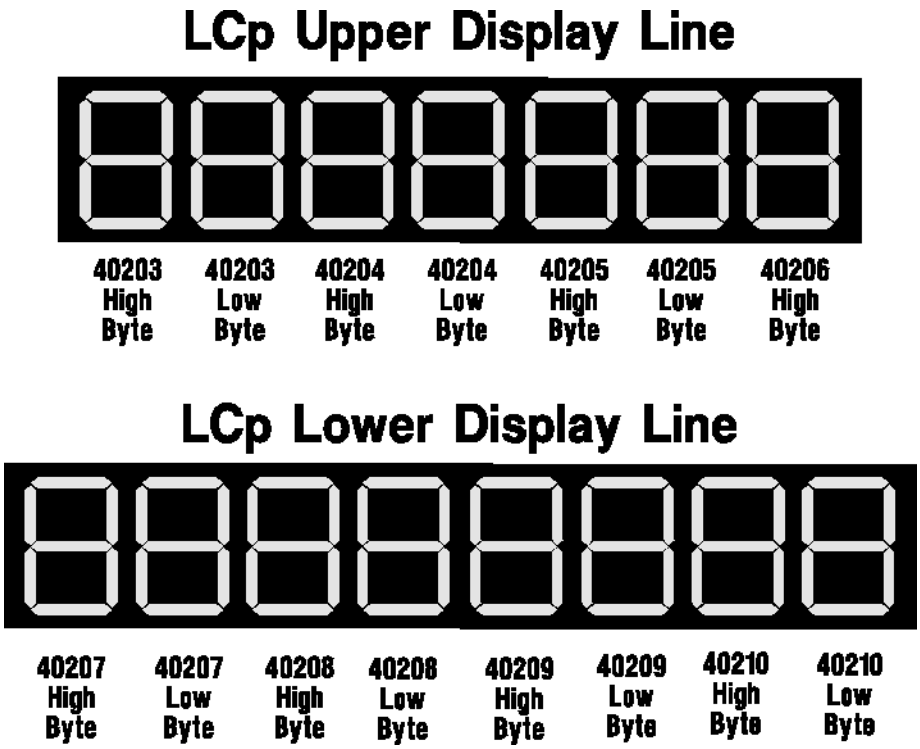


Figure 11-3. Front Panel Display Write - Register and Byte Allocations

Address	Data Format	# Registers	Register Contents
40202	Control Data	1 Register	if bit 0 = 1, apply data in registers 40203-40206 to upper display if bit 1 = 1, apply data in registers 40207-40210 to lower display if bit 2 = 1 and bit 0 = 1, flash the upper display if bit 3 = 1 and bit 1 = 1, flash the lower display bits 4-7 are spares, set to zero bits 8-15 are the display timer, each increment adds 50 msec i.e. 00000001 = 50 msec, 00000010 = 100 msec NOTE: 00000000 = 12800 msec timer (12.8 seconds)
40203 - 40206	Upper Display Data	4 Registers	see Figure 11-3 for byte allocations
40207- 40210	Lower Display Data	4 Registers	see Figure 11-3 for byte allocations

SECTION 12. Profibus Protocol

This chapter defines the optional Profibus interface as it pertains to BLH LCt-104 instruments. Profibus, standardized in the European standard EN 50 170, is the operational network interface for Siemens PLC based control systems.

12.1 THE INTERFACE DEFINED

Consisting of three communication levels, the interface structure was designed for high-speed (up to 12 mbaud) communication between master (typically PLC) and slave devices.

12.1.1 Profibus DP

Although three communication levels exist, LCt-104units communicate only at the Profibus DP (decentralized periphery) level. At this level, LCt's are dedicatedslaves with no master status or functionality. They cannot manipulate the bus or control token passes. Theywill respond quickly, however, to any master device onthe network.

12.1.2 GSD Files (see paragraph 12.7)

GSD files are required to establish communication onthe Profibus network. GSD files contain all device specific parameters such as supported baud rates, message lengths, I/O numbers, and diagnostic messaging. BLH supplies two GSD files on the accompanying diskette included with each order. Read the HINTSGSD.rtf file contained on this diskette and load the appropriate GSD file into the master(s) network device.

12.2 INTERFACE WIRING

Figure 12-1 depicts the LCt-104 rear panel wiring arrangements. Simply connect a shielded, two-wire twisted pair cable to the PROFIBUS terminal. Cableshielding MUST BE connected at both ends to ensureproper operation. BLH recommends using a Siemens nine-pin, sub D connector with integrated termination (PN 6ES7972-0BA10-0XA0). If another connector is used, mandatory A and B signals must be accommodated as well as provision for termination, when required. For reliable network operation, BLH recommends that the first and last network node be powered up at alltimes.

12.3 LCt-104 MENU CHANGES

With the Profibus option installed, parameter selections change in several menus. These changes override definitions and selections presented in earlier chapters of this manual.

12.3.1 IIO Menu Changes

With Profibus installed, other expansion slot A interfaces are disabled. Figure 11-2 shows the modified I/O menu with Profibus available rather than Modbus Plus or Allen-Bradley Remote I/O. Additional Profibus selections allow individual units to be reset or taken offline.

NOTE: Use 'GO' commands to take the LCt-104 **off-line** momentarily. This prevents the unit from transmitting data invalid messages to the master controller while parameters/settings are being changed.

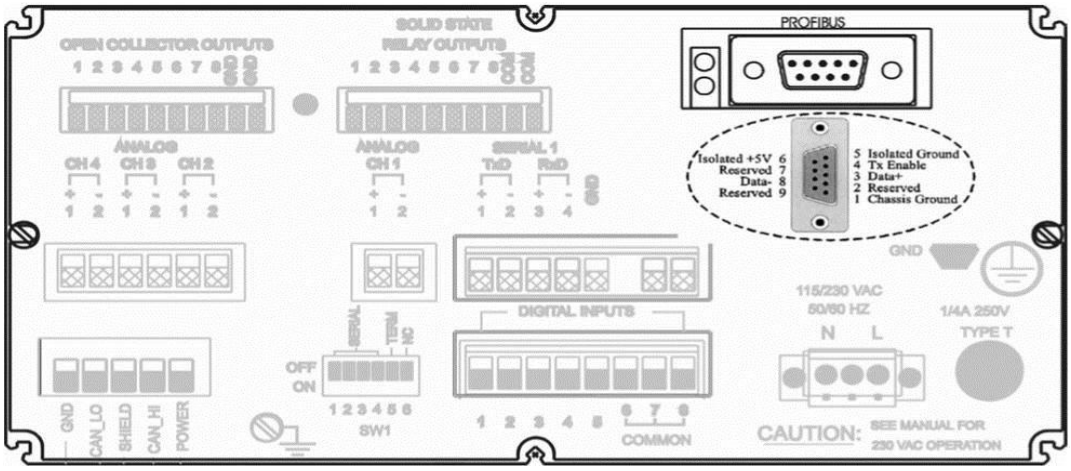
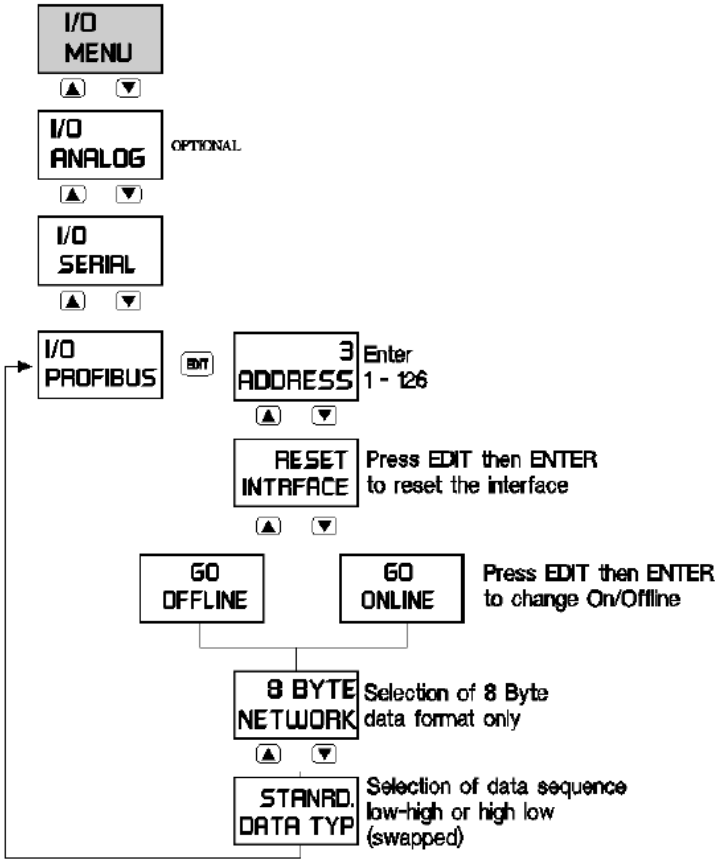


Figure 12-1. Rear Panel Profibus Connector and Pin Designations



Reset: This command is a hard reset of the Profibus interface. Reset also transpires during power up.
Go online: This command can be issued from the LCt-104 to instruct the Profibus interface to initiate communication with a master.
Go offline: This command can be issued from the LCt-104 to instruct the Profibus interface to stop communication with a master.

Figure 12-2. Profibus I/O Menu Change

12.3.2 Diagnostic Menu Changes

Figure 12-3 presents changes to the diagnostic menu. Added features define Profibus errors if they occur and current online/offline status.

Error Number	Description
1	Hardware Error
2	Configuration Mode
4	Start-Up Error
5	Assert Error
6	Abort Error
7	Kernal Error
8	Watchdog Time-Out
9	Unreported Watchdog Time-Out
10	Invalid Module Status
16	Module Not Present
20	Unresolved Hardware Interrupt
21	Busy Time-Out
32	ID Block Major Rev Mismatch
33	ID Block Minor Rev Mismatch
34	Control/Status Block Major Rev Mismatch
35	Control/Status Block Minor Rev Mismatch
48	Open Interface Response Time-Out
49	Heartbeat Response Time-Out
50	Module Reported Heartbeat Time-Out
51	Invalid Trigger Out Pointer
52	Invalid Trigger In Pointer
53	Trigger Que is Full
54	Invalid Event Out Pointer
55	Invalid Event In Pointer
56	Trigger Error Event Received
57	Invalid Event Received
58	Unexpected Event Received
64	Data Idle
65	Data Invalid

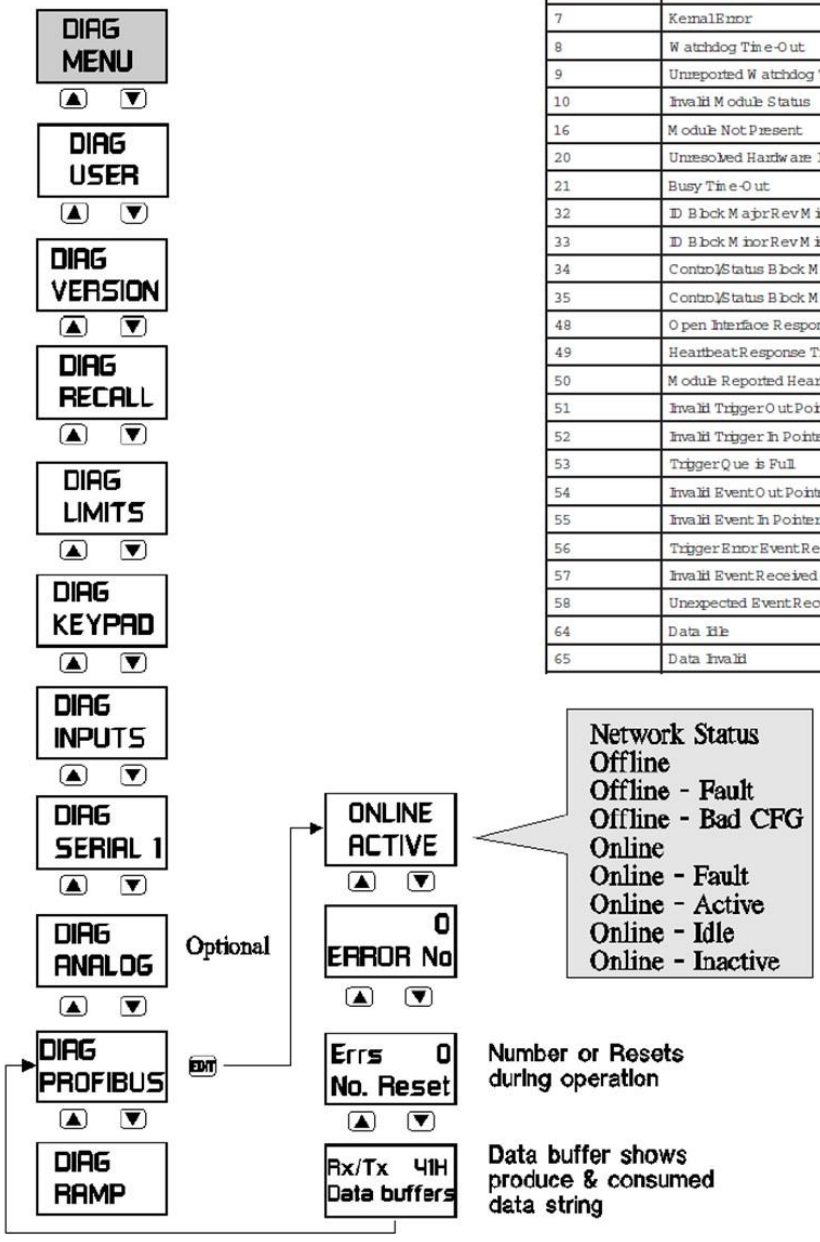


Figure 12-3. Profibus Diagnostic Menu Change

12.3.3 Display Menu Changes

See Figure 12-4 for alarm annunciator changes. TheProfibus selection allows the lower rear panel networkstatus LED activity to be mirrored on one of the eightfront panel annunciators. Behavior of this LED is network specific and defined in Figure 12-4

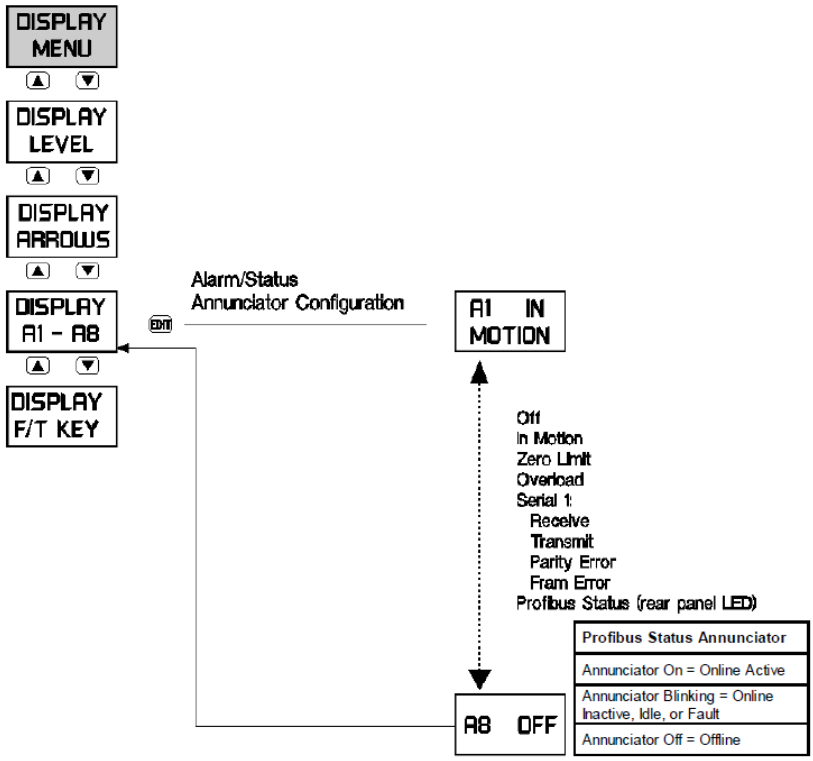


Figure 12-4. Display Menu Changes

12.4 DATA EXCHANGE FORMATS

LCt-104 Profibus input and output data formats consistof up to 8 bytes each as shown in Table 12-1. Eachgrouping of two bytes constitutes one 16-bit word.

Table 12-1. Data Exchange Formats

Input data format							
msg#	Data-ID	status		data low		data high	
Word 1		Word 2		Word 3		Word 4	
byte1	byte2	byte3	byte4	byte5	byte6	byte7	byte8
Output data format							
msg#	Data ID	command		data low		data high	
Word 1		Word 2		Word 3		Word 4	
byte1	byte2	byte3	byte4	byte5	byte6	byte7	byte8

12.4.1 Produced Data (LCt-104 Transmission)

The input data string is transmitted by the LCt-104 tothe requesting master device. Each string consists ofeight bytes and breaks down as follows:

Byte 1. Message #: Message # is an echo of the first byte of the outputdata string (transmitted by the master). This is usedby the master for data transfer verification.

Byte 2. Input data ID: Data ID code as shown in Table 12-4.

Bytes 3 & 4. Status: The LCt-104 operating status, each bit of the word madeup of bytes 3 & 4 represents specific operating status.The descriptions of the bits are in Table 12-2. Bits 0 - 7are in Byte 3, bits 8 - 15 are in Byte 4.

Bytes 5 - 8 (Words 3 & 4). Input data: These two words contain the actual weight value (low word and then high word). Word 3, low word, is a 16 bitsigned integer -32768 to 32767 with byte 5 being thelow byte. Word 4, high word, is a 16 bit signed integertimes 32768 with byte 7 being the low byte. If word 3 = 2 and word 4 = 1 the total data value would be 32770 (2+ 32768).

Table 12-2. Status Word Definitions

Status Word					
Bit Description		Decimal Point Position			
0	Decimal Point Position A	C	B	A	Position
1	Decimal Point Position B	0	0	0	0
2	Decimal Point Position C	0	0	1	0.0
3	Powering up or Linking to Jbox	0	1	0	0.00
4	Motion	0	1	1	0.000
5	Zero successful	1	0	0	0.0000
6	Angle ref successful	1	0	1	0.00000
7	Unable to Zero/Angle	1	1	0	0.000000
8	Status register one				
9	Status register two		Display Data		
10	Status register three		B	A	Display
11	Status register four		0	0	Force
12	Display A		0	1	Angle
13	Display B		1	0	Tension
14	Download address error		1	1	Spare
15	Download data error				

12.4.2 Consumed Data (LCt-104 Receive)

Output data is transmitted to the LCt-104 by the requesting master. It consists primarily of command andID data. ID data is defined in Table 12-4. Each stringconsists of eight bytes and breaks down as follows:

Byte 1. Message #: Any number between 0 and 255 generated by themaster and copied by the LCt-104 into the first byteof the input string. This is for host data transfer verification.

Byte 2. Output data ID: When the Profibus master issues a download command, it must include the output data ID and the output data as well. Byte 2 of the Profibus output provides output data ID code as shown in Table 12-4.

Bytes 3 & 4 (Word 2). Command: This command word is used by Profibus master to control LCt-104 (as a slave). The meanings of commands are shown in Table 12-3.

Bytes 5 - 8 (Words 3 & 4). Output Data: The third and forth words of the Profibus output are low word and high word of the actual download data. Word3, low word, is a 16 bit signed integer -32768 to 32767.Word 4, high word, is a 16 bit signed integer times32768. See example in Inputs Words 3 & 4 definition. See Table 5 for ID codes and definitions of writable data.

Table 12-3. Profibus Master Command List

Profibus Interface Commands	
Command ID	Description
0	Null Command
1	Switch to Force
2	Switch to Angle
3	Switch to Tension
4	Zero Force Weight
5	Acquire Ref Angle
6	Download Data
7	Clear Status Errors

Data sequence format:

Bytes 5 - 8 (Words 3,7 & 4,8). Input Data: Byte 5 swaps with byte 6 & byte 7 swaps with byte 8.

Bytes 5 - 8 (Words 3,7 & 4,8). Output Data: Byte 5swaps with byte 6 & byte 7 swaps with byte 8.

STANDARD format is Byte 5 low and byte 6 high, byte7 low and byte 8 high.

SWAPPED format is Byte 5 high and byte 6 low, byte7 high and byte 8 low.

NOTE: ASCII data and some bit data are not reversible. Ex. Set point output name... See register Tables fordetails

Table 12-4. Profibus Data Identification Codes

	Decimal	Hex	Devicenet Data ID Codes			
Type	ID Code		Data	Words	Description	can be swapped
System	0	0	Status 1&2	2	System status registers 1 & 2 (see description)	no
System	1	1	Status 3&4	2	System status registers 3 & 4 (see description)	no
Operate	2	2	Force	2	Current Total Force Data	yes
Operate	3	3	Tension	2	Current Total Tension Data	yes
Operate	4	4	Angle	2	Current Angle data	yes
Arrow K	5	5	mV/V vertical	2	mV/V average signal V1 or V1 + V3	yes
ArrowK	6	6	mV/V horizon	2	mV/V average signal H2 or H2 + H4	yes
Indv K	7	7	Gross Cell 1	2	Gross data from channel one without crosstalk	yes
Indv K	8	8	Gross Cell 2	2	Gross data from channel two without crosstalk	yes
Indv K	9	9	Gross Cell 3	2	Gross data from channel three without crosstalk	yes
Indv K	10	0A	Gross Cell 4	2	Gross data from channel four without crosstalk	yes
Indv K	11	0B	Gross cell 1	2	Gross data from channel one with crosstalk	yes
Indv K	12	0C	Gross cell 2	2	Gross data from channel two with crosstalk	yes
Indv K	13	0D	Gross cell 3	2	Gross data from channel three with crosstalk	yes
Indv K	14	0E	Gross cell 4	2	Gross data from channel four with crosstalk	yes
Indv K	15	0F	mV/V cell 1	2	mV/V data from channel 1	yes
Indv K	16	10	mV/V cell 2	2	mV/V data from channel 2	yes
Indv K	17	11	mV/V cell 3	2	mV/V data from channel 3	yes
Indv K	18	12	Mv/v cell 4	2	mV/V data from channel 4	yes
Indv K	19	13	Peak ID11|0B	2	Peak total channel 1	yes
Indv K	20	14	Peak ID12|0C	2	Peak total channel 2	yes
Indv K	21	15	Peak I3|0D	2	Peak total channel 3	yes
Indv K	22	16	Peak I4|0E	2	Peak total channel 4	yes
Indv K	23	17	% load cell 1	1	If one HTU V1, If two HYU's V1	yes
Indv K	24	18	% load cell 2	1	If one HTU H1, If two HYU's V3	yes
Indv K	25	19	% load cell 3	1	If one HTU none, If two HYU's H2	yes
Indv K	26	1A	% load cell 4	1	If one HTU none, If two HYU's H4	yes
N/A	27	1B	Spare	1	Spare	n/a
N/A	28	1C	Spare	1	Spare	n/a
N/A	29	1D	Spare	1	Spare	n/a
N/A	30	1E	Spare	1	Spare	n/a

Table 12-4. Profibus Data Identification Codes (cont.)

	Decimal	Hex	Devicenet Data ID Codes			
Type	ID Code		Data	Words	Description	can be swapped
Diag M	31	1F	Spare	1	Spare	n/a
Diag M	32	20	Spare	1	Spare	n/a
Diag M	33	21	Spare	1	Spare	n/a
Diag M	34	22	Spare	1	Spare	n/a
Diag M	35	23	deadload 1	1	Acquire deadload channel 1	yes
Diag M	36	24	deadload 2	1	Acquire deadload channel 2	yes
Diag M	37	25	deadload 3	1	Acquire deadload channel 3	yes
Diag M	38	26	deadload 4	1	Acquire deadload channel 4	yes
Diag M	39	27	Zero cell 1	2	Aquired zero data for channel one	yes
Diag M	40	28	Zero cell 2	2	Aquired zero data for channel two	yes
Diag M	41	29	Zero cell 3	2	Aquired zero data for channel three	yes
Diag M	42	2A	Zero cell 4	2	Aquired zero data for channel four	yes
Diag M	43	2B	Angle refer	2	Aquired angle reference	yes
Diag M	44	2C	Angle diff	2	Difference live reference angles	yes
Diag M	45	2D	Spare	2	Spare	yes
Diag M	46	2E	Spare	2	Spare	yes
Diag M	47	2F	Serial number	2	7 Digit number in decimal fromat *	no
Diag M	48	30	Software ver	1	3 Digit number in decimal format *	no
Diag M	49	31	Ref date	2	6 Digit number in decimal format *	no
Diag M	50	32	Zero total	2	Zero data total if Downloaded Zero data	yes
Diag M	51	33	Spare	2	Spare	yes
Diag M	52	34	Zero limit	2	Zero total limit allowed	yes
Diag M	53	35	Overload limit	2	Overload total limit allowed (if zero = no overload protection)	yes
Diag M	54	36	Spare	1	Spare	yes
Diag M	55	37	Filter averaging	1	Fliter setting (off, 1-12 decimal)	yes
Filter M	56	38	Filter band	1	Filter setting band (0-off, 1-100 decimal)	yes
Diag M	57	39	Motion band	1	Motion setting (off, 1-58 decimal)	yes
Diag M	58	3A	Motion timer	1	Motion timer setting 0-4 sec (0-7 decimal)	yes
Teni M	59	3B	Autowrap	2	off = 0, on=1	yes
Spnt K	60	3C	Setpoint 1	2	Setpoint one main value	yes

Table 12-4. Profibus Data Identification Codes (cont.)

	Decimal	Hex	Devicenet Data ID Codes			
Type	ID Code		Data	Words	Description	can be swapped
Spnt K	61	3D	Setpoint 2	2	Setpoint two main value	yes
Spnt K	62	3E	Setpoint 3	2	Setpoint three main value	yes
Spnt K	63	3F	Setpoint 4	2	Setpoint four main value	yes
Spnt K	64	40	Setpoint 5	2	Setpoint five main value	yes
Spnt K	65	41	Setpoint 6	2	Setpoint six main value	yes
Spnt K	66	42	Setpoint 7	2	Setpoint seven main value	yes
Spnt K	67	43	Setpoint 8	2	Setpoint eight main value	yes
I/O M	68	44	Inflight 1	1	Infight one value	yes
I/O M	69	45	Inflight 2	1	Infight two value	yes
I/O M	70	46	Inflight 3	1	Infight three value	yes
I/O M	71	47	Inflight 4	1	Infight four value	yes
I/O M	72	48	Inflight 5	1	Infight five value	yes
I/O M	73	49	Inflight 6	1	Infight six value	yes
I/O M	74	4A	Inflight 7	1	Infight seven value	yes
I/O M	75	4B	Inflight 8	1	Infight eight value	yes
I/O M	76	4C	Tag id 1	2	Tag low (4 asscii char) , { 31-39, 41-5A, 20 & 2D hex)	no
I/O M	77	4D	Tag id 1	2	Tag high (4 asscii char)	no
I/O M	78	4E	Tag id 2	2	Tag low (4 asscii char)	no
I/O M	79	4F	Tag id 2	2	Tag high (4 asscii char)	no
I/O M	80	50	Tag id 3	2	Tag low (4 asscii char)	no
I/O M	81	51	Tag id 3	2	Tag high (4 asscii char)	no
I/O M	82	52	Tag id 4	2	Tag low (4 asscii char)	no
I/O M	83	53	Tag id 4	2	Tag high (4 asscii char)	no
I/O M	84	54	Tag id 5	2	Tag low (4 asscii char)	no
I/O M	85	55	Tag id 5	2	Tag high (4 asscii char)	no
I/O M	86	56	Tag id 6	2	Tag low (4 asscii char)	no
I/O M	87	57	Tag id 6	2	Tag high (4 asscii char)	no
I/O M	88	58	Tag id 7	2	Tag low (4 asscii char)	no
I/O M	89	59	Tag id 7	2	Tag high (4 asscii char)	no
I/O M	90	5A	Tag id 8	2	Tag low (4 asscii char)	no
I/O M	91	5B	Tag id 8	2	Tag high (4 asscii char)	no
Diag M	92	5C	User tag	2	User tag 3 digits high (same as setpoint asscii)	no
Diag M	93	5D	User tag	2	User tag 4 digits low (same as setpoint asscii)	no

Table 12-4. Profibus Data Identification Codes (cont.)

	Decimal	Hex	Devicenet Data ID Codes			
Type	**ID Code**		**Data**	**Words**	**Description**	**can be swapped**
Display	94	5E	Control data	1	Control data for lower & upper display messaging	no
Display	95	5F	Upper display	2	Upper display first 4 chars (asscii) * see note	no
Display	96	60	Upper display	2	Upper display last 3 chars (asscii)	no
Display	97	61	Lower display	2	Lower display first 4 chars (asscii)	no
Display	98	62	Lower display	2	lower display last 4 chars (asscii)	no

FOR DISPLAY MESSAGING:

REGISTER 94 CONTROL

if bit 0 = 1 apply data in registers 95&96 to upper display
if bit 1 = 1 apply data in registers 97&98 to lower display
if bit 2 = 1 & bit 0 = 1 flash the upper display
if bit 3 = 1 & bit 1 = 1 flash the lower display
if bit 4 = 1 keep display on until this bit is written again as “0” bits 5-7 are spares, set to zero
timer; 0000010 bits 8-15 are the display timer, each increment adds 50 msec i.e. 00000001 = 50msec = 100 msec timer

Note: For display messaging all following hex code are acceptable.

30 - 7A (hex) numbers and letters or symbols, also space 20H or minus 2DH

Note: Messaging will only display if LCt-104 is in operating display mode. (no menu routines)

Table 12-5. Profibus Status Registers 1 and 2

	ProfibusStatus Register #1	
BIT	**NAME**	**Defintion**
0	spare	
1	spare	
2	spare	
3	Lost zero	Checksum error @ power up
4	No mv/v cal	Checksum error @ power up
5	No engineering cal	Checksum error @ power up
6	No tempature cal	Checksum error @ power up
7	Eeprom error	Error writing eeprom
8	Comm power fault	Serial output - power supply fault
9	spare	
10	spare	
11	spare	
12	Analog #1 open	Open connection
13	Analog #2 open	Open connection
14	Analog #3 open	Open connection
15	Analog #4 open	Open connection

	Profibus Status Register #2	
BIT	NAME	Defintion
0	A/D overrange channel cell 1	Signal greater than A/D range
1	A/D overrange channel cell 2	Signal greater than A/D range
2	A/D overrange channel cell 3	Signal greater than A/D range
3	A/D overrange channel cell 4	Signal greater than A/D range
4	spare	
5	spare	
6	spare	
7	spare	
8	Execition open channel cell 1	Load cell not connected
9	Execition open channel cell 2	Load cell not connected
10	Execition open channel cell 3	Load cell not connected
11	Execition open channel cell 4	Load cell not connected
12	Execition Low channel cell 1	Check cell for shorts
13	Execition Low channel cell 2	Check cell for shorts
14	Execition Low channel cell 3	Check cell for shorts
15	Execition Low channel cell 4	Check cell for shorts

Table 12-6. Profibus Status Registers 3 and 4

	ProfibusStatus Register #3	
BIT	NAME	Defintion
0	Overload limit cell 1	Cell overload value has been exceeded
1	Overload limit cell 2	Cell overload value has been exceeded
2	Overload limit cell 3	Cell overload value has been exceeded
3	Overload limit cell 4	Cell overload value has been exceeded
4	Zero limit cell 1	Cell zero limit has been exceeded
5	Zero limit cell 2	Cell zero limit has been exceeded
6	Zero limit cell 3	Cell zero limit has been exceeded
7	Zero limit cell 4	Cell zero limit has been exceeded
8	Analog #1 underrange	Weight data below analog output range
9	Analog #1 overrange	Weight data above analog output range
10	Analog #2 underrange	Weight data below analog output range
11	Analog #2 overrange	Weight data above analog output range
12	Analog #3 underrange	Weight data below analog output range
13	Analog #3 overrange	Weight data above analog output range
14	Analog #4 underrange	Weight data below analog output range
15	Analog #4 overrange	Weight data above analog output range

	Profibus Status Register #4	
BIT	NAME	Defintion
0	Ouput #1	Setpoint is on if bit = '1'
1	Ouput #2	Setpoint is on if bit = '1'
2	Ouput #3	Setpoint is on if bit = '1'
3	Ouput #4	Setpoint is on if bit = '1'
4	Ouput #5	Setpoint is on if bit = '1'
5	Ouput #6	Setpoint is on if bit = '1'
6	Ouput #7	Setpoint is on if bit = '1'
7	Ouput #8	Setpoint is on if bit = '1'
8	Input # 1	Input is activated if bit = '1'
9	Input # 2	Input is activated if bit = '1'
10	Input # 3	Input is activated if bit = '1'
11	Input # 4	Input is activated if bit = '1'
12	spare	
13	spare	
14	spare	
15	spare	

12.5 LED STATUS INDICATION

Two bicolor (red/green) LED indicators are mounted beside the network connector (Figure 13-1). The upper LEDindicates LCt-104 status while the lower LED displays theProfibus Network Status. If an LED is flashing, the nominal flash rate is 500ms ON, and 500ms OFF.

12.5.1 LCt-104 Status

The upper (LCt-104 status) LED indicator flash sequences are defined in the following Table:

LED Status	LCt-104 Network Status
Off	No Power
Flashing Red	Recoverable configuration fault (invalid firmware, OEM data, or personality data)
Solid Red	Hardware error
Flashing Green	No errors, client interface is not open
Solid Green	No errors, client interface is active
Red/Green	Configuration mode

12.5.2 Profibus Network Status

The lower (network status) LED indicator flash sequences are defined in the following Table:

LED Status	Profibus Network Status
Off	No Power
Flashing Red	I/O connection in timed out state or other recoverable fault
Solid Red	Unrecoverable fault
Flashing Green	Device is online but has no connections
Solid Green	Device is online with established connections
Red/Green	Device is in communication faulted state and responding to an identity communication fault request

12.6 Profibus GSD FILE

Two GSD files (Table 12-7 and 12-8) are provided for LCt104 Profibus operation. A GSD file (Electronic Data Sheet)establishes a simple format that includes the device's configurable parameters and public interfaces to those parameters. It provides user friendly configuration tools thatcan be easily updated without having to constantly revisethe configuration software tool. GSD files are used by network tools to read or set device parameters.

Hints for Using the Right GSD File

Always attempt to establish system operation with Revision 1 GSD code - Vblh_021.gsd as presented in Table 12-7. This code defines the real LCt-104 diagnostic length, thereby using less memory in the Master device.

Table 12-7. Revision 1 GSD Code (Vblh_021.gsd)

```
;****************************
; GSD-file for BLH LCT-SERIES
; GSD - Revision 1
;****************************
#Profibus_DP
;
GSD_Revision=1
Vendor_Name = "BLH"
Model_Name = "LCT Profibus Slave"
Revision = "Version 1.0"
Ident_Number = 0x086B
Protocol_Ident = 0
Station_Type = 0
FMS_supp = 0
Hardware_Release = "1.0"
Software_Release = "1.00"
9.6_supp=1
19.2_supp=1
93.75_supp=1
187.5_supp=1
500_supp=1
1.5M_supp=1
3M_supp=1
6M_supp=1
12M_supp=1
MaxTsdr_9.6=60
MaxTsdr_19.2=60
MaxTsdr_93.75=60
MaxTsdr_187.5=60
MaxTsdr_500=100
MaxTsdr_1.5M=150
MaxTsdr_3M=250
MaxTsdr_6M=450
MaxTsdr_12M=800
Bitmap_Device="DP_NORM"
;
; Slave-Specification:
Auto_Baud_supp=1
Min_Slave_Intervall=2
Max_Diag_Data_Len=7
Slave_Family=0
Max_Module=0
Max_Input_Len=8
Max_Output_Len=8
Max_Data_Len=16
;
; UserPrmData: Length and Preset:
User_Prm_Data_Len=0
;
; <Module-Definition-List>
```

```
Module = " 8 Bytes In/Out cons."
0x97,0xA7
EndModule
```

If communication cannot be established with Vblh_021.gsd,use the Revision Vblh_020.gsd code presented in Table12-8. This code uses more memory and limits the number of slaves the Master can access. However, it may work for some older Master devices that do not function with Revision 1.

Table 12-8. Revision 0 GSD Code (Vblh_020.gsd)

```
;=======================
; GSD-file for  BLH GSD Rvision 0
; Stand : 01/05/04
;=======================
;
#Profibus_DP
;
;
;Instrument Identification
;
Vendor_Name = "BLH"
Model_Name = "LCt Profibus Slave"
Revision = "Version 1.0"
Ident_Number = 0x086B
Protocol_Ident = 0
Station_Type = 0
FMS_supp = 0
Hardware_Release = "1.0"
Software_Release = "1.00"
;
;
;Baudrates
;
9.6_supp = 1
19.2_supp = 1
93.75_supp = 1
187.5_supp = 1
500_supp = 1
1.5M_supp = 1
3M_supp=1
6M_supp=1
12M_supp=1
;
;
;Maximum responder time for baudrates
;
MaxTsdr_9.6 = 60
MaxTsdr_19.2 = 60
MaxTsdr_93.75 = 60
MaxTsdr_187.5 = 60
MaxTsdr_500 = 100
MaxTsdr_1.5M = 150
MaxTsdr_3M = 250
MaxTsdr_6M = 450
MaxTsdr_12M = 800
;
Redundancy = 0
Repeater_Ctrl_Sig = 2
24V_Pins = 0
;
;
;Slave specific data
;
Freeze_Mode_supp = 0
Sync_Mode_supp = 0
Auto_Baud_supp = 1
Set_Slave_Add_supp = 0
User_Prm_Data_Len = 0
;
; Default user parameter string
;User_Prm_Data = 0x00 ;# of defaults
specified here must match # specified
for
Maximum length of user paramter data
Min_Slave_Intervall = 2
Modular_Station = 0
Max_Input_Len = 8
Max_Output_Len = 8
Max_Data_Len = 16
;
Module = " 4/4 Bytes In & 4/4 bytes
Out"
0x93, 0x93, 0xA3, 0xA3
EndModule
```

SECTION 13. DeviceNet Protocol

This chapter defines the optional DeviceNet interfaceas it pertains to LCt-104 instruments. DeviceNet is alow cost industrial network designed to easily connectup to 64 "cell" type devices to a PLC/PC. Informationin this section defines the LCt-104 DeviceNet registerallocations and interface instructions.

13.1 THE INTERFACE DEFINED

13.1.1 General ODVA DeviceNet Description

DeviceNet is one of the world's leading device-level networks for industrial automation. In fact, more than 40% of end users surveyed by independent industry analysts report choosing DeviceNet over other networks. DeviceNet offers robust, efficient data handling becauseit is based on Producer/Consumer technology. This modern communications model offers key capabilitiesthat allow the user to effectively determine what information is needed and when. Users also benefit fromODVA's strong conformance testing policies, whichensure that products are interoperable. As a result,users can mix-and-match products from a variety of suppliers and integrate them seamlessly.

NOTE: ODVA stands for Open DeviceNet Vendor Association. For all specifications, wiring, power, cable lengths, etc., please access the ODVA web site. Reference: Specifications DeviceNet Volume II, release 2.0 (latest release), web address: http://www.odva.org

13.1.2 LCt-104 DeviceNet Interface Description

The LCt-104 DeviceNet interface uses vendor supplied product technology. This product has passed the compliance specifications set forth by ODVA and is registered with them (ODVA) by the vendor. BLH embeds this product in the LCt-104 to communicate tension and parameter data to a connected device. BLH is registered with ODVA as Vendor #661.

13.2 INTERFACE WIRING

Figure 13-1 depicts the LCt-104 rear panel DeviceNetconnector. Each unit has a DeviceNet compatiblesealed micro connector. Make connections in accordance with pinouts as shown.

13.3 LED STATUS INDICATION

Two bicolor (red/green) LED indicators are mountedbeside the network connector (Figure 13-1). The upperLED indicates LCt-104 status while the lower LED displays the DeviceNet Network Status. If an LED is flashing, the nominal flash rate is 500ms ON, and 500msOFF.

13.3.1 LCt-104 Status

The upper (LCt-104 status) LED indicator flash sequences are defined in the following Table:

LED Status	LCp-1 04 Network Status
Off	No Power
Flashing Red	Recoverable configuration fault (invalidfirmware, OEM data, or personality data)
Solid Red	Hardware error
Flashing Green	No errors, client interface is not open
Solid Green	No errors, client interface is active
Red/Green	Configuration mode

13.3.2 DeviceNet Network Status

The lower (network status) LED indicator flash sequences are defined in the following Table:

LED Status	DeviceNet Network Status
Off	No Power
Flashing Red	I/O connection in timed-out state or otherrecoverable fault
Solid Red	Unrecoverable fault

Flashing Green	Device is online but has no connections
Solid Green	Device online with established connections
Red/Green	Device is in communication faulted state and responding to an identify communication faulted request

13.4 LCt-104 MENU CHANGES

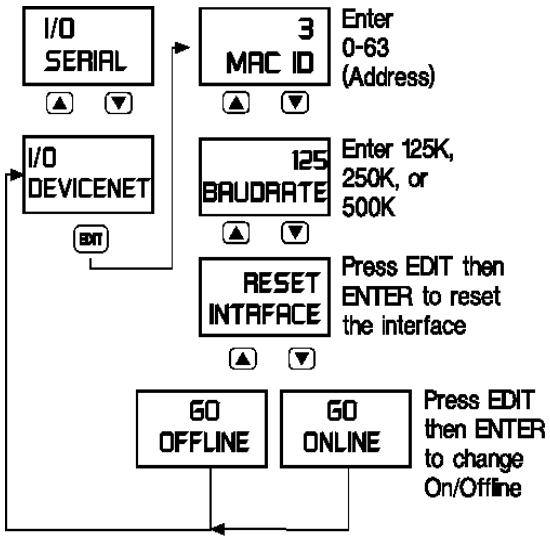
With the DeviceNet option installed, parameter selections change in several menus. These changes override definitions and selections presented in earlier chapters of this manual. The following pages discuss specific changes to several menus.

13.4.1 I/O Menu Changes

With DeviceNet installed, other expansion slot A interfaces are disabled. Figure 13-2 shows the modified I/O menu with DeviceNet available rather than Modbus Plus, Allen-Bradley Remote I/O, or Profibus. Baud rates, address selections, and commands can be selected though the front panel display under the I/O DeviceNet menu. Baud rate selection must be identical to the master control setting. The Mac ID address must be uniquely different from all other nodes. Additional DeviceNet selections allow individual units to be reset or taken off-line.

NOTE: Go commands can be used if an operator wants to change settings on the LCt-104 and does not want invalid data to be sent to the master controller. Also if a customer wants to change baud rate or Mac id, the LCt-104 must be off line.

NOTE: Upon power up the LCt-104 will attempt to link to a master host.



Reset: This command is a hard reset of the DeviceNet interface. Reset also transpires during power up.

Go online: This command can be issued from the LCt-104 to instruct the DeviceNet interface to initiate communication with a master.

Go offline: This command can be issued from the LCt-104 to instruct the DeviceNet interface to stop communication with a master.

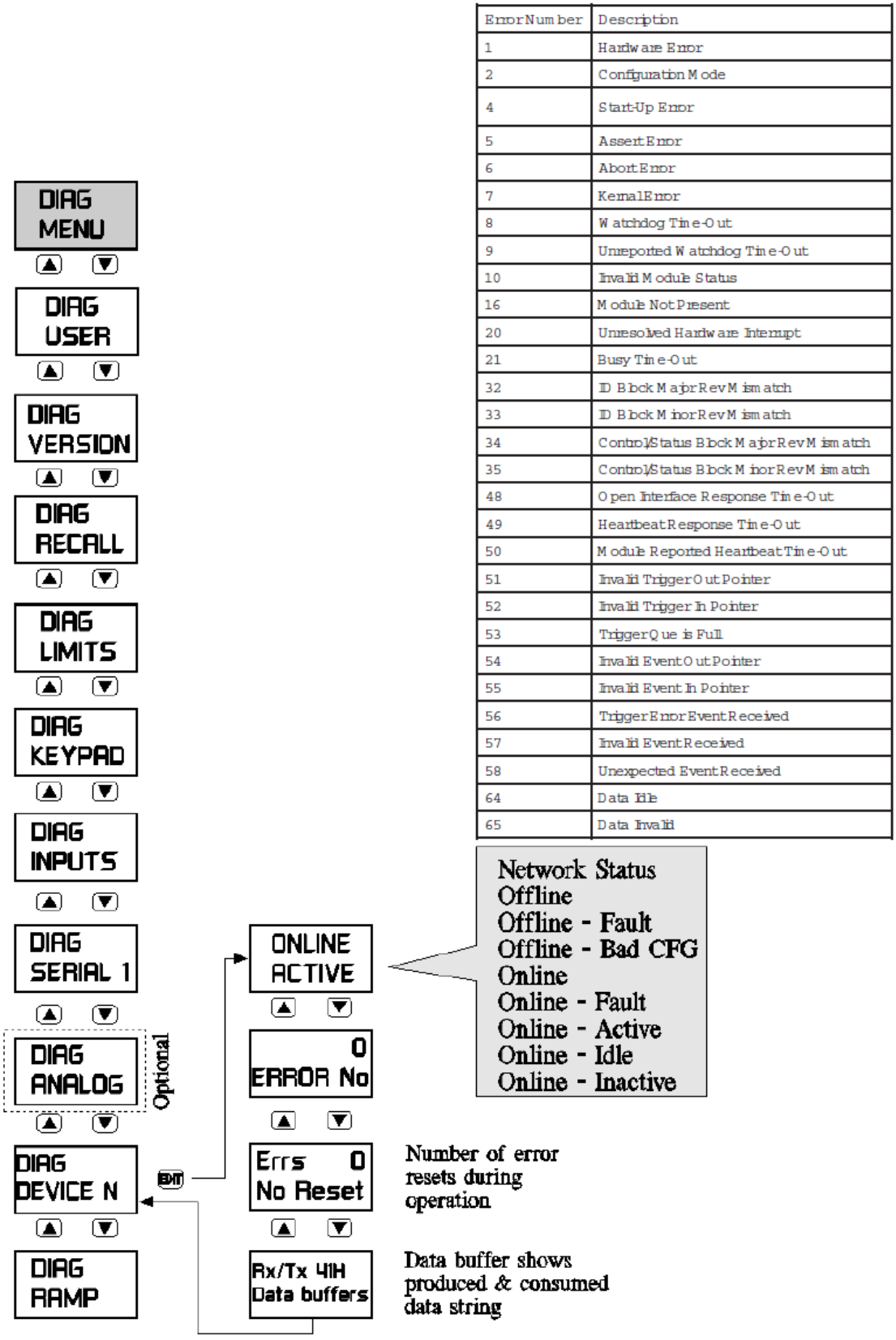
Figure 13-2. I/O Menu Changes

13.4.2 Diagnostic Menu Changes

Figure 13-3 presents changes to the diagnostic menu. Two added features define DeviceNet errors if they occur and current online/offline status.

13.4.3 Display Menu Changes

See Figure 13-4 for alarm annunciator changes. The DeviceNet selection allows the lower rear panel network status LED activity to be mirrored on one of the eight front panel annunciators. Behavior of this LED is network specific and defined in Figure 13-4.



Error Number	Description
1	Hardware Error
2	Configuration Mode
4	Start-Up Error
5	Assert Error
6	Abort Error
7	Kernal Error
8	Watchdog Time-Out
9	Unreported Watchdog Time-Out
10	Invalid Module Status
16	Module Not Present
20	Unresolved Hardware Interrupt
21	Busy Time-Out
32	ID Block Major Rev Mismatch
33	ID Block Minor Rev Mismatch
34	Control/Status Block Major Rev Mismatch
35	Control/Status Block Minor Rev Mismatch
48	Open Interface Response Time-Out
49	Heartbeat Response Time-Out
50	Module Reported Heartbeat Time-Out
51	Invalid Trigger Out Pointer
52	Invalid Trigger In Pointer
53	Trigger Que is Full
54	Invalid Event Out Pointer
55	Invalid Event In Pointer
56	Trigger Error Event Received
57	Invalid Event Received
58	Unexpected Event Received
64	Data Idle
65	Data Invalid

Figure 13-3. Diagnostic Menu Changes.

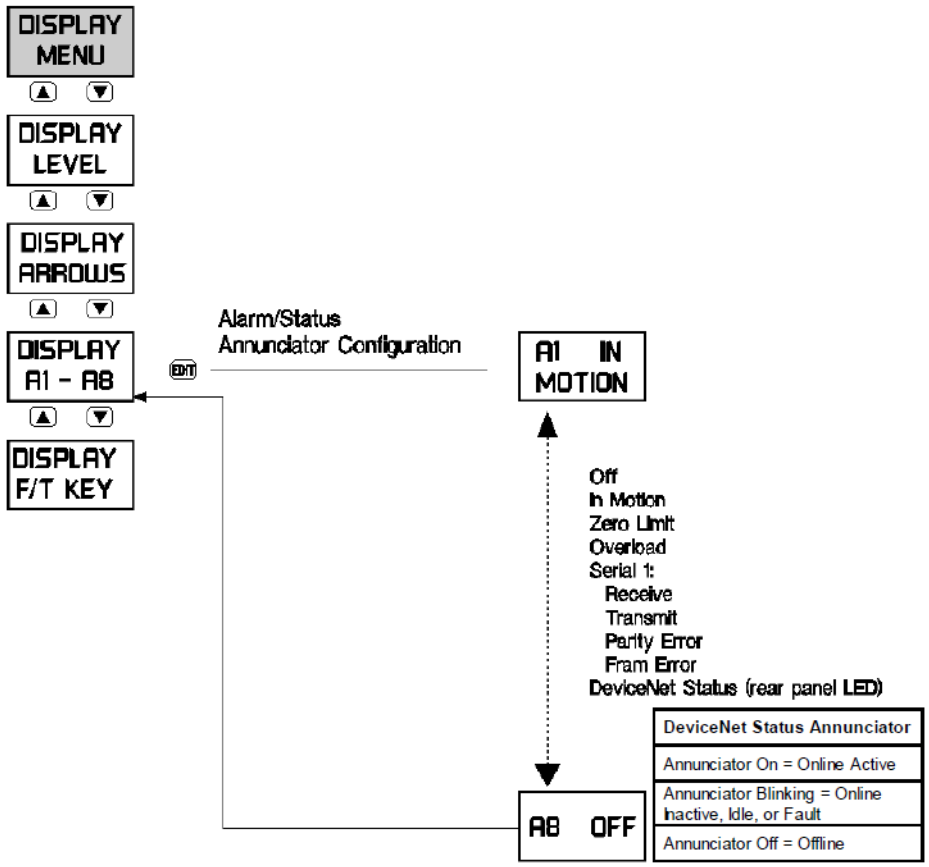


Figure 13-4. Display Menu Changes

13.5 DATA EXCHANGE FORMATS

LCt-104 DeviceNet input and output data formats consist of up to 8 bytes each as shown in Table 13-1, each grouping of two bytes constitutes one 16-bit word.

Table 13-1. Data Exchange Formats

Input data format							
msg#	Data-ID	status		data low		data high	
Word 1		Word 2		Word 3		Word 4	
byte1	byte2	byte3	byte4	byte5	byte6	byte7	byte8
Output data format							
msg#	Data ID	command		data low		data high	
Word 1		Word 2		Word 3		Word 4	
byte1	byte2	byte3	byte4	byte5	byte6	byte7	byte8

13.5.1 Produced Data (LCt-104 Transmission)

The input data string is transmitted by the LCt-104 tothe requesting master device. Each string consists ofeight bytes and breaks down as follows:

Byte 1. Message #: Message # is an echo of the first byte of the outputdata string (transmitted by the master). This is usedby the master for data transfer verification.

Byte 2. Input data ID: Data ID code as shown in Table 13-4.

Bytes 3 & 4. Status: The LCt-104 operating status, each bit of the word made up of bytes 3 & 4 represents specific operating status.The descriptions of the bits are in Table 13-2. Bits 0 - 7are in Byte 3, bits 8 - 15 are in Byte 4.

Bytes 5 - 8 (Words 3 & 4). Input data: These two words contain the actual tension value (low word and then high word). Word 3, low word, is a 16 bitsigned integer -32768 to 32767 with byte 5 being thelow byte. Word 4, high word, is a 16 bit signed integertimes 32768 with byte 7 being the low byte. If word 3 = 2 and word 4 = 1 the total data value would be 32770 (2+ 32768).

Table 13-2. Status Word Definitions

Status Word					
Bit Description		Decimal Point Position			
0	Decimal Point Position A	C	B	A	Position
1	Decimal Point Position B	0	0	0	0
2	Decimal Point Position C	0	0	1	0.0
3	Powering up or Linking to Jbox	0	1	0	0.00
4	Motion	0	1	1	0.000
5	Zero successful	1	0	0	0.0000
6	Angle ref successful	1	0	1	0.00000
7	Unable to Zero/Angle	1	1	0	0.000000
8	Status register one				
9	Status register two		Display Data		
10	Status register three		B	A	Display
11	Status register four		0	0	Force
12	Display A		0	1	Angle
13	Display B		1	0	Tension
14	Download address error		1	1	Spare
15	Download data error				

13.5.2 Consumed Data (LCt-104 Receive)

Output data is transmitted to the LCt-104 by the requesting master. It consists primarily of command andID data. ID data is defined in Table 13-4. Each stringconsists of eight bytes and breaks down as follows:

Byte 1. Message #: Any number between O and 255 generated by the master and copied by the LCt-104 into the first byteof the input string. This is for host data transfer verification.

Byte 2. Output data ID: When the DeviceNet master issues a download command, it must include the output data ID and the output data as well. Byte 2 of the DeviceNet output provides output data ID code as shown in Table 13-4.

Bytes 3 & 4 (Word 2). Command: This command word is used by DeviceNet master to control LCt-104 (as a slave). The meanings of commands are shown in Table 13-3.

Bytes 5 - 8 (Words 3 & 4). Output Data: The third and forth words of the DeviceNet output are low word and high word of the actual download data.Word 3, low word, is a 16 bit signed integer -32768 to32767. Word 4, high word, is a 16 bit signed integer times 32768. See example in Inputs Words 3 & 4 definition. See Table 5 for ID codes and definitions of writable data.

Table 13-3. DeviceNet Master Command List

DeviceNet Interface Commands	
Command ID	Description
0	Null Command
1	Switch to Force
2	Switch to Angle
3	Switch to Tension
4	Zero Force Weight
5	Acquire Ref Angle
6	Download Data
7	Clear Status Errors

Data sequence format:

Bytes 5 - 8 (Words 3,7 & 4,8). Input Data: Byte 5 swaps with byte 6 & byte 7 swaps with byte 8.

Bytes 5 - 8 (Words 3,7 & 4,8). Output Data: Byte 5swaps with byte 6 & byte 7 swaps with byte 8.

STANDARD format is Byte 5 low and byte 6 high, byte 7 low and byte 8 high.

SWAPPED format is Byte 5 high and byte 6 low, byte7 high and byte 8 low.

NOTE: ASCII data and some bit data are not reversible. Ex. Set point output name... See register Tables fordetails

Table 13-4. DeviceNet Data Identification Codes

	Decimal	Hex	DeviceNet Data ID Codes			
Type	ID Code		Data	Words	Description	can be swapped
System	0	0	Status 1&2	2	System status registers 1 & 2 (see description)	no
System	1	1	Status 3&4	2	System status registers 3 & 4 (see description)	no
Operate	2	2	Force	2	Current Total Force Data	yes
Operate	3	3	Tension	2	Current Total Tension Data	yes
Operate	4	4	Angle	2	Current Angle data	yes
Arrow K	5	5	mV/V vertical	2	mV/V average signal V1 or V1 + V3	yes
ArrowK	6	6	mV/V horizon	2	mV/V average signal H2 or H2 + H4	yes
Indv K	7	7	Gross Cell 1	2	Gross data from channel one without crosstalk	yes
Indv K	8	8	Gross Cell 2	2	Gross data from channel two without crosstalk	yes
Indv K	9	9	Gross Cell 3	2	Gross data from channel three without crosstalk	yes
Indv K	10	0A	Gross Cell 4	2	Gross data from channel four without crosstalk	yes
Indv K	11	0B	Gross cell 1	2	Gross data from channel one with crosstalk	yes
Indv K	12	0C	Gross cell 2	2	Gross data from channel two with crosstalk	yes
Indv K	13	0D	Gross cell 3	2	Gross data from channel three with crosstalk	yes
Indv K	14	0E	Gross cell 4	2	Gross data from channel four with crosstalk	yes
Indv K	15	0F	mV/V cell 1	2	mV/V data from channel 1	yes
Indv K	16	10	mV/V cell 2	2	mV/V data from channel 2	yes
Indv K	17	11	mV/V cell 3	2	mV/V data from channel 3	yes
Indv K	18	12	Mv/v cell 4	2	mV/V data from channel 4	yes
Indv K	19	13	Peak ID11|0B	2	Peak total channel 1	yes
Indv K	20	14	Peak ID12|0C	2	Peak total channel 2	yes
Indv K	21	15	Peak I3|0D	2	Peak total channel 3	yes
Indv K	22	16	Peak I4|0E	2	Peak total channel 4	yes
Indv K	23	17	% load cell 1	1	If one HTU V1, If two HYU's V1	yes
Indv K	24	18	% load cell 2	1	If one HTU H1, If two HYU's V3	yes
Indv K	25	19	% load cell 3	1	If one HTU none, If two HYU's H2	yes
Indv K	26	1A	% load cell 4	1	If one HTU none, If two HYU's H4	yes
N/A	27	1B	Spare	1	Spare	n/a
N/A	28	1C	Spare	1	Spare	n/a
N/A	29	1D	Spare	1	Spare	n/a
N/A	30	1E	Spare	1	Spare	n/a

Table 13-4. DeviceNet Data Identification Codes (cont.)

	Decimal	Hex	DeviceNet Data ID Codes			
Type	ID Code		Data	Words	Description	can be swapped
Diag M	31	1F	Spare	1	Spare	n/a
Diag M	32	20	Spare	1	Spare	n/a
Diag M	33	21	Spare	1	Spare	n/a
Diag M	34	22	Spare	1	Spare	n/a
Diag M	35	23	deadload 1	1	Acquire deadload channel 1	yes
Diag M	36	24	deadload 2	1	Acquire deadload channel 2	yes
Diag M	37	25	deadload 3	1	Acquire deadload channel 3	yes
Diag M	38	26	deadload 4	1	Acquire deadload channel 4	yes
Diag M	39	27	Zero cell 1	2	Acquired zero data for channel one	yes
Diag M	40	28	Zero cell 2	2	Acquired zero data for channel two	yes
Diag M	41	29	Zero cell 3	2	Acquired zero data for channel three	yes
Diag M	42	2A	Zero cell 4	2	Acquired zero data for channel four	yes
Diag M	43	2B	Angle refer	2	Acquired angle reference	yes
Diag M	44	2C	Angle diff	2	Difference live reference angles	yes
Diag M	45	2D	Spare	2	Spare	yes
Diag M	46	2E	Spare	2	Spare	yes
Diag M	47	2F	Serial number	2	7 Digit number in decimal format *	no
Diag M	48	30	Software ver	1	3 Digit number in decimal format *	no
Diag M	49	31	Ref date	2	6 Digit number in decimal format *	no
Diag M	50	32	Zero total	2	Zero data total if Downloaded Zero data	yes
Diag M	51	33	Spare	2	Spare	yes
Diag M	52	34	Zero limit	2	Zero total limit allowed	yes
Diag M	53	35	Overload limit	2	Overload total limit allowed (if zero = no overload protection)	yes
Diag M	54	36	Spare	1	Spare	yes
Diag M	55	37	Filter averaging	1	Filter setting (off, 1-12 decimal)	yes
Filter M	56	38	Filter band	1	Filter setting band (0-off, 1-100 decimal)	yes
Diag M	57	39	Motion band	1	Motion setting (off, 1-58 decimal)	yes
Diag M	58	3A	Motion timer	1	Motion timer setting 0-4 sec (0-7 decimal)	yes
Teni M	59	3B	Autowrap	2	off = 0, on=1	yes
Spnt K	60	3C	Set point 1	2	Set point one main value	yes

Table 13-4. DeviceNet Data Identification Codes (cont.)

	Decimal	Hex	DeviceNet Data ID Codes			
Type	ID Code		Data	Words	Description	can be swapped
Spnt K	61	3D	Set point 2	2	Set point two main value	yes
Spnt K	62	3E	Set point 3	2	Set point three main value	yes
Spnt K	63	3F	Set point 4	2	Set point four main value	yes
Spnt K	64	40	Set point 5	2	Set point five main value	yes
Spnt K	65	41	Set point 6	2	Set point six main value	yes
Spnt K	66	42	Set point 7	2	Set point seven main value	yes
Spnt K	67	43	Set point 8	2	Set point eight main value	yes
I/O M	68	44	Inflight 1	1	Infight one value	yes
I/O M	69	45	Inflight 2	1	Infight two value	yes
I/O M	70	46	Inflight 3	1	Infight three value	yes
I/O M	71	47	Inflight 4	1	Infight four value	yes
I/O M	72	48	Inflight 5	1	Infight five value	yes
I/O M	73	49	Inflight 6	1	Infight six value	yes
I/O M	74	4A	Inflight 7	1	Infight seven value	yes
I/O M	75	4B	Inflight 8	1	Infight eight value	yes
I/O M	76	4C	Tag id 1	2	Tag low (4 ASCII char) , { 31-39, 41-5A, 20 & 2D hex)	no
I/O M	77	4D	Tag id 1	2	Tag high (4 ASCII char)	no
I/O M	78	4E	Tag id 2	2	Tag low (4 ASCII char)	no
I/O M	79	4F	Tag id 2	2	Tag high (4 ASCII char)	no
I/O M	80	50	Tag id 3	2	Tag low (4 ASCII char)	no
I/O M	81	51	Tag id 3	2	Tag high (4 ASCII char)	no
I/O M	82	52	Tag id 4	2	Tag low (4 ASCII char)	no
I/O M	83	53	Tag id 4	2	Tag high (4 ASCII char)	no
I/O M	84	54	Tag id 5	2	Tag low (4 ASCII char)	no
I/O M	85	55	Tag id 5	2	Tag high (4 ASCII char)	no
I/O M	86	56	Tag id 6	2	Tag low (4 ASCII char)	no
I/O M	87	57	Tag id 6	2	Tag high (4 ASCII char)	no
I/O M	88	58	Tag id 7	2	Tag low (4 ASCII char)	no
I/O M	89	59	Tag id 7	2	Tag high (4 ASCII char)	no
I/O M	90	5A	Tag id 8	2	Tag low (4 ASCII char)	no
I/O M	91	5B	Tag id 8	2	Tag high (4 ASCII char)	no
Diag M	92	5C	User tag	2	User tag 3 digits high (same as set point ASCII)	no
Diag M	93	5D	User tag	2	User tag 4 digits low (same as set point ASCII)	no

	Decimal	Hex	DeviceNet Data ID Codes			
Type	ID Code		Data	Words	Description	can be swapped
Display	94	5E	Control data	1	Control data for lower & upper display messaging	no
Display	95	5F	Upper display	2	Upper display first 4 chars (ASCII) * see note	no
Display	96	60	Upper display	2	Upper display last 3 chars (ASCII)	no
Display	97	61	Lower display	2	Lower display first 4 chars (ASCII)	no
Display	98	62	Lower display	2	lower display last 4 chars (ASCII)	no

FOR DISPLAY MESSAGING:

REGISTER 94 CONTROL I f bit 0 = 1 apply data in registers 95&96 to upper display

if bit 1 = 1 apply data in registers 97&98 to lower display

if bit 2 = 1 & bit 0 = 1 flash the upper display

if bit 3 = 1 & bit 1 = 1 flash the lower display

if bit 4 = 1 keep display on until this bit is written again as “0” bits 5-7 are spares, set to zero

bits 8-15 are the display timer, each increment adds 50 msec i.e. 00000001 = 50msec timer; 0000010 = 100 msec timer

Note: For display messaging all following hex code are acceptable.

30 - 7A (hex) numbers and letters or symbols, also space 20H or minus 2DH

Note: Messaging will only display if LCt-104 is in operating display mode. (no menu routines)

Table 13-5. DeviceNet Status Registers 1 and 2

	DeviceNet Status Register #1	
BIT	NAME	Definition
0	spare	
1	spare	
2	spare	
3	Lost zero	Checksum error @ power up
4	No mv/v cal	Checksum error @ power up
5	No engineering cal	Checksum error @ power up
6	No temperature cal	Checksum error @ power up
7	EEPROM error	Error writing EEPROM
8	Comm power fault	Serial output - power supply fault
9	spare	
10	spare	
11	spare	
12	Analog #1 open	Open connection
13	Analog #2 open	Open connection
14	Analog #3 open	Open connection
15	Analog #4 open	Open connection

	DeviceNet Status Register #2	
BIT	NAME	Definition
0	A/d overrange channel cell 1	Signal greater than A/D range
1	A/d overrange channel cell 2	Signal greater than A/D range
2	A/d overrange channel cell 3	Signal greater than A/D range
3	A/d overrange channel cell 4	Signal greater than A/D range
4	spare	
5	spare	
6	spare	
7	spare	
8	Excitation open channel cell 1	Load cell not connected
9	Excitation open channel cell 2	Load cell not connected
1 0	Excitation open channel cell 3	Load cell not connected
1 1	Excitation open channel cell 4	Load cell not connected
1 2	Excitation Low channel cell 1	Check cell for shorts
1 3	Excitation Low channel cell 2	Check cell for shorts
1 4	Excitation Low channel cell 3	Check cell for shorts
1 5	Excitation Low channel cell 4	Check cell for shorts

Table 13-6. DeviceNet Status Registers 3 and 4

	DeviceNet Status Register #3	
BIT	NAME	Definition
0	Overload limit cell 1	Cell overload value has been exceeded
1	Overload limit cell 2	Cell overload value has been exceeded
2	Overload limit cell 3	Cell overload value has been exceeded
3	Overload limit cell 4	Cell overload value has been exceeded
4	Zero limit cell 1	Cell zero limit has been exceeded
5	Zero limit cell 2	Cell zero limit has been exceeded
6	Zero limit cell 3	Cell zero limit has been exceeded
7	Zero limit cell 4	Cell zero limit has been exceeded
8	Analog #1 underrange	Weight data below analog output range
9	Analog #1 overrange	Weight data above analog output range
10	Analog #2 underrange	Weight data below analog output range
11	Analog #2 overrange	Weight data above analog output range
12	Analog #3 underrange	Weight data below analog output range
13	Analog #3 overrange	Weight data above analog output range
14	Analog #4 underrange	Weight data below analog output range
15	Analog #4 overrange	Weight data above analog output range

	DeviceNet Status Register #4	
B IT	NAME	Definition
0	Output # 1	Set point is on if bit = ' 1 '
1	Output #2	Set point is on if bit = ' 1 '
2	Output #3	Set point is on if bit = ' 1 '
3	Output #4	Set point is on if bit = ' 1 '
4	Output #5	Set point is o n if bit = ' 1 '
5	Output #6	Set point is o n if bit = ' 1 '
6	Output #7	Set point is o n if bit = ' 1 '
7	Output #8	Set point is o n if bit = ' 1 '
8	Input # 1	Input is activated if bit = ' 1 '
9	Input # 2	Input is activated if bit = ' 1 '
1 0	Input # 3	Input is activated if bit = ' 1 '
1 1	Input # 4	Input is activated if bit = ' 1 '
1 2	spare	
1 3	spare	
1 4	spare	
1 5	spare	

13.6 DeviceNet EDS FILE

An Electronic Data Sheet (EDS) is a simple file format that includes the device's configurable parameters and public interfaces to those parameters. It provides user-friendly configuration tools that can be easily updated without having to constantly revise the configuration software tool. EDS files are used by network toolsto read or set device parameters. Table 13-7 presentsthe simple EDS file code used for the LCt-104.

Table 13-7. Actual EDS File Code

```
$ DeviceNet Electronic Data Sheet
$ Electronic Data Sheet generated using SST
EDS Editor

[File]
        DescText = “Weight/Rate Transmitter eds
file”;
        CreateDate = 11-16-00;
        CreateTime = 11:19:02;
        ModDate = 01-18-01;
        ModTime = 09:48:45;
        Revision = 1.0;
[Device]
        VendCode = 661;
        VendName = “ BLH”;
        ProdType = 12;
        ProdTypeStr = “Communication Adapter”;
        ProdCode = 1;
        MajRev = 1;
        MinRev = 1;
        ProdName = “LCt-series”;
        Catalog = “”;
[IO_Info]
        Default = 0x0001;
        PollInfo = 0x000D, 1, 1;
        COSInfo = 0x000D, 1, 1;
        CyclicInfo = 0x000D, 1, 1;
        Input1=
        8, 0, 0x000D,
        “input1”,
        2, “61 49”,
        “”;
        Output1=
        8, 0, 0x000D,
        “output1”,
        2, “61 4F”,
        “”;
[ParamClass]
[Params]
[EnumPar]
[Groups]
```

BLH NOBEL

A VPG Brand

blhnobel.com