WEIGH SYSTEMS TECHNOLOGY

VISHAY PRECISION GROUP

BLH

LCp-400
System Network Controller
Operator's Manual

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Doc 35124

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Appendix - LCp-400 Outline and Wiring Drawings

SECTION 1. Introduction

1.1 PRODUCT DESCRIPTION

The LCp-400 Gate-Weigh (Figure 1-1) is a multi-scale local area network controller and communication gateway. This network bridge device uses BLH Digi-System Plus network communication technology to continuously scan up to 16 weigh system nodes and may be equipped with an Allen-Bradley Remote I/O, Modbus Plus, or Modbus RTU network port interface.

The LCp-400 is a centralized scanning terminal that displays weight and status information from any node on the network. Currently the LCp-400 Digi-System Plus network is compatible with the LCp-100 Indicator/Transmitter, LCp-200 Indicator Controller, Baldwin 2010 Controller, and Baldwin 2020 Indicator/Controllers.

1.1.1 Digi-System Plus Network

The BLH Digi-System Plus network is a self configuring, enhanced RS-485 based communication link that operates at up to 57.6 KBPS over distances of up to 4000 feet. Any node detected is automatically linked into the network without operator intervention. Operationally, the LCp-400 scans each node on the network continuously and updates internal register locations with current weight, diagnostic, and status data. Through the gateway port (optional), a host PLC, PC, or DCS can perform read/write commands to retrieve data without polling and response delays typical in other multi-drop network arrangements.

1.1.2 Digi-System Plus Network Scanning

LCp-400 scanning allows a single operator to monitor each weigh system node on the Digi-System Plus Network. Pressing the right and left scan keys causes the LCp-400 to increment or decrement through subsequent node addresses. Scanning is a 'view-only' function. Units purchased without a PLC interface ('NONE' selected for expansion slot A) function in scan mode only.

1.1.3 PLC Gate-Weigh Interfacing

LCp-400 units typically function as transparent multiplexers allowing a single PLC to monitor, control, and manipulate up to 16 independent weigh systems (nodes). Read and write data packets sent by the PLC are routed by the LCp-400 to the appropriately addressed node. Node responses received by the LCp-400 are transmitted directly to the host PLC/DCS device.

1.2 ALLEN-BRADLEY REMOTE I/O

The Allen-Bradley Remote I/O interface is a communication link that supports remote, time critical I/O control communications between a master processor and a remote I/O slave. It is typically used to transfer I/O bit images between the master and slave. The LCp-400 represents a quarter (1/4) rack of discrete I/O with 32 bit input and output image files to the scanning PLC. Image tables communicate weight data and status information from the addressed network node to the PLC in the shortest time possible.

Figure 1-1. Model LCp-400 Gate-Weigh Controller

Block data transfers gather data from all nodes simultaneously on a less time critical basis. Block transfer data registers are customer configurable for maximum network efficiency. See Section V for further details.

1.3 MODBUS PLUS NETWORK

MODBUS Plus protocol allows the LCp-400 to communicate on a peer-to-peer network link with Modicon 984 and Quantum PLC devices. See Section VI for a full description of this interface.

1.4 MODBUS RTU PROTOCOL

Modbus is often recognized as an industry standard method of digital communication protocol between a master or host computer and a slave device. This protocol was originally developed by Modicon to communicate discrete and analog information between a PLC and a master host. As implemented in the LCp400, this protocol efficiently communicates weight and status information from each network node to a Modbus Master driver equipped host. See Section VII for operating procedures.

1.5 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. For Div. 2 hazardous locations, units are available with FM approval as a non-incendive device. For Division 1 hazardous locations, explosion proof or purged enclosures are available.

1.6 LCp-400 SPECIFICATIONS

Display

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

Environment

Operating Temp	-10 to 55 °C(15 to 131°F)
Storage Temp	-20 to 85°C (-5 to 185°F)
Humidity	5 to 90% rh non-condensing
Voltage	117/230 Vac +/-15% @ 50/60 Hz
Power	15 watts max

Enclosure

Dimensions (std)	4.63 x 8.40 x 6.5 in. HWD
NEMA 4/4X, 12	8.5 x 13.5 x 10.45 in. HWD

Materials

Aluminum Case and Bezel	overlay meets 94V-0 rating

BLH Digi-System Plus Network

Serial RS-485	two wire
Baud Rates	9600, 28800 or 57600
Protocol	proprietary
Addressing	up to 16 nodes

Gateway Interfaces

Allen-Bradley	Remote I/O - 1/4 logical rack
Modbus Plus	peer-to-peer
Modbus RTU	LCp-400 = slave device

Approvals

FM (Factory Mutual)	3611 (Class I, II, III; Div.1,2; Groups A-G)
CSA	C22.2 (Class I, II,III; Div.1,2; Groups A-G)

1.7 ORDERING INFORMATION

LCp-400 [M] - [AP] - [C] - [B] LAN Controller/GateWeigh

[M] MOUNTING
- [1] NEMA4X PANEL MOUNT
- [2] #1 & FM/CSA DIVISION 2 APPROVAL (CLI, Div 2, GRP A-D, F,G)
- [5] NEMA 4X STAINLESS STEEL WALL MOUNT ENCLOSURE
- [6] #5 & FM/CSA DIVISION 2 APPROVAL (CLI, II, Div 2, GRP A-D, F,G)
- [13] #6 with TYPE Y PURGE SUITABLE FOR DIV.1 AREAS

[A] EXPANSION SLOT A
- [1] NONE
- [2] RS232/422 GATEWEIGH PORT WITH MODBUS RTU SLAVE PROTOCOL
- [3] MODBUS PLUS GATEWEIGH PORT
- [4] ALLEN BRADLEY REMOTE I/0 GATEWEIGH PORT

[P] PROCESS INPUTS & OUTPUTS
- [1] REMOTE FUNCTION INPUT (zero, gross/net, tare, print)

[C] COMMUNICATION
- [1] BLH DIGI-SYSTEM PLUS NETWORK

[B] EXPANSION SLOT B
- [1] NONE

1.8 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.

1.9 FIELD ENGINEERING SERVICES

Improper LCp-400 installation or operation may result in equipment damage. Please follow instructions carefully. BLH will not accept any liability for faulty installation and/or misuse of this product. Authorized BLH Field Service Engineers are available around the world to install LCp-400 calibrator systems and/or train factory personnel to do so. The field service department at BLH is the most important tool to assure the best performance from your application.

Factory: (Main Number)

(781) 298-2200

Southwest: (281) 655-5041

Midwest: (614) 476-6453

Canada: (416) 251-2690

or (800) 567-6098 toll free

SECTION 2. Installation

2.1 INTRODUCTION

This chapter provides LCp-400 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 Standard Unit Mounting

Standard LCp-400 controllers are shipped with the necessary hardware for panel mounting. Outline and panel cutout dimensions are depicted in Figure 2-1.

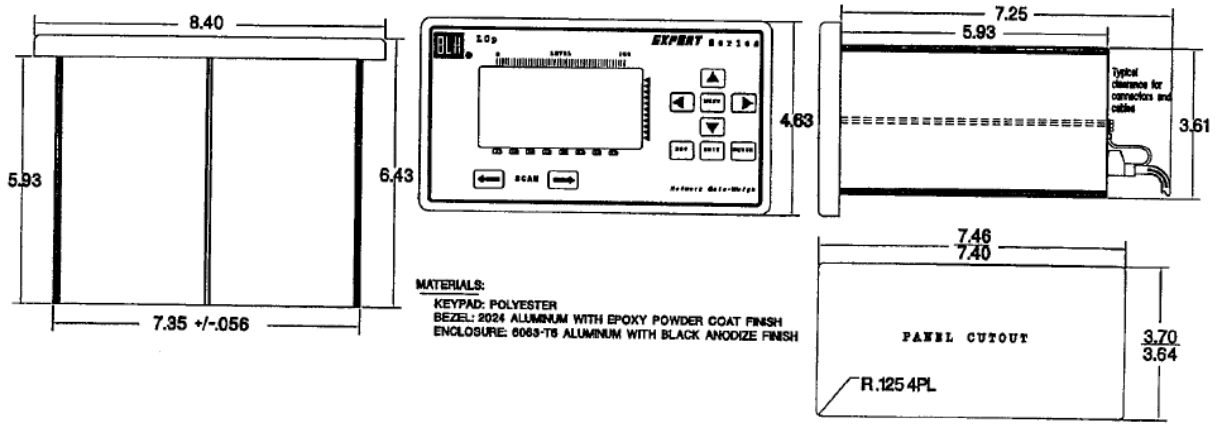


Figure 2-1. LCp-400 Panel Mount Outline

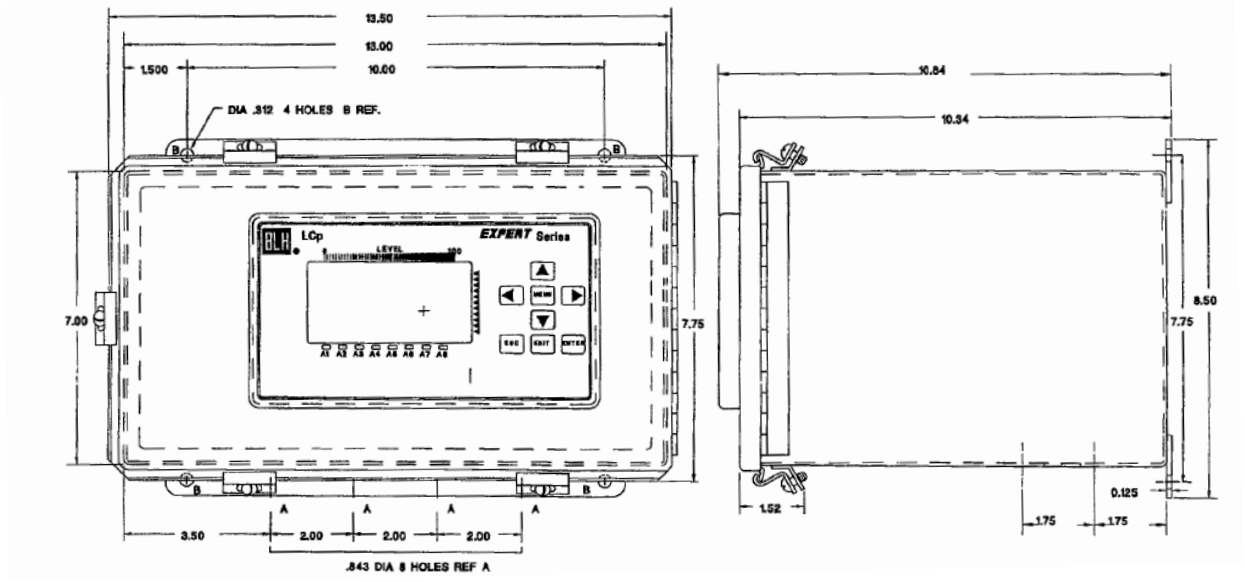


Figure 2-2. LCp-400 NEMA Enclosure Outline.

2.2.2 Optional NEMA 414X Enclosures

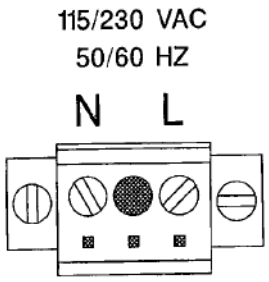
NEMA 4 and 4X enclosures are equipped with four pre-punched holes for mounting to a wall or bracket. A U-bolt can be used for mounting to a pipe support. The enclosure should be installed in a vibration free environment close to the load cell summing junction box. If conduit is used to shield interconnecting cables, drains should be provided to reduce the possibility of condensate entering the enclosure. Outline dimensions for NEMA 4/4X enclosures are presented in Figure 2-2.

2.3 ELECTRICAL CONNECTIONS

Electrical connections consist of ac power, the Digi-System Plus Network loop, and a host PLC interface (Allen-Bradley Remote I/O, Modbus Plus, or Modbus RTU).

2.3.1 Mains (ac) Power

LCp-400 instruments are shipped ready to operate at 115 VAC (50 or 60 Hz). For 220 VAC operation, remove the rear panel and change the internal voltage selection switch as shown in Figure 2-4.



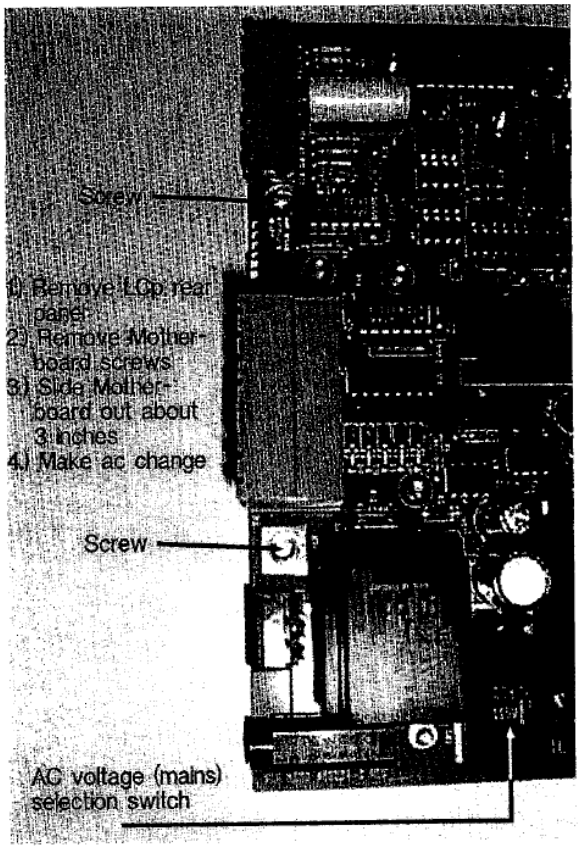


Figure 2-4. Mains (ac) Power Connector & Selection Switch.

2.3.2 Digi-System Network Connections

The Digi-System Plus Network operates with an RS-485 format requiring a single twisted pair of conductors. Figure 2-5 depicts Digi-System wiring arrangements for LCp-100/ 200 and Baldwin 2020 instruments. Baldwin 2010 wiring is shown in Figure 2-6 (next page). Wiring between nodes and the controller is done in parallel at distances of up to 10,000 feet. The two-wire communication connection is made at the serial port connector on the back panel of the instrument. The female mating connector (supplied) has screw terminals for a single twisted pair of 20 to 24 gage communication wire. Wire must be supplied by the installer (Belden # 9501 recommended).

NOTE: All LCp-100/200 and Baldwin 2020 nodes must have DIP Switch SW1 positions 1 -4

set to the ON position (Figure 2-4). The first and last nodes on the network must have position 5 set to ON to connect integral termination resistors. All in-between nodes must have switch position 5 set to OFF for proper operation.

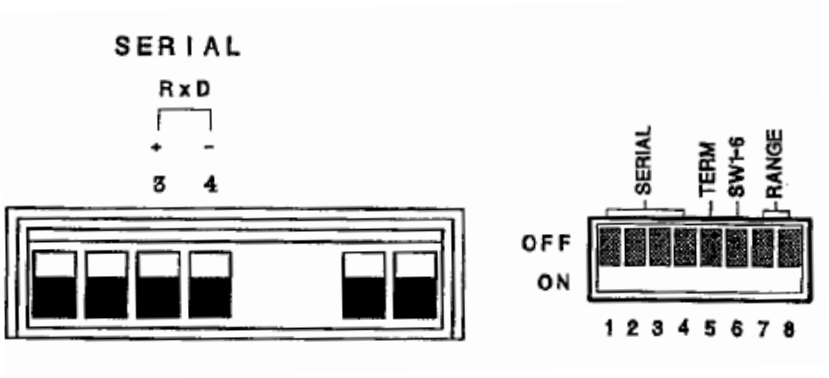


Figure 2-4. Digi-System Plus Serial Connector.

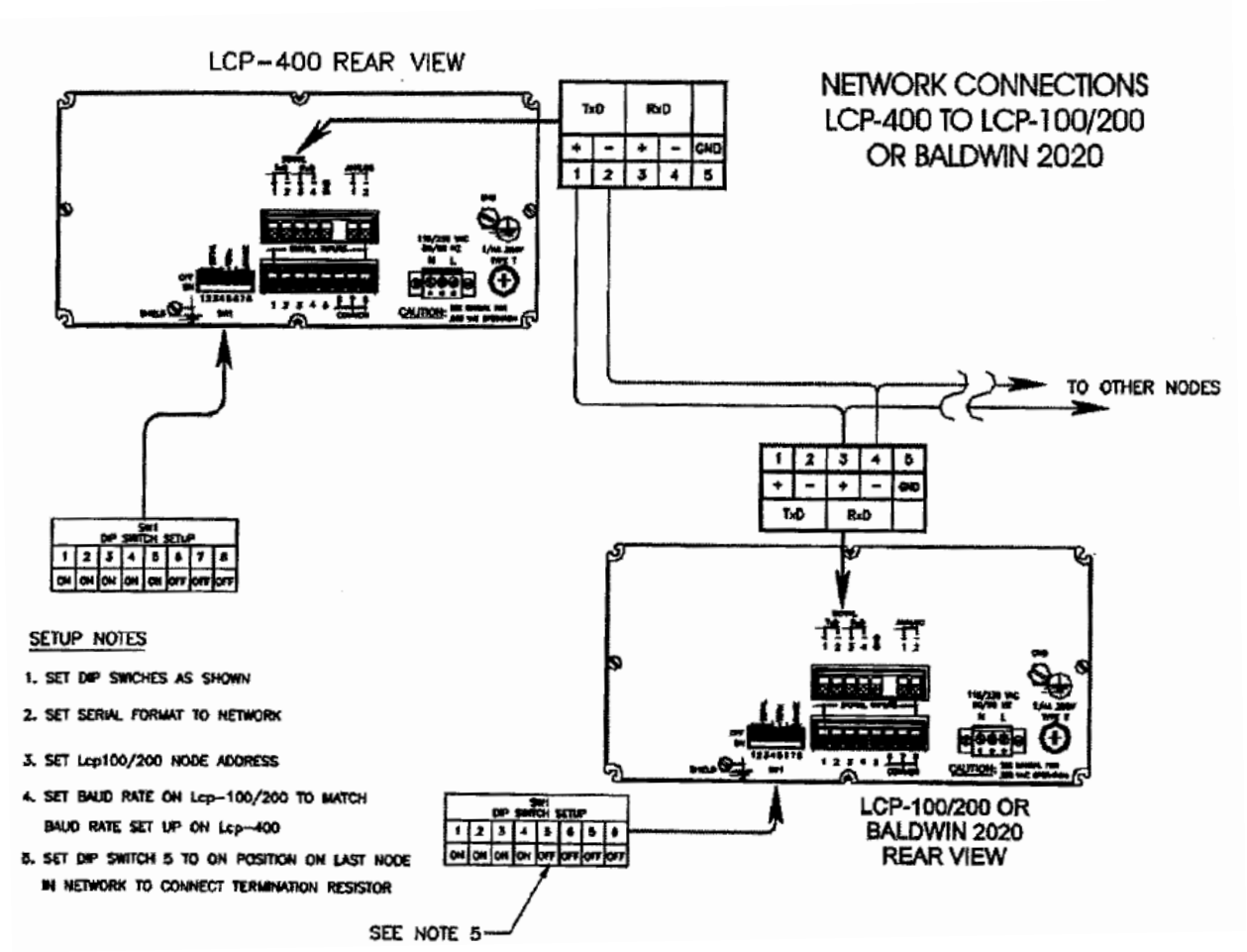


Figure 2-6. Digi-System Plus Wiring Configuration.

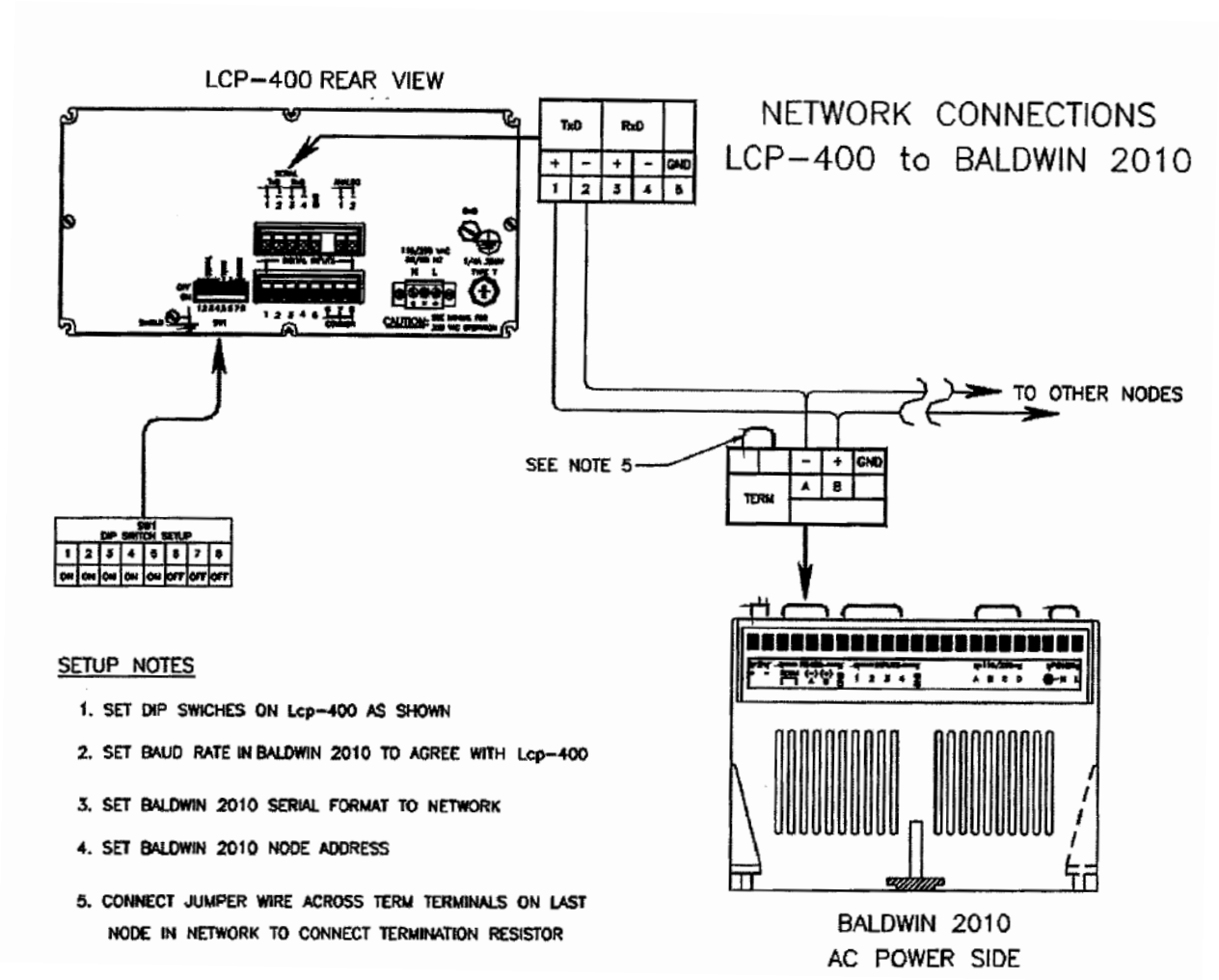


Figure 2-6. Model 2010 Digi-System Wiring Diagram.

2.3.3 Allen Bradley Remote I/O

Units ordered with the Allen-Bradley remote I/O option have a 3-socket mating half connector for the REMOTE VO port. Wiring designations are presented in Figure 2-3 and Table 2-1. Section V presents a complete description of the Allen-Bradley interface.

NOTE: Termination resistors are not supplied by BLH.

Table 2-1. Remote I/O Interface Connections.

Remote I/O Interface		
Pin Name	Function	Terminating Resistor
1	Blue	See Chart Below
Shield	(Wire Braid)	
2	Clear	
Gd	Chassis Ground	
Install termination resistor only if the LCp-400 is at the end of the communication cable	Baud	Resistor
	57.6K	150 ohms
	115.2K	150 ohms
	230.4K	82 ohms

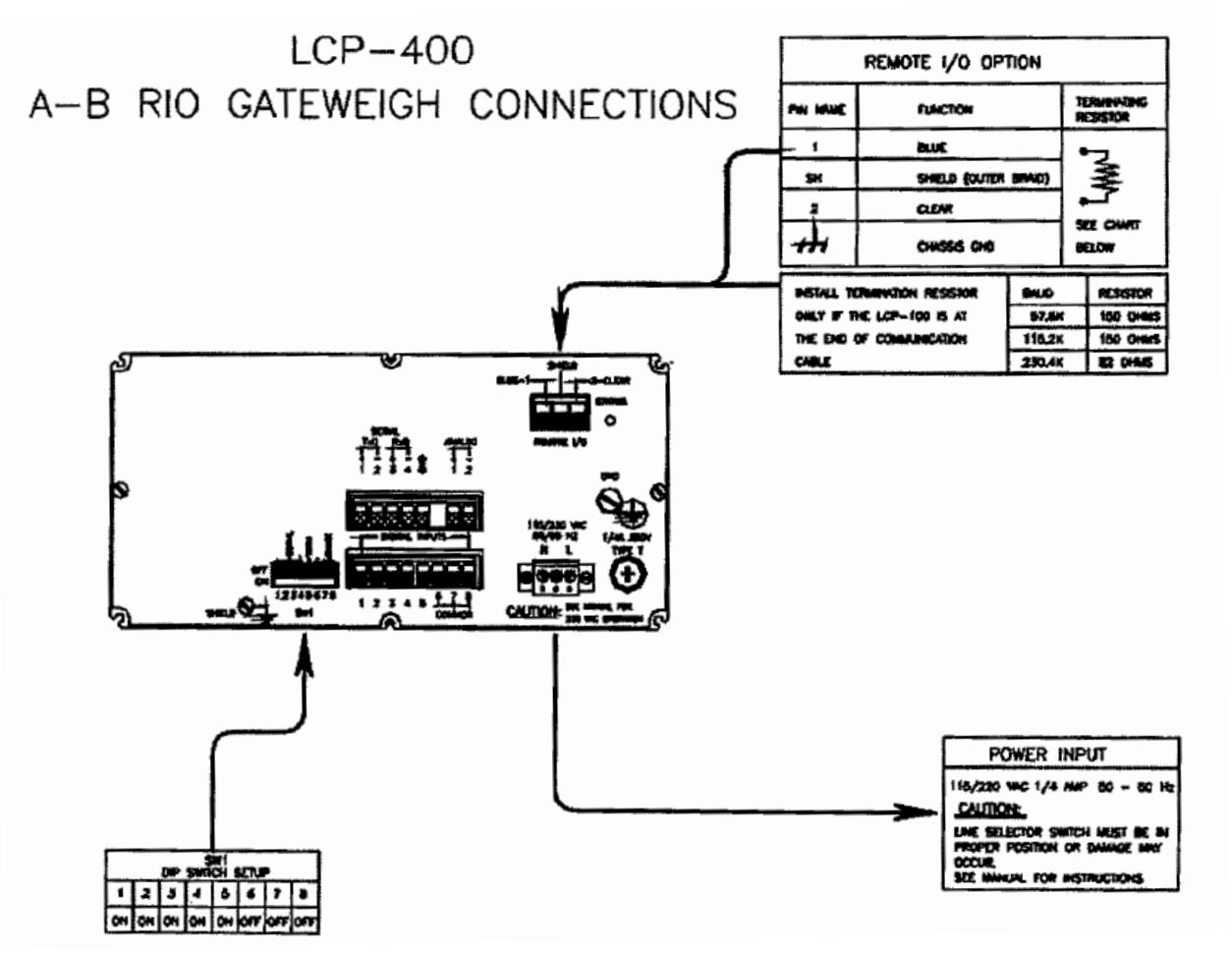


Figure 2-7. Remote I/O Wiring Diagram.

2.3.4 Modbus Plus

Units shipped with the Modbus Plus interface have a custom rear panel with a specific 9-socket, D-type Modbus Plus Connector (see Figure 2-3). This connector mates with an ASA Modicon AS-MKT-085 9-pin, D-type connector. BLH recommends using ASA Modicon number 490NAA27101 shielded cable for interconnect wiring.

Instructions for assembling an AS-MKT-085 based connector cable are located in the `MODBUS PLUS Network Planning and Installation Guide' (#GM-MBPL001) available from the AEG Schneider Corporation.

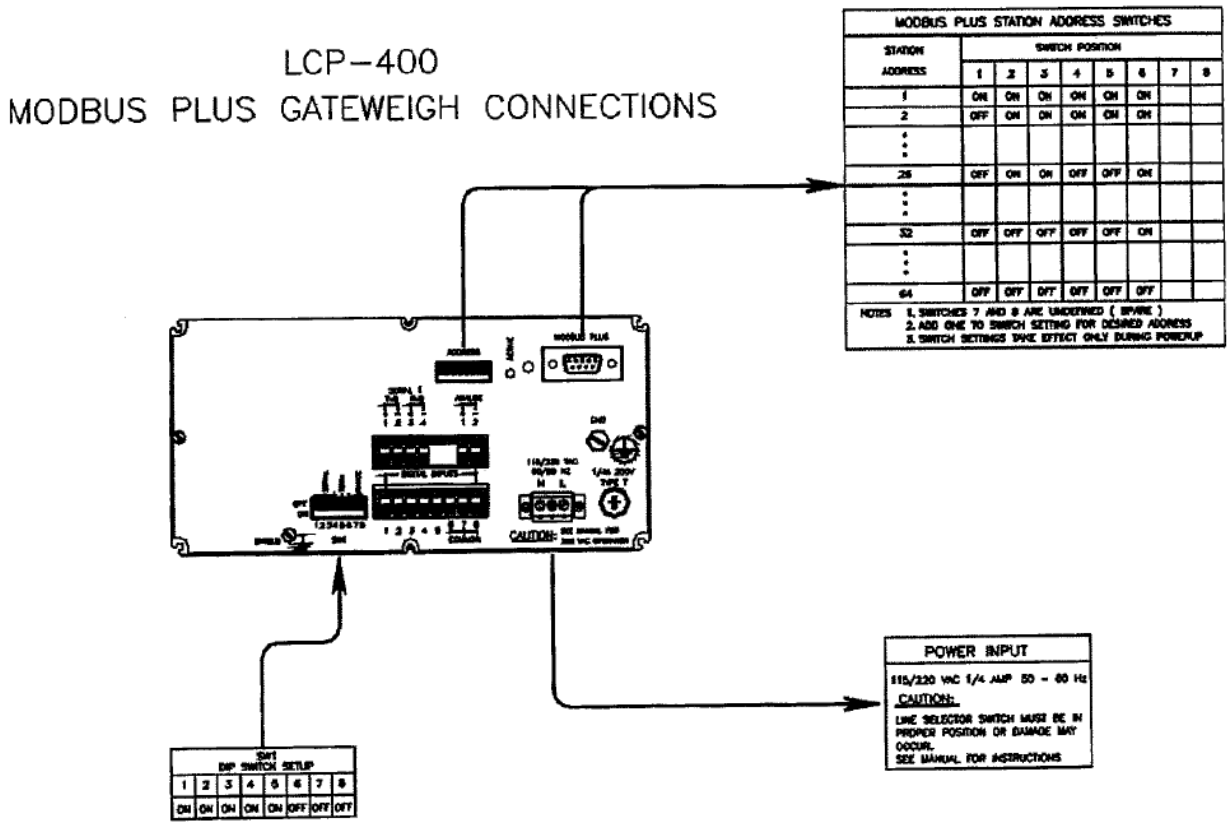


Figure 2-8. Modbus Plus Wiring Diagram.

2.3.5 Modbus RTU

Units shipped with the Modbus RTU interface have a custom rear panel with a specific 3-pin connector (mating half supplied). Make wiring connections in accordance with Figure 2-9. See Section VII for full details of the Modbus RTU interface.

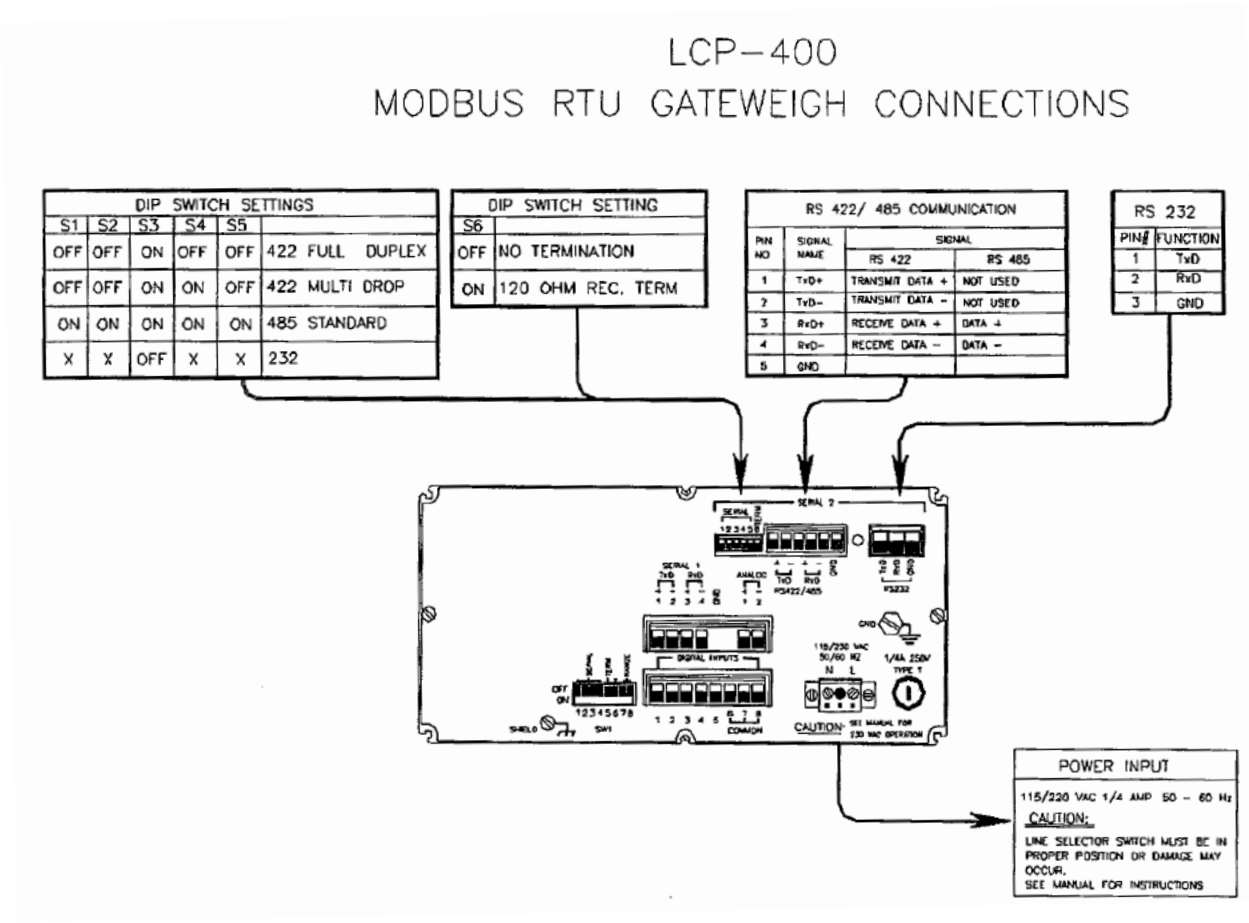


Figure 2-9. Modbus RTU Wiring Diagram.

SECTION 3. Configuration

After installation, configuration is the next step in preparing the LCp-400 for operation. Figure 3-1 (next page) presents an overall configuration flow diagram. After a brief explanation of node auto-linking (paragraph 3.1), paragraphs in this Section will follow the sequence of Figure 3-1 by explaining each menu in turn. Configuration parameters are entered easily using the front panel display and the configuration keys. Key functions are defined on individual flow diagrams.

NOTE: If no PLC option board is installed in expansion slot 'A', PLC related menus and functions will be skipped over during configuration.

3.1 NODE AUTO-LINKING

Individual nodes that are sequentially addressed and wired according to Figure 2-6 will automatically be detected by the LCp-400. No enable/disable signals or switches are required. Consult the node operator's manual to confirm or change an address.

3.2 THE NETWORK MENU

The first menu, Network, allows the selection or alteration of the Digi-System Plus Network baud rate (data communication speed). The LCp-400 selection must match that of all other nodes on the network (LCp-100/ 200, Model 2020, or Model 2010 transmitters). In virtually all cases the optimum selection is 57,600 baud. In applications with a large number of nodes spread out over a long distance (4000-ft.), slower rates of 28,800 or 9600 may have to be used. Select 9.6, 28.8, or 57.6 Kbaud as shown in Figure 3-2.

3.3 DISPLAY ANNUNCIATORS

Use the Display Menu to configure the eight front panel alarm/status annunciators. Annunciators provide on-going system diagnostic information. Each annunciator can be configured to represent 1 of 4 standard conditions; OFF (no function), network communication transmit, network communication receive, network NAK (negative acknowledge), and various other PLC functions based upon option board installed. Once configured as A1-A8, vacuum fluorescent segments will be illuminated when configured condition is true. Configure each annunciator consecutively as shown in Figure 3-3.

NOTE: All LCp and Baldwin nodes must have different address values (i.e. 1-16). If two or more nodes have the same address, the network will not function properly. Consult device operator's manual for address selection/alteration.

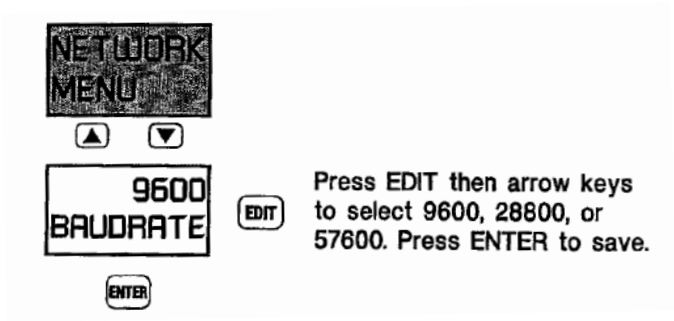


Figure 3-2. Network Baud Rate Selection.

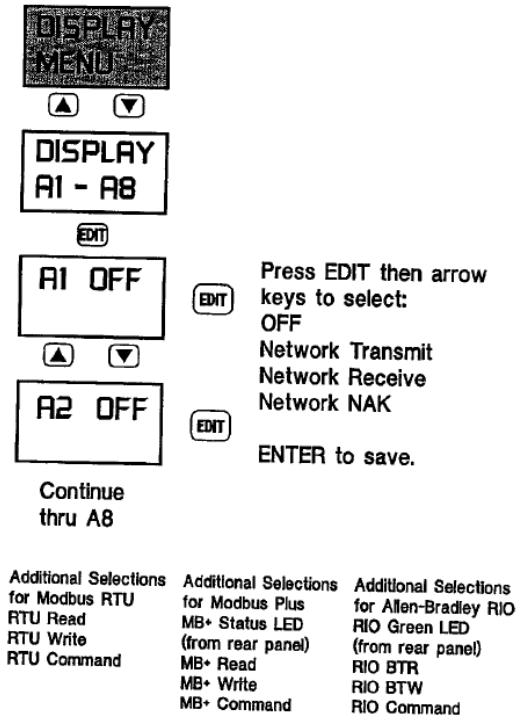
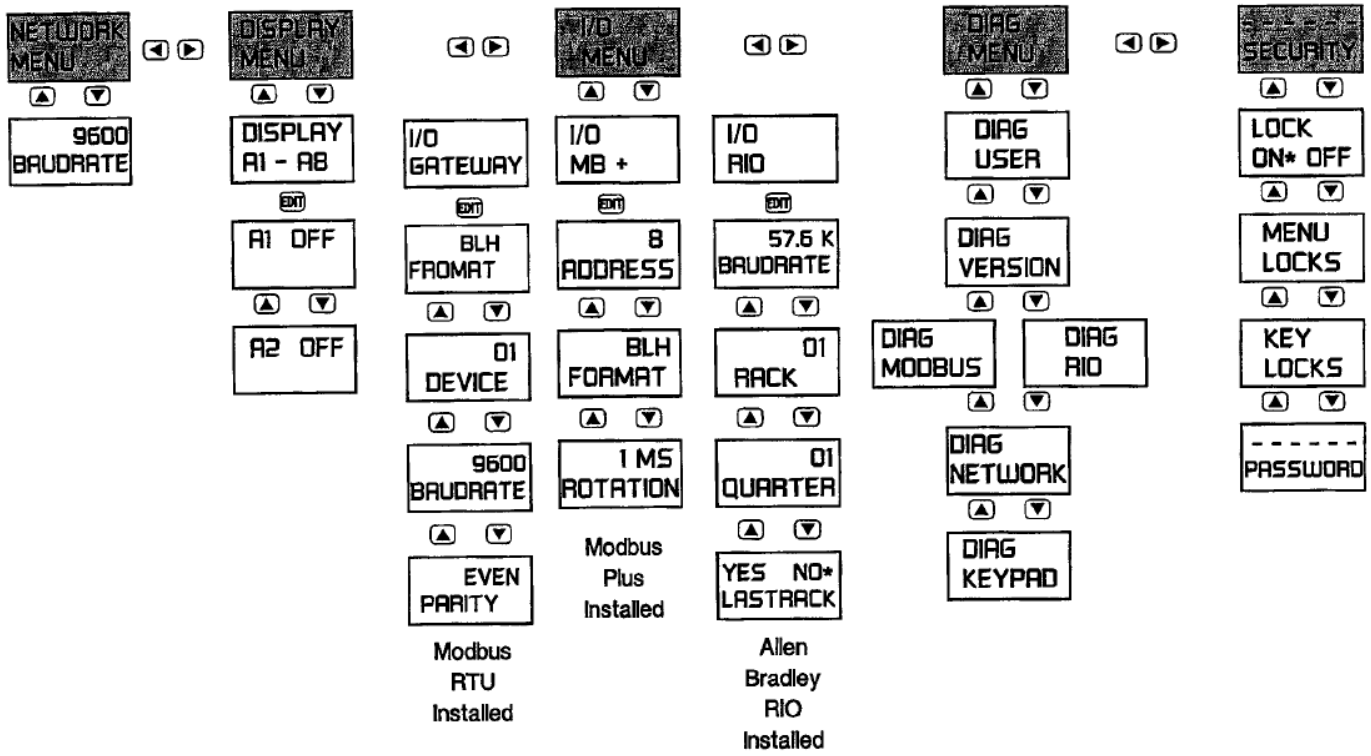


Figure 3-3. Display Annunciator Functions.

LCp-400 Main Configuration Flow Diagram



NOTE: PLC menus and functions will be skipped if the LCp-400 has no PLC option board installed. (i.e. in the ordering code, Expansion Slot 'A' = NONE)

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

Figure 3-1. Configuration Main Menu.

3.4 I/O SELECTIONS

The I/O menu takes one of three distinct paths de-pending upon which communication protocol is in-stalled. Figure 3-4 presents detailed explanations of all protocol paths. Select MB + for Modbus Plus, RIO for Allen-Bradley Remote I/O, or Gateway for Modbus RTU.

3.4.1 I/O Modbus Plus

With Modbus Plus protocol installed, three parameters determine operation (see Figure 3-4). A full definition of Modbus Plus is presented in Section VI.

Address (MB+)

Address is non-configurable from the front panel. It simply indicates that the Modbus Plus network has recognized the LCp-400 device at the designated address.

Address selections are made using the ADDRESS DIP switches on the LCp-400 rear panel. The LCp-400 may occupy any station address location from 1 to 64.

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

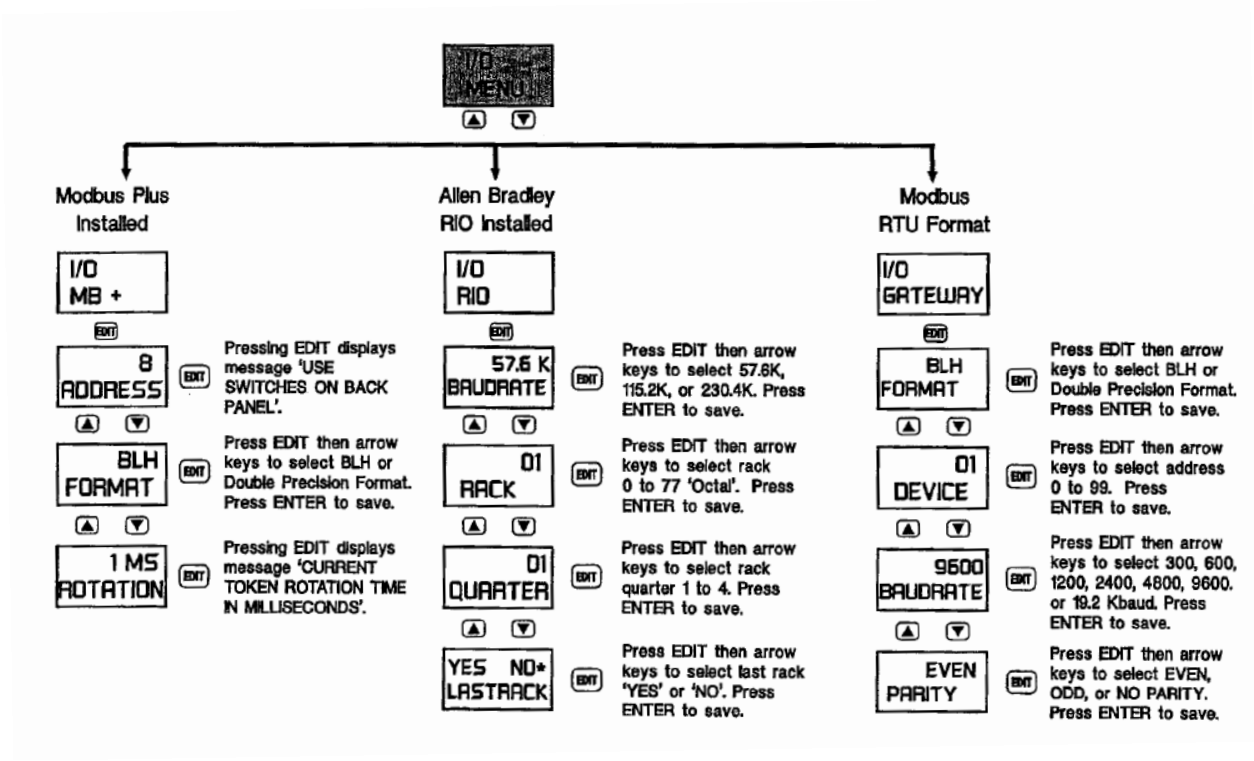


Figure 3-4. PLC Interface Selections.

Format (MB+) - BLH offers two data transfer format types, BLH and Double Precision. Both formats will be discussed in greater detail in Section VI. Users with systems achieving less than 32,768 counts will find the BLH format easier to work with since it requires only one register to convey data. Double Precision is available for users that need it.

Rotation (MB+) - Rotation is non-configurable. Rotation shows the time used for one complete token pass of all network nodes. Network timing should be 50 ms or less to ensure timely communication of all current node data.

3.4.2 Allen-Bradley Remote I/O

When Allen Bradley Remote I/O is installed, four parameters determine system operation.

Remote I/O interface details are presented in Section V. See Figure 3-4 flow diagram for baud rate, rack, quarter, and last rack parameter entries.

3.4.3 Modbus RTU

Modbus RTU data format (BLH or Double Precision), device address (0-99), baud rate, and parity are all selectable as defined in Figure 3-4. Section VII gives full details concerning the RTU interface.

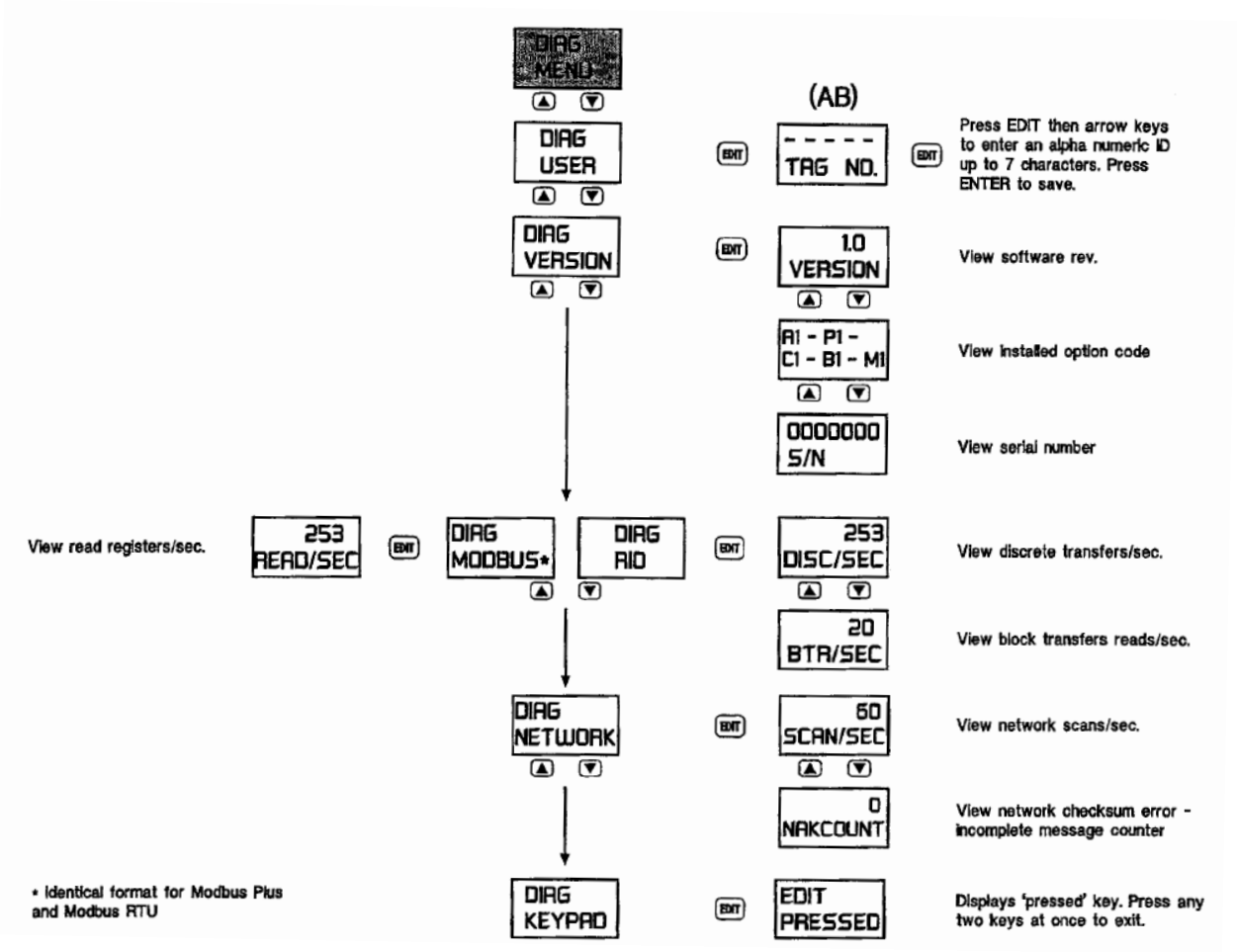


Figure 3-5. LCp-400 Diagnostic Menu.

3.5 DIAGNOSTIC MENU

LCp-400 diagnostics provide easy access to critical operating system data, and test verification procedures for many indicator functions. Figure 3-5 (preceding 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 communication functions.

3.5.1 Diagnostic User

Diagnostic user provides an alphanumeric register for entering a tag number (up to 7 characters).

3.5.2 Diagnostic Version

Diagnostic version provides the software version, the installed option code derived from the ordering specification, and the unit serial number.

3.5.3 Diagnostic I/O

Diagnostic I/O displays data transfer time factors to determine PLC interface efficiency. For Modbus Plus and Modbus RTU, registers read per second are shown. Remote I/O readouts show the number of discrete transfers and block transfers per second. Parameters displayed are read only and cannot be altered.

3.5.4 Network Diagnostics

Network diagnostics reveal the overall speed and efficiency of the Digi-System Network loop. Scans per second allow an operator to determine how frequently data from each node is updated and transferred to the host PLC. NAK counts alert system-operating personnel to faulty or incomplete node transmissions. Most parameters are for viewing only and cannot be changed. The only parameter that can be changed is the NAK counter which is reset by pressing EDIT then ENTER.

3.5.5 Front Panel Key Test

DIAG KEYPAD allows an operator to functionally test any/all LCp-400 front panel keys. Press any two keys simultaneously to exit.

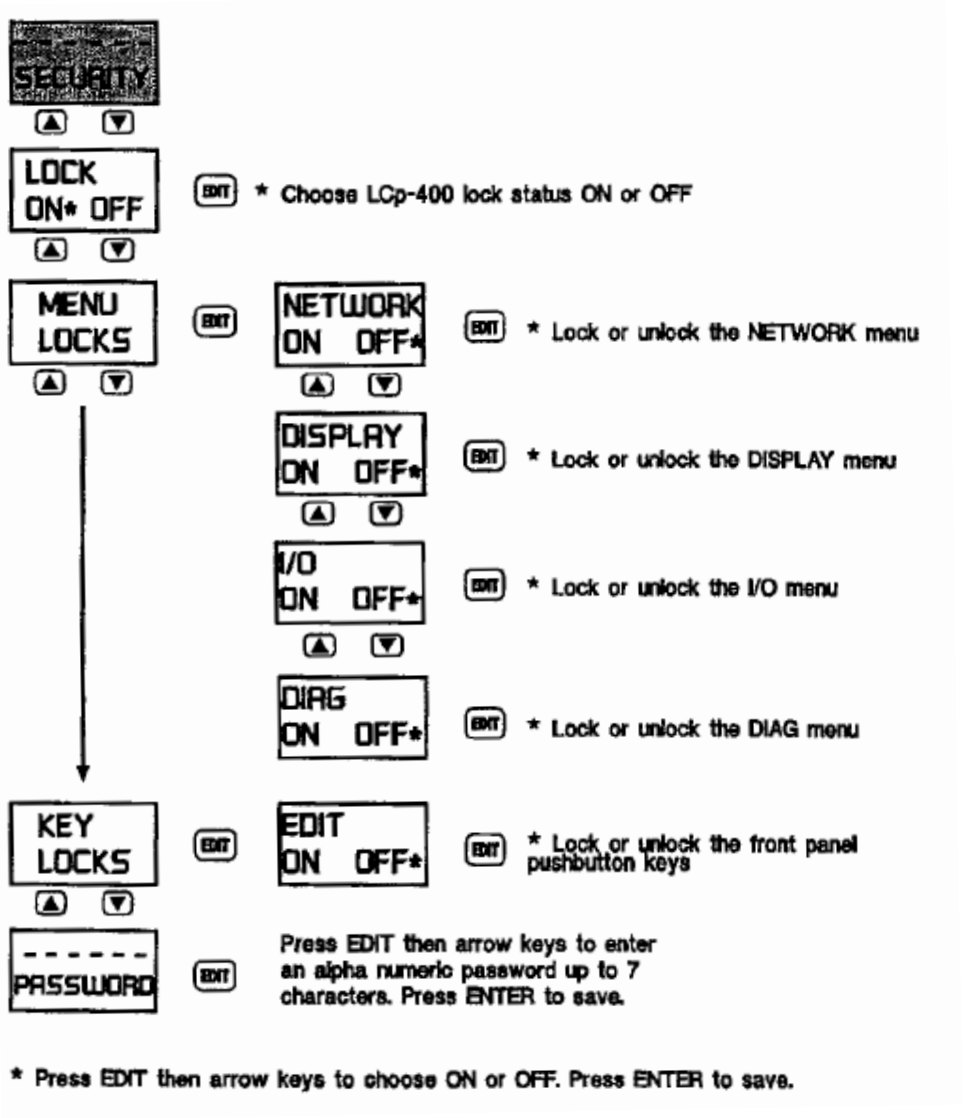


Figure 3-6. System Security Selections.

3.6 SYSTEM SECURITY

From password access to individually selectable menu and key 'locks', Safe-Weigh Software protects the entire gateway from overt tampering or accidental configuration alterations. Figure 3-6 presents the security menu flow diagram. Follow the procedures designated to secure as many parameters as desired.

3.6.1 Lock On/Off

Lock 'On' restricts access to the security menu and all other menus/keys designated as 'locked'. If locked, the designated password (see paragraph 3.5.4) must be entered to gain access to the security menu. Units are shipped with the lock 'OFF' to allow initial configuration without a password.

3.6.2 Menu Locks

Any or all of the LCp-400 main menus can be 'locked' to prevent parameter changes. To lock a menu, choose ON by pressing the EDIT and RIGHT arrow keys in sequence. Then press ENTER to store. Once a menu is designated as locked access to that menu is barred. To 'unlock' a locked menu, return to the security menu, enter the correct password, and change the status to OFF.

3.6.3 Key Locks

The LCp-400 front panel keypad can be 'locked' to prohibit key function. To lock the keypad, choose ON by pressing the EDIT and RIGHT arrow keys in sequence. Then press ENTER to store. Once locked, keys will not function when pressed. To 'unlock', return to the security menu, enter the correct password, and change the status to OFF.

3.6.4 Password Access

If lock ON is selected (paragraph 3.5.1), a password must be entered to regain access to the security menu. The following paragraphs explain how to select and enter a password. Once a password is chosen, it should be written down and stored in a confidential area

A password can be any combination of alphanumeric characters up to seven digits long. It is not necessary to use all seven digits. At the PASSWORD display, key in the designated characters using the arrow keys (LEFT/RIGHT to change digits, UP/DOWN to select character). When the password is correctly displayed, press ENTER to store.

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: 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.

Master Password:

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

SECTION 4. Network Scanning

4.1 Scanning Nodes

When used in scan mode, the LCp-400 allows the operator to view the front panel display of each node on the Digi-System Plus Network (Figure 4-1). The node address number is displayed along with the current weight/status information, lithe node is in a fault or error condition, the fault/error message will be displayed instead of weight/status. Consult the node operator's manual to determine the meaning of the fault/error message.

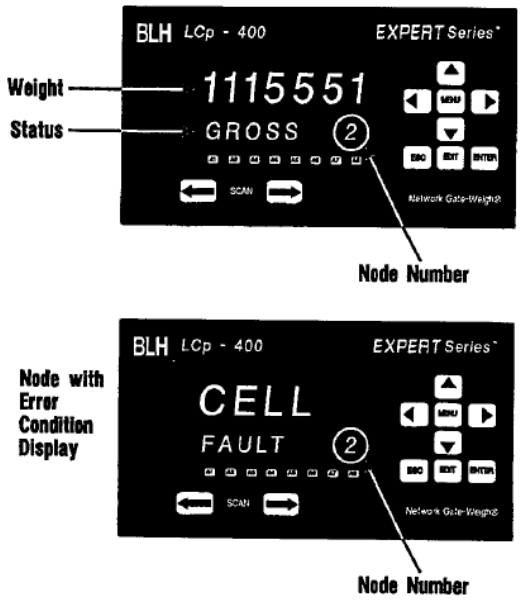


Figure 4-1. Node Display on LCp-400 Front Panel

To scan through the network, simply press the right and left scan keys (Figure 4-2). The right arrow key increments to the next addressed node while the left arrow key decrements to the previous node. A single operator using the LCp-400 scan mode can monitor up to 16 independent weigh systems.

NOTE: Scan mode is for node viewing only, functions/ parameters cannot be altered.

Figure 4-2. Front Panel Scan Control.

SECTION 5. Allen-Bradley Remote I/O

5.1 OPERATIONAL OVERVIEW

The Allen-Bradley Remote VO (RIO) interface is standard on many PLC-2, 3, and 5 series programmable logic controllers and optional on the SLCO5 controllers. The technology used in the interface and licensed by Allen-Bradley to BLH enables the LCp transmitter to communicate the weight and status information to the PLC as if it were a 1/4 rack of discrete VO. By using the standard RIO interface port and representing weight data as simple discrete I/O, a low cost reliable, easy to use, communication link between the PLC and network gateway is established. Live weight data from the addressed node is available through discreet transfers. If the value is less than 32,767, no conversions are necessary. For values greater than 32,767, PLC ladder logic instructions will convert image table data to floating point values. The LCp also supports block transfers of data. Using block transfers, the PLC can obtain all weight data from all nodes in a single transaction, if desired.

5.1.1 Configurations

One Quarter Rack. The LCp-400 is configured to act as 1/4 rack of VO using 2 input words and 2 output words in the PLC's I/O image table. LCp addressing supports rack addresses 0-77 (octal) and identification of position in rack (first — last quarter).

Discrete Transfer. Weight data and operating status information from the addressed node is transmitted continually through discrete transfers using the PLC's Remote I/O image table.

Block Transfer. Block data transfers are initiated by the PLC ladder logic program (BTR and BTVV instructions) to obtain weight and status data from any/all non-addressed nodes. Block transfers are controlled by discrete transfer data.

Word Integrity is Ensured. The LCp will 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.

Decimal point location. For both discrete and block transfers the decimal point location of the weight data is located in the node status register bits 0 - 2 (see Table 5-3). The binary value of bits 0 - 2 determines the decimal point location. 0 = no decimal point, 1 = 0.0, 2 = 0.00, 3 = 0.000, etc. Use the appropriate multiplier (0.1, 0.01, etc.) to convert the weight data to a floating-point value.

Units. Unit information is not supplied in the interface. The application must know whether the data is lb, kg, oz. etc.

5.1.2 Node Network Communication Error Count

There is a communication error counter for every node, which is incremented each time a network communication error occurs. There are 3 possible errors: (1) Checksum error, (2) Incomplete response, and (3) No response.

5.1.3 Network Nak Counter

This is not to be confused with the Node Network Communication error Counters. The Network Nak Counter is a global counter incremented every time there is a Checksum error or an Incomplete response in the network communications. This counter can be cleared (see paragraph 3.5.4) and is used primarily to monitor the extent of physical disturbances on network communication lines.

5.2 INTERFACE CONFIGURATION

Baud rate, rack address, starting quarter, and last rack designations are all configured through the LCp-400 I/ 0 sub-menu (Figure 3-4). Access the VO sub menu by stepping to the I/O RIO display and make selections. The LCp can be addressed up to rack number 77 (octal).

5.3 DISCRETE DATA TRANSFER

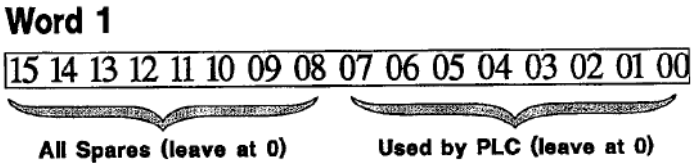
5.3.1 Output Image Table

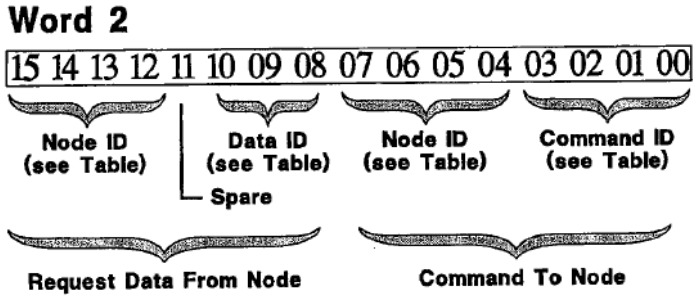
The PLC-5 initiates the communication interface by transmitting two words from the output image table (Figure 5-1) to the addressed node. The first word is regarded as a 'spare' by the LCp-400. The second word commands the addressed node to switch to gross, switch to net, switch to rate, tare, zero, clear status registers, clear error counts, clear the network NAK counter, or do nothing (null) using bits 0-3. Word two also 'tells' the node to load either net, gross, or rate weight data into the input image table (bits 8-10) for transmission back to the PLC. Bit 11 is unused at this time.

NOTE: The node address (ID) must appear in both locations, bits 4-7 and bits 12-15, to be interpreted correctly.

5.3.2 Input Image Table

After evaluating the contents of the output image table, the LCp responds by transmitting two words to the in-put image table (Figure 5-2). The first word contains signed integer weight data as requested by output word two. The second word contains the upper order data in bits 0-7, the node's address (for confirmation) in bits 12-15, and an `echo' of the requested data transaction in bits 8-10.





Node ID Table

15	14	13	12	Node #
0	0	0	0	= 1
0	0	0	1	= 2
0	0	1	0	= 3
0	0	1	1	= 4
0	1	0	0	= 5
0	1	0	1	= 6
0	1	1	0	= 7
0	1	1	1	= 8
1	0	0	0	= 9
1	0	0	1	= 10
1	0	1	0	= 11
1	0	1	1	= 12
1	1	0	0	= 13
1	1	0	1	= 14
1	1	1	0	= 15
1	1	1	1	= 16

Data ID Table

10	09	08	
0	0	0	= Gross Weight
0	0	1	= Net Weight
0	1	0	= Rate
0	1	1	= Spare
1	0	0	= Spare
1	0	1	= Spare
1	1	0	= Spare
1	1	1	= Spare

Command ID Table

3	2	1	0	Definition
0	0	0	0	= Null
0	0	0	1	= Switch to Gross
0	0	1	0	= Switch to Net
0	0	1	1	= Tare (net mode)
0	1	0	0	= Zero (gross mode)
0	1	0	1	= Switch to Rate
0	1	1	0	= Clear Status Registers
0	1	1	1	= Spare
1	0	0	0	= Clear Error Count
1	0	0	1	= Clear NAK Count
1	0	1	0	= Spare
1	0	1	1	= Spare
1	1	0	0	= Spare
1	1	0	1	= Spare
1	1	1	0	= Spare
1	1	1	1	= Spare

Figure 5-1. The LCp-400 Output Image Table.

5.4 BLOCK DATA TRANSFERS

5.4.1 Interface

Block data transfers are initiated by the ladder logic program write (BTW) and read (BTR) commands. The transfer sequence begins when the PLC sends the LCp¬400 a one word (16-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 513).

Table 5-1 (next page) presents a register location map. This map gives an overview of register allocation sectors while Table 5-2 presents specific node read-only designations. Locations 1-256 represent the weight and status values the LCp-400 has collected from each of the (16) network nodes. After establishing the starting register location, the PLC then transmits a read transfer block command telling the LCp how many words of information are needed.

5.4.2 Block Transfer Reads (BTRs)

Once the register location pointer value is established (a one word BTW with the starting 'address' register location must always precede a BTR), the PLC logic program issues a block transfer read command to obtain node data (registers 1-256), LCp-400 specific information (registers 503-512), or customer configured data in registers 513-640. A BTR can request up to 64 words of LCp information (see Table 5-1). The LCp will respond to the BTR by transmitting the number of words requested, starting at the pointer location. NOTE: The first word transmitted by the LCp will be the register pointer value. The LCp adds this word at the beginning of the transmission to `echo' the pointer value prior to transmitting requested data. Therefore, the BTR command MUST add 1 to the number of words requested. If the PLC needs two words of LCp information, the BTR request must be for three words.

Block transfer reads enable the PLC to acquire data from multiple nodes simultaneously. Discrete transfers convey only data from the addressed node.

Block transfer reads also allow the host PLC to access the operating status of the LCp-400 (Table 5-2 light gray shaded area).

5.4.3 Block Transfer Writes (BTWs)

Block transfer writes are used for two reasons; to set the starting register location (address) pointer for a BTR or to move node data into customer configurable data registers 513-640.

All BTRs must be preceded by a starting register location address BTW. Without this BTW, the PLC program BTR does not know what location to start reading data from.

Registers 513 through 640 may be used by the customer to relocate/reconfigure existing node data from registers 1-256 (see Tables 5-1, 5-2). When transferring data to registers 513-640, register numbers 641- 768 must be used as register location (address) pointers. For example, register 641 is the pointer value for register 513. To transfer a word of information into register 513, the location pointer value (first BTW word) must be entered as 641. The second through last word(s) of the BTW data string consist of the register location(s) containing the node data to be transferred into the configurable registers. For example, to transfer the operating status of node 1 (register 1, Table 2-2) to configurable location 513, the BTW data string would be two words long; 641, 1. The pointer 641 directs the contents of register 1 (node 1 status) into location 513. To load the gross weight of the first four nodes into locations 513-517, the BTW would be five words long: 641, 2, 18, 34, 50, where 2, 18, 34, and 50 are the register locations containing node gross weight. Configurable registers allow data to be grouped according to customer needs/usage. Certain applications may need only gross weight data from each node. Rather than gathering all data from all nodes, configuration allows the gross weight of each node to be stored in 16 consecutive registers for easy retrieval (1 BTR accesses all).

5.5 NODE STATUS WORDS

Table 5-3 shows the bit definitions for a node status word. Status words define system error conditions, decimal point location, motion status, and communication response. Each node transmits its status word to the LCp-400 along with weight data. In the LCp-400, status words are stored with other node data in the Table 5-2 allocated registers.

NOTE: Node status words are not included in discrete data transfers.

Table 5-3. Node Operating Status Word Bit Map

Node Operating Status Word		
Bit #	**Definition**	**Comment**
0-2	Decimal Point Location	binary count = number of places i.e. 2 = 0.00
3	Gross/Net or Rate	node display mode, 1=net: if (7) Rate=1, then Rate override
4	Motion	1=system in motion
5	Unable to Tare or Zero due to motion or zero limit	true for 5 seconds
6	Node Key Pressed	true for 5 seconds
7	Rate	rate=1, this redefines bits 0-2
8	A/D Signal Underrange	signal below a/d range
9	Gross Overload Limit	value selectable in node
10	A/D Signal Overrange	signal above a/d range
11	Excitation Fault	bad load cell/cell connection
12	Spare	
13	Data Checksum Error	network checksum
14	Incomplete Response	node to LCp-400 comm. error
15	No Response	node not responding to LCp

5.6 DIRECT NODE ACCESS

LCp-400 units allow the host PLC full block read/write transfer access to each node on the network. Although transactions transpire much faster using the LCp-400 based node registers (Figure 5-1 & 2), access to the 256 internal node registers also is available. All address values above 1000 are directed to a specific node as designated in Table 5-4. Direct node access allows the host to remotely reconfigure individual systems as desired.

NOTE: Since network devices have different internal register assignments (up to 256 allocations), consult BLH device-specific Allen-Bradley Remote I/O Manuals. For example, TM020 defines internal allocations for LCp-100/200 indicators.

NOTE: Node direct access significantly slows down system response time.

5.6.1 Block Transfer Reads

Read the calibration, configuration, and set point data of the addressed node. Read individual nodes in accordance with the Table 5-4 address designations. All conventions defined in paragraph 5.4.2 apply to node direct BTRs, i.e., a one word BTW with the starting address register location must precede the BTR, etc. Only one node (internal registers) may be read at a time.

5.6.2 Block Transfer Writes

All conventions defined in paragraph 5.4.3 apply to node direct BTWs. Using node direct BTWs, the host PLC can overwrite or re-write existing node calibration, con-figuration, and set point parameter data. BLH strongly recommends performing a BTR of changed locations for confirmation.

NOTE: Some node registers are designated 'read only' and cannot be overwritten. Consult device specific Remote I/O manuals for register read/write allocation status.

Table 5-4. Network Node Address Allocations

Individual Node Address Allocations	
Address	Designated Node
1001 - 1255	Node 1 - 255 internal registers
2001 - 2255	Node 2 - 255 internal registers
3001 - 3255	Node 3 - 255 internal registers
4001 - 4255	Node 4 - 255 internal registers
5001 - 5255	Node 5 - 255 internal registers
6001 - 6255	Node 6 - 255 internal registers
7001 - 7255	Node 7 - 255 internal registers
8001 - 8255	Node 8 - 255 internal registers
9001 - 9255	Node 9 - 255 internal registers
10001 - 10255	Node 10 - 255 internal registers
11001 - 11255	Node 11 - 255 internal registers
12001 - 12255	Node 12 - 255 internal registers
13001 - 13255	Node 13 - 255 internal registers
14001 - 14255	Node 14 - 255 internal registers
15001 - 15255	Node 15 - 255 internal registers
16001 - 16255	Node 16 - 255 internal registers
NOTE: Address 1001 = Register 1 of Node 1, Address 5022 = Register 22 of Node 5, etc.	

SECTION 6. Modbus Plus

6.1 MODBUS PLUS INTERFACE

BLH is an official Misconnect Partner. As such, BLH has been authorized by Schneider Automation to incorporate MB+ (Modbus Plus) Communication Technology in its LCp-400 series product line. MB+ protocol allows the LCp-400 to communicate on a peer-to-peer network link with Modicon 984 and Quantum PLC devices.

LCp-400 units equipped with the MB+ option have a custom rear panel with a specific MODBUS PLUS connector (see Figure 2-3 and paragraph 2.3.9). The MB+ interface does not use the standard LCp-400 RS-485/ 422 communication port.

6.2 ROUTING PATH ADDRESSING

The LCp-400 MB+ node is a Host Computer node with 8 data-slave input paths. When using Read/Write MSTR operations, or multiple MB+ networks, take note of the message routing format. A routing address is five bytes in length. This allows communication between multiple MB+ Networks across Bridge Mix hardware devices. Since the LCp 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 LCp network station address (1-64). The last non-zero byte specifies the input path or task number (1-8) to which the message is assigned. The other three routing address bytes allow communication through up to 3 Bridge Mix Devices. Table 6-1 depicts the address routing path for an LCp device at address 12, using path/ task number 1.

Table 6-1. Routing Path Examples

Routing Path Example	5 Byte Address
No Bridge Mux Devices	12-1-0-0-0
Bridge Mux @ Ad.26,	26-12-1-0-0
1st Bridge Mux @ Ad.26, 2nd Bridge Mux @ Ad.28, 3rd Bridge Mux @ Ad.30,	26-28-30-12-1

NOTE: If multiple devices access the LCp-400, 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 PLC designated devices, the input path/task number is not required since it is automatically selected.

NOTE: BLH assumes reader/operator familiarity with MB+ token passing network operation. Readers/operators unfamiliar with MB+ 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.

6.3 DATA REGISTER ALLOCATIONS

The primary function of the LCp-400 is to gather weight and status information from all weigh system nodes and make it available to the host PLC. Table 6-2 presents an overview of the LCp-400 node register allocations. Table 6-3 shows a map of all registers and briefly defines their functions. Subsequent paragraphs will define register read and write status.

6.3.1 Node Status and Weight Data Registers 40001 -40256 (Read only)

Registers 40001 - 40256 contain real time node data scanned by the LCp-400 Digi-System network. Data is stored in BLH or Double Precision format as configured by customer in MB+ I/O menu (see Figure 3-4 and paragraph 6.5). Data from these registers may be reformatted into programmable data registers 40513 - 40640 for easier access or faster transfer time.

6.3.2 Network Status Registers 40504 - 40512 (Read only)

These registers contain LCp-400 instrument serial #, software version #, and Network real time status. Data from these registers may be placed in programmable data registers 40513-40640 (see gray area of Table 6-3).

Table 6-2. Node Data Register Allocations.

NODE	REG#	NODE	REG#	NODE	REG#	NODE	REG#	NODE	REG#	NODE	REG#	NODE	REG#	NODE	REG#	DATA
1	40001	3	40033	5	40065	7	40097	9	40129	11	40161	13	40193	15	40225	Operating Status
1	40002	3	40034	5	40066	7	40098	9	40130	11	40162	13	40194	15	40226	Gross Weight
1	40003	3	40035	5	40067	7	40099	9	40131	11	40163	13	40195	15	40227	Gross Overflow >32768
1	40004	3	40036	5	40068	7	40100	9	40132	11	40164	13	40196	15	40228	Net Weight
1	40005	3	40037	5	40069	7	40101	9	40133	11	40165	13	40197	15	40229	Net Overflow >32768
1	40006	3	40038	5	40070	7	40102	9	40134	11	40166	13	40198	15	40230	Tare
1	40007	3	40039	5	40071	7	40103	9	40135	11	40167	13	40199	15	40231	Tare Overflow >32768
1	40008	3	40040	5	40072	7	40104	9	40136	11	40168	13	40200	15	40232	Zero
1	40009	3	40041	5	40073	7	40105	9	40137	11	40169	13	40201	15	40233	Zero Overflow >32768
1	40010	3	40042	5	40074	7	40106	9	40138	11	40170	13	40202	15	40234	Spare
1	40011	3	40043	5	40075	7	40107	9	40139	11	40171	13	40203	15	40235	Spare
1	40012	3	40044	5	40076	7	40108	9	40140	11	40172	13	40204	15	40236	Spare
1	40013	3	40045	5	40077	7	40109	9	40141	11	40173	13	40205	15	40237	Spare
1	40014	3	40046	5	40078	7	40110	9	40142	11	40174	13	40206	15	40238	Spare
1	40015	3	40047	5	40079	7	40111	9	40143	11	40175	13	40207	15	40239	Spare
1	40016	3	40048	5	40080	7	40112	9	40144	11	40176	13	40208	15	40240	Error Counter
2	40017	4	40049	6	40081	8	40113	10	40145	12	40177	14	40209	16	40241	Operating Status
2	18	4	40050	6	40082	8	40114	10	40146	12	40178	14	40210	16	40242	Gross Weight
2	40019	4	40051	6	40083	8	40115	10	40147	12	40179	14	40211	16	40243	Gross Overflow >32768
2	40020	4	40052	6	40084	8	40116	10	40148	12	40180	14	40212	16	40244	Net Weight
2	40021	4	40053	6	40085	8	40117	10	40149	12	40181	14	40213	16	40245	Net Overflow >32768
2	40022	4	40054	6	40086	8	40118	10	40150	12	40182	14	40214	16	40246	Tare
2	40023	4	40055	6	40087	8	40119	10	40151	12	40183	14	40215	16	40247	Tare Overflow >32768
2	40024	4	40056	6	40088	8	40120	10	40152	12	40184	14	40216	16	40248	Zero
2	40025	4	40057	6	40089	8	40121	10	40153	12	40185	14	40217	16	40249	Zero Overflow >32768
2	40026	4	40058	6	40090	8	40122	10	40154	12	40186	14	40218	16	40250	Spare
2	40027	4	40059	6	40091	8	40123	10	40155	12	40187	14	40219	16	40251	Spare
2	40028	4	40060	6	40092	8	40124	10	40156	12	40188	14	40220	16	40252	Spare
2	40029	4	40061	6	40093	8	40125	10	40157	12	40189	14	40221	16	40253	Spare
2	40030	4	40062	6	40094	8	40126	10	40158	12	40190	14	40222	16	40254	Spare
2	40031	4	40063	6	40095	8	40127	10	40159	12	40191	14	40223	16	40255	Spare
2	40032	4	40064	6	40096	8	40128	10	40160	12	40192	14	40224	16	40256	Error Counter

Table 6-3. Register Allocation Map.

Register #	Description
40001	Node # 1 Operating Status
40002	Node # 1 Gross Weight
40003	Node # 1 Gross Weight Overflow (>32768)
40004	Node # 1 Net Weight
40005	Node # 1 Net Weight Overflow (>32768)
40006	Node # 1 Tare
40007	Node # 1 Tare Overflow (>32768)
40008	Node # 1 Zero
40009	Node # 1 ZeroOverflow (>32768)
40010	Node # 1 Spare
40011	Node # 1 Spare
40012	Node # 1 Spare
40013	Node # 1 Spare
40014	Node # 1 Spare
40015	Node # 1 Spare
40016	Node # 1 Network Communication Error Counter
40017	Node # 2 Operating Status
40018	Node # 2 Gross Weight
[illegible]	[illegible]
40255	Node # 16 Spare
40256	Node # 16 Network Communication Error Counter
40257-40503	Currently Unused
40504	Serial # Year/Week (i.e. 820 = 1998 20th week)
40505	Serial Number 0-3699
40506	Version # (i.e. 300 = Ver. 3.00)
40507	Network NAK Counter
40508	Network Scans per Second
40509	MB+ Reads per Second
40510	Active Network Nodes (bit zero = node 1 active, etc.)
40511	Node Fault Conditions (bit zero = node 1 faulted, etc.)
40512	LCp-400 Status
40513-40640	Customer Configurable Registers
40641-40768	Pointers for Customer Configurable Registers. Register 641 points to register 513 etc. For example a 2 in register 641 puts the contents of register 2 (node 1 gross weight data) in register 513.
40769	Number of global data words used by customer (31 max)
40770-40801	Pointers for global data transmission. Point to up to 31 other register locations. Locations pointed to will be transmitted as global data.
40802	Commands for addressed node
40803	Node display control word
40804-40811	Node screen display characters

6.3.3 Programmable Data Registers 40513 - 40640 (Read only)

These registers may be formatted to contain data from registers 40001 -40256 and 40502 - 40511. Registers 40641 -40768 are the data pointers for registers 40513 - 40640. For instance, if the PLC needs only gross weight data from all 16 nodes, gross weight register allocations from locations from 40001-40256 may be culled out and placed into locations 40513-40529 (16 registers). Now the PLC only needs to read 16 registers (rather than the full 256) to obtain the desired data.

Writing a 2 to register 40641 will program register 40513 to contain the contents of 40002, node # 1 gross data. Writing a 4 to register 40642 will program register 40514 to contain the contents of 40004, node # 1 net data, etc.

6.3.4 Programmable Data Register Pointers 40641 -40768 (Read/Write)

These non-volatile read/write registers point to the data contents of programmable registers 40513 - 40640. The contents of register 40641 points to the contents of register 40513, register 40642 points to the contents of register 40514, etc. A # 1 - 511 written to a programmable data register pointer places the data contents of a register 40001 - 40511 into the corresponding programmable register 40513 - 40640. This enables packing of node data for efficient MB+ transfers.

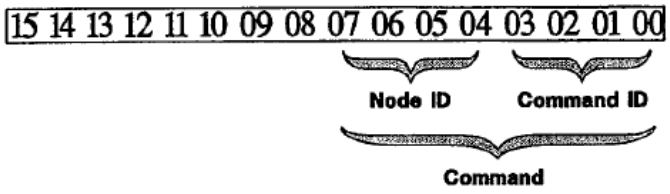
6.3.5 Global Data Configuration Registers 40769 - 40801 (Read/Write)

These non-volatile read/write registers configure the LCp-400 global data registers. Register 40769 contains the number of Global Data words to be transferred. Registers 40770 - 40801 point to the contents of Global Data words 1 -32. As with programmable data register pointers 40641 — 40768, the contents of register 40770 points to the contents of Global Data word # I, register 40771 points to the contents of Global Data word #2, etc.

6.3.6 Node Command Register 40802 (Read/ Write)

A write to this register sends commands to the LCp-400 and individual nodes. Register bits 0-7 are for the commands. The commands themselves are in bits 0 — 3 and the address of the node receiving the command is in bits 4- 7. The individual node commands are: Switch to Gross, Switch to Net, Tare Net Weight, Zero Gross Weight, and Clear the addressed node communication error counter. The only LCp-400 command clears the Global Nak counter (for this command, bits 4 - 7 are NA). The Global Nak counter is incremented any time the LCP-400 receives a checksum error or an incomplete data string from any node. See Figure 6-1 for a detailed breakout of this register.

Node Command Register 40802



Node ID Table

7	6	5	4	Node #
0	0	0	0	= 1
0	0	0	1	= 2
0	0	1	0	= 3
0	0	1	1	= 4
0	1	0	0	= 5
0	1	0	1	= 6
0	1	1	0	= 7
0	1	1	1	= 8
1	0	0	0	= 9
1	0	0	1	= 10
1	0	1	0	= 11
1	0	1	1	= 12
1	1	0	0	= 13
1	1	0	1	= 14
1	1	1	0	= 15
1	1	1	1	= 16

Data ID Table

3	2	1	0	
0	0	0	0	= Null
0	0	0	1	= Switch to Gross
0	0	1	0	= Switch to Net
0	0	1	1	= Tare
0	1	0	0	= Zero
1	0	0	0	= Clear Error Count
1	0	0	1	= Clear NAK Count

Figure 6-1. Node Command Register.

6.3.7 LCp-400 Display Control Registers 40803 - 40811 (Read/Write)

These registers allow control to the upper and lower display lines of the LCp-400. Register 40803 is for control. Registers 40804- 40807 are for upper display data and registers 40808 - 40811 are for lower display data (See paragraph 6.7 and Figure 6-4).

6.4 DATA ACCESS

Data within the LCp-400 registers may be acquired or altered (if write is permitted) using Read/Write MSTR instructions or global data transfers.

6.4.1 Read MSTR

A Read MSTR function can read node status and weight data from LCP-400 Registers 40001 -40256, LCp-400 Network status registers 40504 - 40512, programmable data registers 40513 - 40640, programmable data register pointers 40641 -40768, global data configuration registers 40769 - 40801, the node command register 40802, or LCp-400 display control registers 40803 - 40812.

6.4.2 Write MSTR

A Write MSTR function writes data to programmable data register pointers 40641 - 40768, global data configuration registers 40769 -40801, the node command register 40802, or LCp-400 display control registers 40803 - 40812

6.4.3 Global Data Transfers

For high-speed process control, BLH recommends using global data transfers. Each time the LCp-400 has the network token, it transmits up to 32 words of global data to all other local network devices. The global data configuration registers (paragraph 6.3.5), which act as pointers to actual node data registers, determine the words transmitted. Using global data transfers without Read/Write MSTR instructions significantly speeds up network rotation time.

6.5 DATA FORMATTING

BLH offers two formats for actual data communication, double precision and BLH. Both formats are defined in the following sub-paragraphs. With both formats, two 16-bit status words (read only) supply system operating parameter information. To select the desired format, choose DOUBLE or BLH as depicted in Figure 3- 4 MB+ Parameter Selections. Note that double precision is the default format.

6.5.1 Double Precision Format

Modicon Double Precision EMTH Functions allow PLC users to perform math functions in a 32-bit format. This is accomplished by combining data from two 16-bit registers. Each register holds a value in the range of 0 to 9999, for a combined Double Precision value in the range of 0 to 99,999,999. The combined value is referred to as operand 1.

The low-order half of operand 1 (register 1) is stored in the displayed register and the high-order half is stored in the implied register (register 2). Double Precision formatting, however, makes no provision for transmitting a data polarity indicator (plus or minus). BLH therefore, makes a slight format modification to transmit this vital statistic.

Double Precision data formatting uses two, 16 bit registers of information to transmit weight data (see Figure 6-2). Each register contains four significant digits. Since the most significant bit of register one is unused (always '0'), BLH uses this bit to transmit data polarity. If data is negative, this bit is set to a '1'. If data is positive (as assumed with conventional Double Precision format), this bit remains a zero. Upon receiving a data transmission, the polarity bit must be immediately evaluated. If data is negative (MSB = '1'), store the negative polarity bit in another PLC register (establish a negative data flag) and reset the MSB of register 1 to ZERO. Do not process the data in register 1 until the MSB is set to zero. Attempting to process data with the negative polarity bit set will result in erroneous information. Once the MSB of register 1 is confirmed to be zero, process data using conventional Double Precision EMTH instructions.

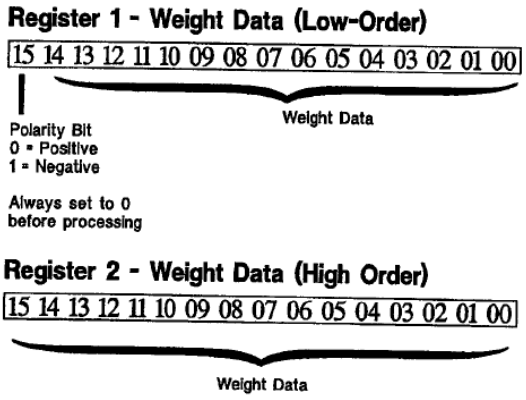


Figure 6-2. The Double Precision Word Format.

6.5.2 BLH Data Format

BLH formatted weight data consists of two 16 bit signed integers, the first (high) integer must be multiplied by 32768 and then added to the second (low) integer (see Figure 6-3).

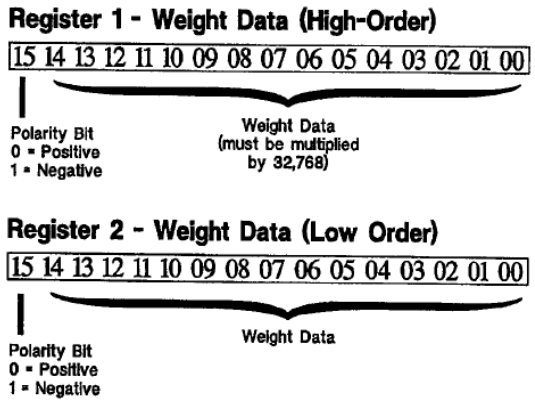


Figure 6-3. The BLH Data Format.

6.5.3 Node Status Words

Table 6-4 (next page) shows the bit definitions for a node status word. Status words are not affected by data formatting; they are bit-mapped words transmitted by each node.

Status words define system error conditions, decimal point location, motion status, and communication response. Each node transmits its status word to the LCp-400 along with weight data. In the LCp-400, status words are stored with other node data in the Table 6-2 allocated registers.

Table 6-4. Node Status Word Bitmap.

Node Operating Status Word		
Bit #	**Definition**	**Comment**
0-2	Decimal Point Location	binary count = number of places i.e. 2 = 0.00
3	Gross/Net	node display mode, 1=net
4	Motion	1=system in motion
5	Unable to Tare or Zero due to motion or zero limit	true for 5 seconds
6	Node Key Pressed	true for 5 seconds
7	Spare	
8	A/D Signal Underrange	signal below a/d range
9	Gross Overload Limit	value selectable in node
10	A/D Signal Overrange	signal above a/d range
11	Excitation Fault	bad load cell/cell connection
12	Spare	
13	Data Checksum Error	network checksum
14	Incomplete Response	node to LCp-400 comm. error
15	No Response	node not responding to LCp

6.5.4 Decimal point location

The decimal point location of the weigh data is located in the node status register bits 0- 2. The binary value of bits 0 - 2 determines the decimal point location. 0= no decimal point, 1 = 0.0, 2 = 0.00, 3 = 0.000, etc. Use the appropriate multiplier (0.1, 0.01, etc.) to convert the weight data to a floating point value.

6.5.5 Units

Unit information is not supplied in the interface. The application must know whether the data is lb, kg, oz, etc.

NOTE: 'Counts' refers to displayed counts. If displayed weight is counting by 2-lb increments then presetting a register to 9 would mean 18 lbs.

6.6 FLASHING LED STATUS

A flashing green 'ACTIVE' LED located on the LCp-400 rear panel (Figure 3-3) indicates the status of MB+ network operation. To interpret flash patterns, refer to the Modbus Plus Planning Guide (GM-MBPL-004).

NOTE: To display flashing status on the LCp-400 front panel, see paragraph 3-3.

6.7 MANIPULATING THE FRONT PANEL DISPLAY

Provision has been made for the host PLC to display messages on the LCp-400 front panel display. Messages may occupy both the upper (7 character) and lower (8 character) display lines (Figure 6-4). To send a message, the host PLC transmits the message coded in conventional ASCII characters* to registers 40804 thru 40811 along with a display control word; register 40803. Information written to these LCp-400 registers determines not only the message content but also the display time period. When the host message display time period expires, the LCp-400 will revert to its normal weight/status display. See Figure 6-4 for a detailed breakout of register allocations and functions.

Host messages displayed on the LCp front panel can be used to alert operators to error conditions, prompt required inputs, etc.

NOTE: Host messages are not displayed if the LCp-400 is in any calibration or parameter configuration menu mode.

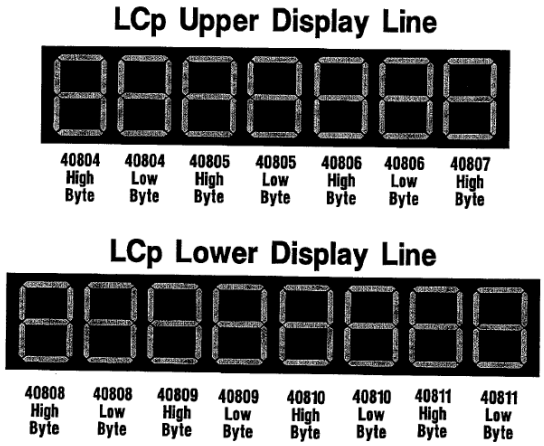


Figure 6-4. LCp-400 Front Panel Display Map.

SECTION 7. Modbus RTU

7.1 MODBUS RTU OPERATION

Modbus is often recognized as an industry standard method of digital communication protocol between a master or host computer and a slave device. This protocol was originally developed by Modicon to communicate discrete and analog information between a PLC and a master host. As implemented in the LCp¬400, this protocol efficiently communicates weight and status information from each network node to a Modbus Master driver equipped host.

This interface method is applicable to virtually any PC or other process control computer with Modbus RTU Master communication capability. The interface provides weight and status information from each Digi¬System node and allows for remote control of tare, zero, and gross/net functions. Information is transmitted in blocks of data, thereby minimizing polling and response time delays. The interface operates with the LCp-400 configured as the slave device and the host computer as the master.

7.2 DATA REGISTER ALLOCATIONS

The primary function of the LCp-400 is to gather weight and status information from all weigh system nodes and make it available to the host PLC. Table 7-1 presents an overview of the LCp-400 node register allocations. Table 7-2 shows a map of all registers and briefly defines their functions. Subsequent paragraphs will define register read and write status.

7.2.1 Node Status and Weight Data Registers 40001 - 40256 (Read only)

Registers 40001 - 40256 contain real time node data scanned by the LCp-400 Digi-System network. Data is stored in BLH or Double Precision format as configured by customer in Modbus RTU I/O menu (see Figure 3-4 and paragraph 7.4). Data from these registers may be reformatted into programmable data registers 40513- 40640 for easier access or faster transfer time.

7.2.2 Network Status Registers 40504 -40512 (Read only)

These registers contain LCp-400 instrument serial #, software version #, and Network real time status. Data from these registers may be placed in programmable data registers 40513-40640 (see gray area of Table 7- 2).

7.2.3 Programmable Data Registers 40513 - 40640 (Read only)

These registers may be formatted to contain data from registers 40001 -40256 and 40502-40511. Registers 40641 - 40768 are the data pointers for registers 40513 - 40640. For instance, if the PLC needs only gross weight data from all 16 nodes, gross weight register allocations from locations from 40001- 40256 may be culled out and placed into locations 40513- 40529 (16 registers). Now the PLC only needs to read 16 registers (rather than the full 256) to obtain the desired data.

Writing a 2 to register 40641 will program register 40513 to contain the contents of 40002, node # 1 gross data. Writing a 4 to register 40642 will program register 40514 to contain the contents of 40004, node # 1 net data, etc.

7.2.4 Programmable Data Register Pointers 40641 - 40768 (Read/Write)

These non-volatile read/write registers point to the data contents of programmable registers 40513- 40640. The contents of register 40641 points to the contents of register 40513, register 40642 points to the contents of register 40514, etc. A # 1 -511 written to a programmable data register pointer places the data contents of a register 40001 - 40511 into the corresponding programmable register 40513 -40640. This enables packing of node data for efficient Modbus RTU transfers.

Table 7-1. Node Data Register Allocations.

NODE	REG#	NODE	REG#	NODE	REG#	NODE	REG#	NODE	REG#	NODE	REG#	NODE	REG#	NODE	REG#	DATA
1	40001	3	40033	5	40065	7	40097	9	40129	11	40161	13	40193	15	40225	Operating Status
1	40002	3	40034	5	40066	7	40098	9	40130	11	40162	13	40194	15	40226	Gross Weight
1	40003	3	40035	5	40067	7	40099	9	40131	11	40163	13	40195	15	40227	Gross Overflow >32768
1	40004	3	40036	5	40068	7	40100	9	40132	11	40164	13	40196	15	40228	Net Weight
1	40005	3	40037	5	40069	7	40101	9	40133	11	40165	13	40197	15	40229	Net Overflow >32768
1	40006	3	40038	5	40070	7	40102	9	40134	11	40166	13	40198	15	40230	Tare
1	40007	3	40039	5	40071	7	40103	9	40135	11	40167	13	40199	15	40231	Tare Overflow >32768
1	40008	3	40040	5	40072	7	40104	9	40136	11	40168	13	40200	15	40232	Zero
1	40009	3	40041	5	40073	7	40105	9	40137	11	40169	13	40201	15	40233	Zero Overflow >32768
1	40010	3	40042	5	40074	7	40106	9	40138	11	40170	13	40202	15	40234	Spare
1	40011	3	40043	5	40075	7	40107	9	40139	11	40171	13	40203	15	40235	Spare
1	40012	3	40044	5	40076	7	40108	9	40140	11	40172	13	40204	15	40236	Spare
1	40013	3	40045	5	40077	7	40109	9	40141	11	40173	13	40205	15	40237	Spare
1	40014	3	40046	5	40078	7	40110	9	40142	11	40174	13	40206	15	40238	Spare
1	40015	3	40047	5	40079	7	40111	9	40143	11	40175	13	40207	15	40239	Spare
1	40016	3	40048	5	40080	7	40112	9	40144	11	40176	13	40208	15	40240	Error Counter
2	40017	4	40049	6	40081	8	40113	10	40145	12	40177	14	40209	16	40241	Operating Status
2	18	4	40050	6	40082	8	40114	10	40146	12	40178	14	40210	16	40242	Gross Weight
2	40019	4	40051	6	40083	8	40115	10	40147	12	40179	14	40211	16	40243	Gross Overflow >32768
2	40020	4	40052	6	40084	8	40116	10	40148	12	40180	14	40212	16	40244	Net Weight
2	40021	4	40053	6	40085	8	40117	10	40149	12	40181	14	40213	16	40245	Net Overflow >32768
2	40022	4	40054	6	40086	8	40118	10	40150	12	40182	14	40214	16	40246	Tare
2	40023	4	40055	6	40087	8	40119	10	40151	12	40183	14	40215	16	40247	Tare Overflow >32768
2	40024	4	40056	6	40088	8	40120	10	40152	12	40184	14	40216	16	40248	Zero
2	40025	4	40057	6	40089	8	40121	10	40153	12	40185	14	40217	16	40249	Zero Overflow >32768
2	40026	4	40058	6	40090	8	40122	10	40154	12	40186	14	40218	16	40250	Spare
2	40027	4	40059	6	40091	8	40123	10	40155	12	40187	14	40219	16	40251	Spare
2	40028	4	40060	6	40092	8	40124	10	40156	12	40188	14	40220	16	40252	Spare
2	40029	4	40061	6	40093	8	40125	10	40157	12	40189	14	40221	16	40253	Spare
2	40030	4	40062	6	40094	8	40126	10	40158	12	40190	14	40222	16	40254	Spare
2	40031	4	40063	6	40095	8	40127	10	40159	12	40191	14	40223	16	40255	Spare
2	40032	4	40064	6	40096	8	40128	10	40160	12	40192	14	40224	16	40256	Error Counter

Table 7-2. Register Allocation Map.

Register #	Description
40001	Node # 1 Operating Status
40002	Node # 1 Gross Weight
40003	Node # 1 Gross Weight Overflow (>32768)
40004	Node # 1 Net Weight
40005	Node # 1 Net Weight Overflow (>32768)
40006	Node # 1 Tare
40007	Node # 1 Tare Overflow (>32768)
40008	Node # 1 Zero
40009	Node # 1 ZeroOverflow (>32768)
40010	Node # 1 Spare
40011	Node # 1 Spare
40012	Node # 1 Spare
40013	Node # 1 Spare
40014	Node # 1 Spare
40015	Node # 1 Spare
40016	Node # 1 Network Communication Error Counter
40017	Node # 2 Operating Status
40018	Node # 2 Gross Weight
[illegible]	See register Allocation Table
40255	Node # 16 Spare
40256	Node # 16 Network Communication Error Counter
40257-40503	Currently Unused
40504	Serial # Year/Week (i.e. 820 = 1998 20th week)
40505	Serial Number 0-9999
40506	Version # (i.e. 300 = Ver. 3.00)
40507	Network NAK Counter
40508	Network Scans per Second
40509	Modbus RTU Reads per Second
40510	Active Network Nodes (bit zero = node 1 active, etc.)
40511	Node Fault Conditions (bit zero = node 1 faulted, etc.)
40512	LCp-400 Status
40513-40640	Customer Configurable Registers
40641-40768	Pointers for Customer Configurable Registers. Register 641 points to register 513 etc. For example a 2 in register 641 puts the contents of register 2 (node 1 gross weight data) in register 513.
40769	Currently Unused
40770-40801	Currently Unused
40802	Commands for addressed node
40803	Node display control word
40804-40811	Node screen display characters (see Figure 7-4)

7.2.5 Node Command Register 40802 (Read/ Write)

A write to this register sends commands to the LCp-400 and individual nodes. Register bits 0-7 are for the commands. The commands themselves are in bits 0 — 3 and the address of the node receiving the command is in bits 4 - 7. The individual node commands are: Switch to Gross, Switch to Net, Tare Net Weight, Zero Gross Weight, and Clear the addressed node communication error counter. The only LCp-400 command clears the Global Nak counter (for this command, bits 4 - 7 are NA). The Global Nak counter is incremented any time the LCP-400 receives a checksum error or an incomplete data string from any node. See Figure 7-1 for a detailed breakout of this register.

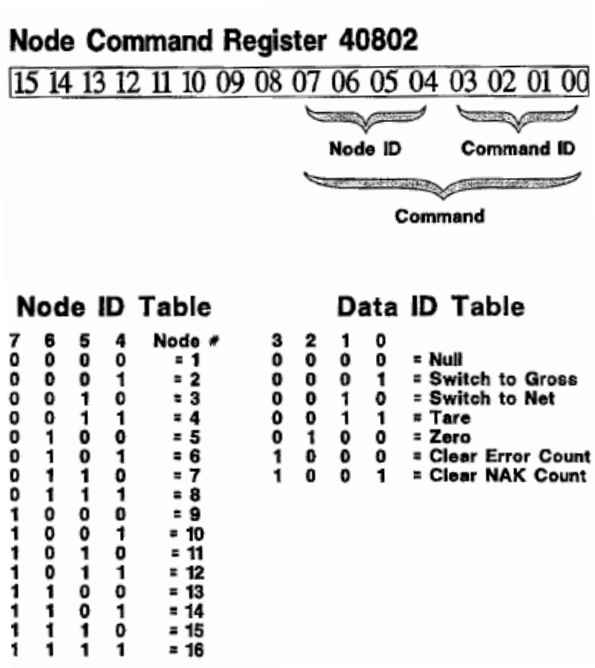


Figure 7-1. The Node Command Register

7.2.6 LCp-400 Display Control Registers 40803 - 40811 (Read/Write)

These registers allow control to the upper and lower display lines of the LCp-400. Register 40803 is for control. Registers 40804 -40807 are for upper display data and registers 40808 -

40811 are for lower display data (See paragraph 7.5 and Figure 7-4).

7.3 DATA ACCESS

Data within the LCp-400 registers may be acquired or altered (if write is permitted) using RTU Read and Write instructions.

7.3.1 Read (03)

The Read instruction (03) reads node status and weight data from LCP-400 Registers 40001 - 40256, LCp-400 Network status registers 40504 - 40512, programmable data registers 40513-40640, programmable data register pointers 40641 - 40768, global data configuration registers 40769 - 40801, the node command register 40802, or LCp-400 display control registers 40803 - 40812.

7.3.2 Write (06) (16)

Write instructions write data to single (06) or multiple (16) programmable data register pointers 40641 -40768, global data configuration registers 40769 - 40801, the node command register 40802, or LCp-400 display control registers 40803 -40812.

7.4 DATA FORMATTING

BLH offers two formats for actual data communication, double precision and BLH. Both formats are defined in the following sub-paragraphs. With both formats, two 16-bit status words (read only) supply system operating parameter information. To select the desired format, choose DOUBLE or BLH as depicted in Figure 3- 4 (I/0 menu) Modbus RTU Parameter Selections. Note that double precision is the default format.

7.4.1 Double Precision Format

Modicon Double Precision EMTH Functions allow PLC users to perform math functions in a 32-bit format This is accomplished by combining data from two 16-bit registers. Each register holds a value in the range of 0 to 9999, for a combined Double Precision value in the range of 0 to 99,999,999. The combined value is referred to as operand 1.

The low-order half of operand 1 (register 1) is stored in the displayed register and the high-order half is stored in the implied register (register 2). Double Precision formatting, however, makes no provision for transmitting a data polarity indicator (plus or minus). BLH therefore, makes a slight format modification to transmit this vital statistic.

Double Precision data formatting uses two, 16 bit registers of information to transmit weight data (see Figure 7-2). Each register contains four significant digits. Since the most significant bit of register one is unused (always '0'), BLH uses this bit to transmit data polarity. If data is negative, this bit is set to a '1'. If data is positive (as assumed with conventional Double Precision format), this bit remains a zero. Upon receiving a data transmission, the polarity bit must be immediately evaluated. If data is negative (MSB = '1 '), store the negative polarity bit in another PLC register (establish a negative data flag) and reset the MSB of register 1 to ZERO. Do not process the data in register 1 until the MSB is set to zero. Attempting to process data with the negative polarity bit set will result in erroneous information. Once the MSB of register 1 is confirmed to be zero, process data using conventional Double Precision EMTH instructions.

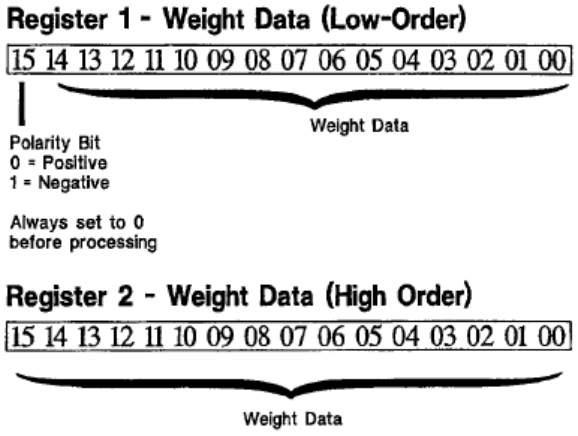


Figure 7-2. The Double Precision Word Format.

7.4.2 BLH Data Format

BLH formatted weight data consists of two 16 bit signed integers, the first (high) integer must be multiplied by 32768 and then added to the second (low) integer (see Figure 7-3).

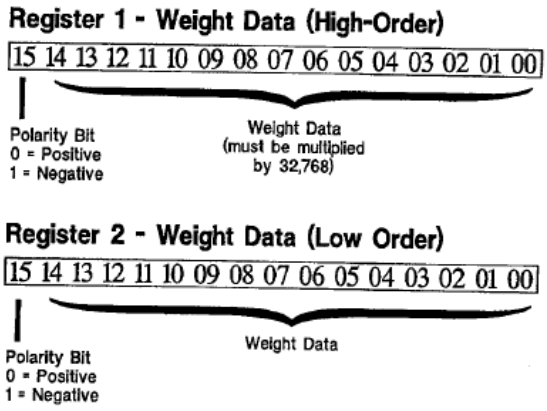


Figure 7-3. The BLH Data Format.

7.4.3 Node Status Words

Table 7-3 shows the bit definitions for a node status word. Status words are not affected by data formatting; they are bit-mapped words transmitted by each node. Status words define system error conditions, decimal point location, motion status, and communication response. Each node transmits its status word to the LCp-400 along with weight data. In the LCp-400, status words are stored with other node data in the Table 7-1 allocated registers.

7.4.4 Decimal point location

The decimal point location of the weigh data is located in the node status register bits 0 -2. The binary value of bits 0 -2 determines the decimal point location. 0= no decimal point, 1 = 0.0, 2 = 0.00, 3 = 0.000, etc. Use the appropriate multiplier (0.1, 0.01, etc.) to convert the weight data to a floating point value.

7.4.5 Units

Unit information is not supplied in the interface. The application must know whether the data is lb, kg, oz, etc.

NOTE: 'Counts' refers to displayed counts. If displayed weight is counting by 2-lb increments then presetting a register to 9 would mean 18 lbs.

7.5 MANIPULATING THE FRONT PANEL

Table 7-3. Node Status Word Bit-Map

Node Operating Status Word		
Bit #	**Definition**	**Comment**
0-2	Decimal Point Location	binary count = number of places i.e. 2 = 0.00
3	Gross/Net	node display mode, 1=net
4	Motion	1=system in motion
5	Unable to Tare or Zero due to motion or zero limit	true for 5 seconds
6	Node Key Pressed	true for 5 seconds
7	Spare	
8	A/D Signal Underrange	signal below a/d range
9	Gross Overload Limit	value selectable in node
10	A/D Signal Overrange	signal above a/d range
11	Excitation Fault	bad load cell/cell connection
12	Spare	
13	Data Checksum Error	network checksum
14	Incomplete Response	node to LCp-400 comm. error
15	No Response	node not responding to LCp

DISPLAY

Provision has been made for the host PLC to display messages on the LCp-400 front panel display. Messages may occupy both the upper (7 character) and lower (8 character) display lines (Figure 7-4). To send a message, the host PLC transmits the message coded in conventional ASCII characters* to registers 40804 thru 40811 along with a display control word; register 40803. Information written to these LCp-400 registers determines not only the message content but also the display time period. When the host message display time period expires, the LCp-400 will revert to its normal weight/status display. See Figure 7-4 for a detailed breakout of register allocations and functions.

Host messages displayed on the LCp front panel can be used to alert operators to error conditions, prompt required inputs, etc.

NOTE: Host messages are not displayed if the LCp¬400 is in any calibration or parameter configuration menu mode.

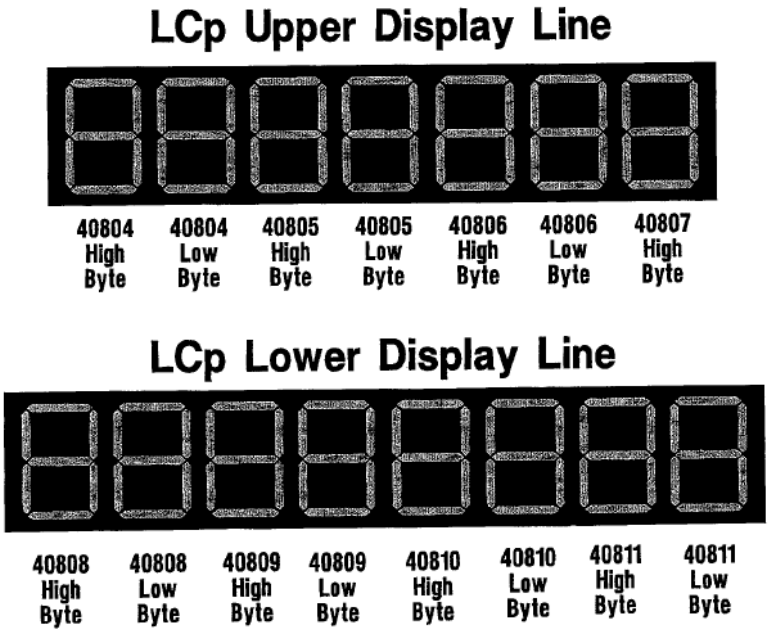
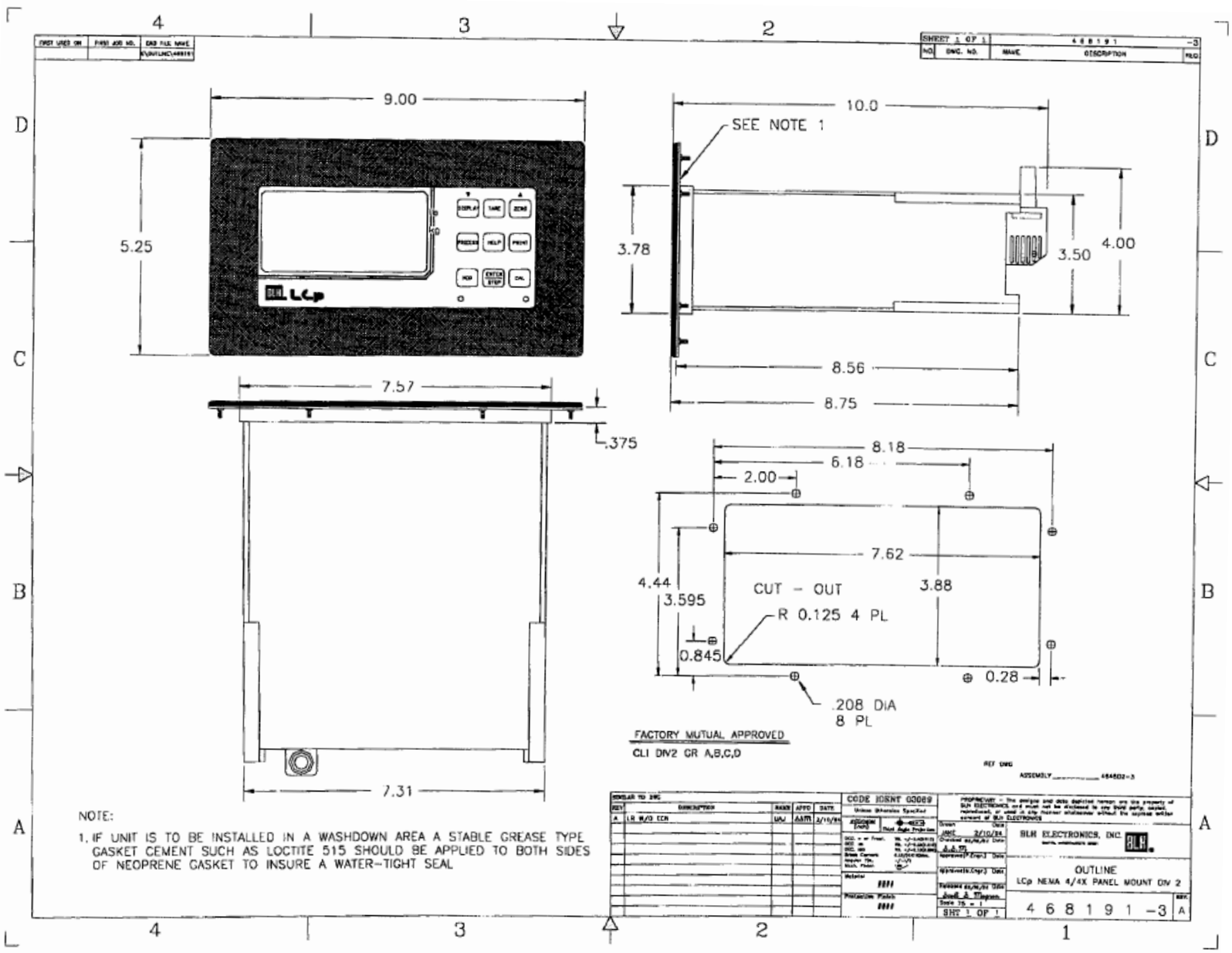
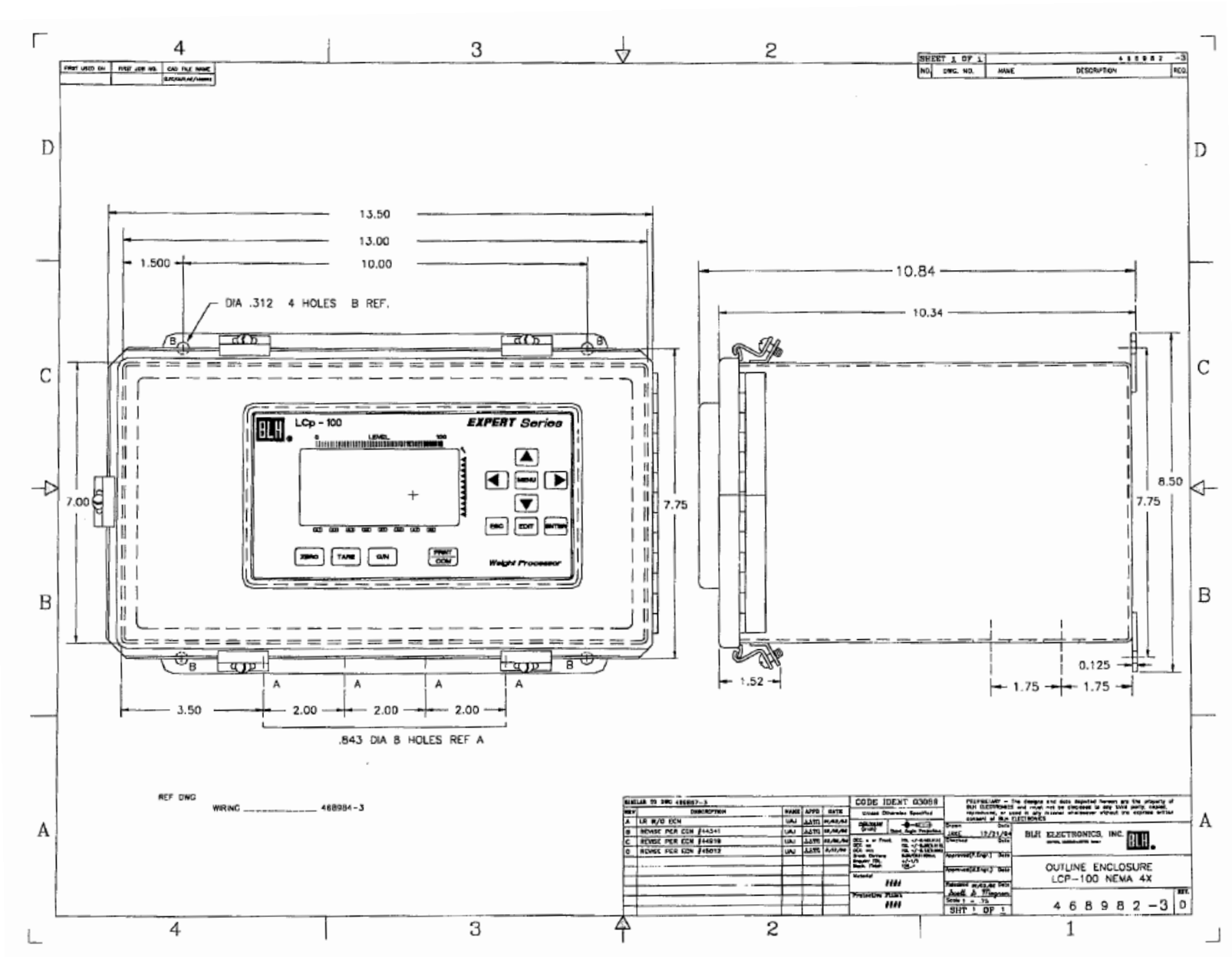
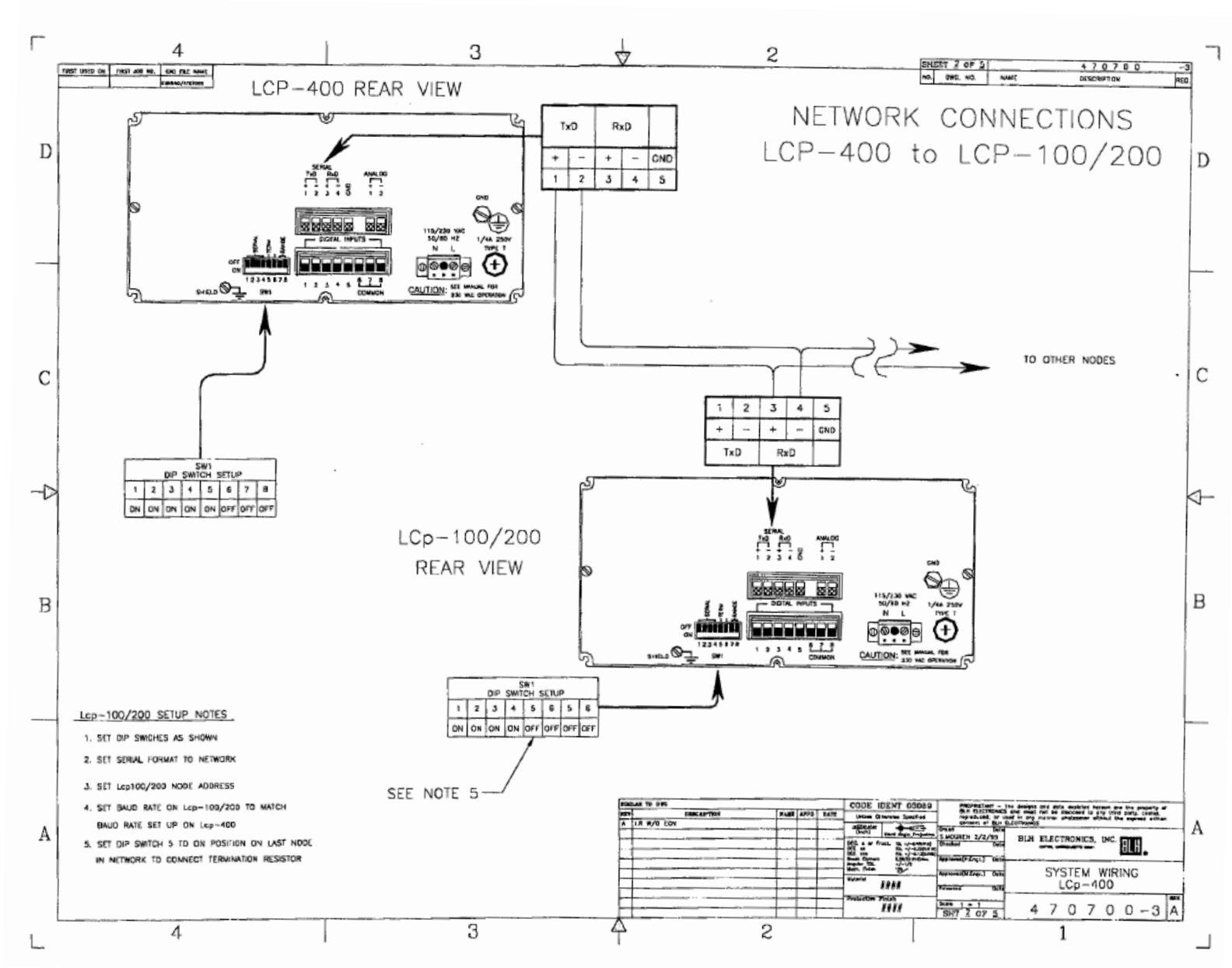


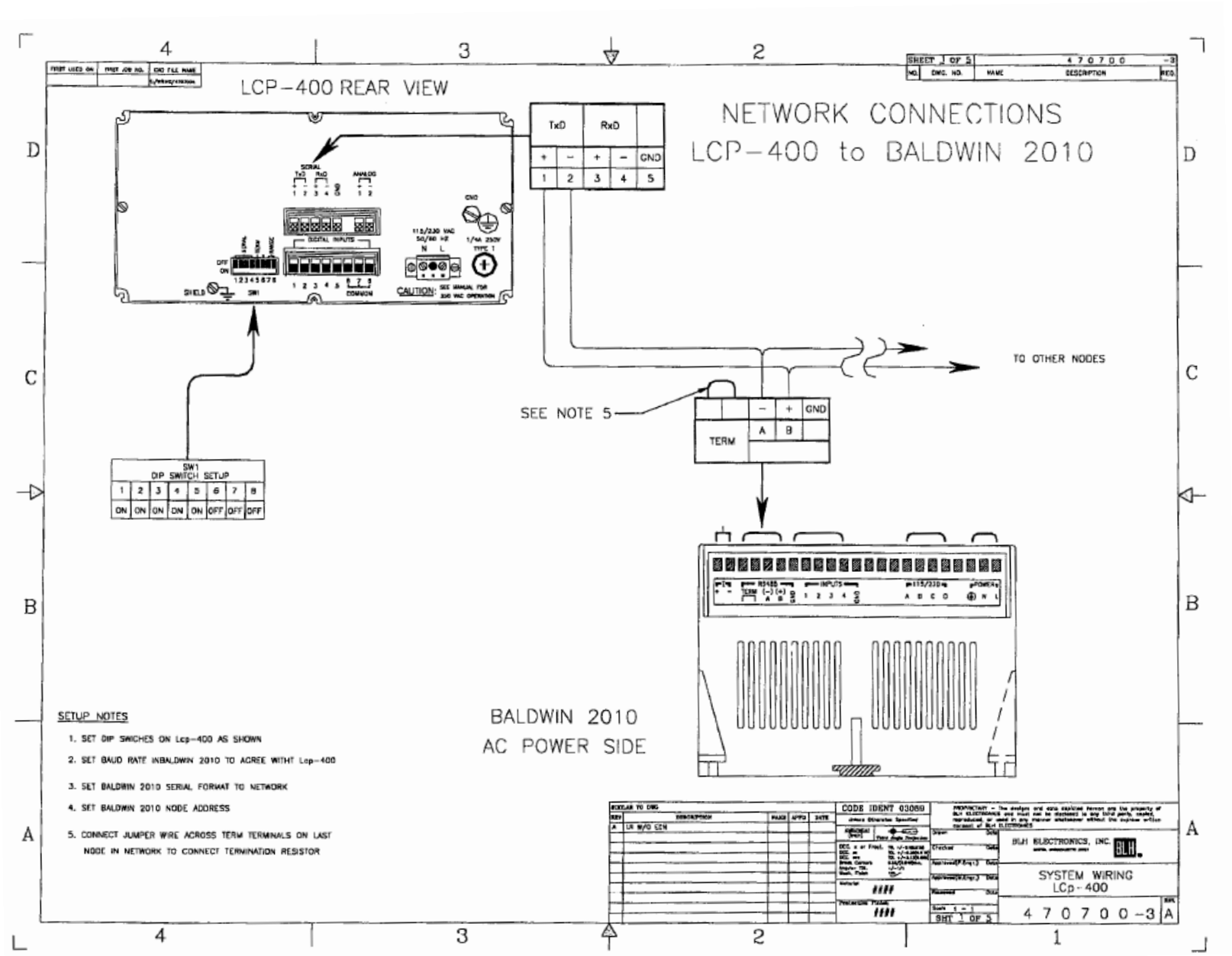
Figure 7-4. LCp-400 Front Panel Display Map.

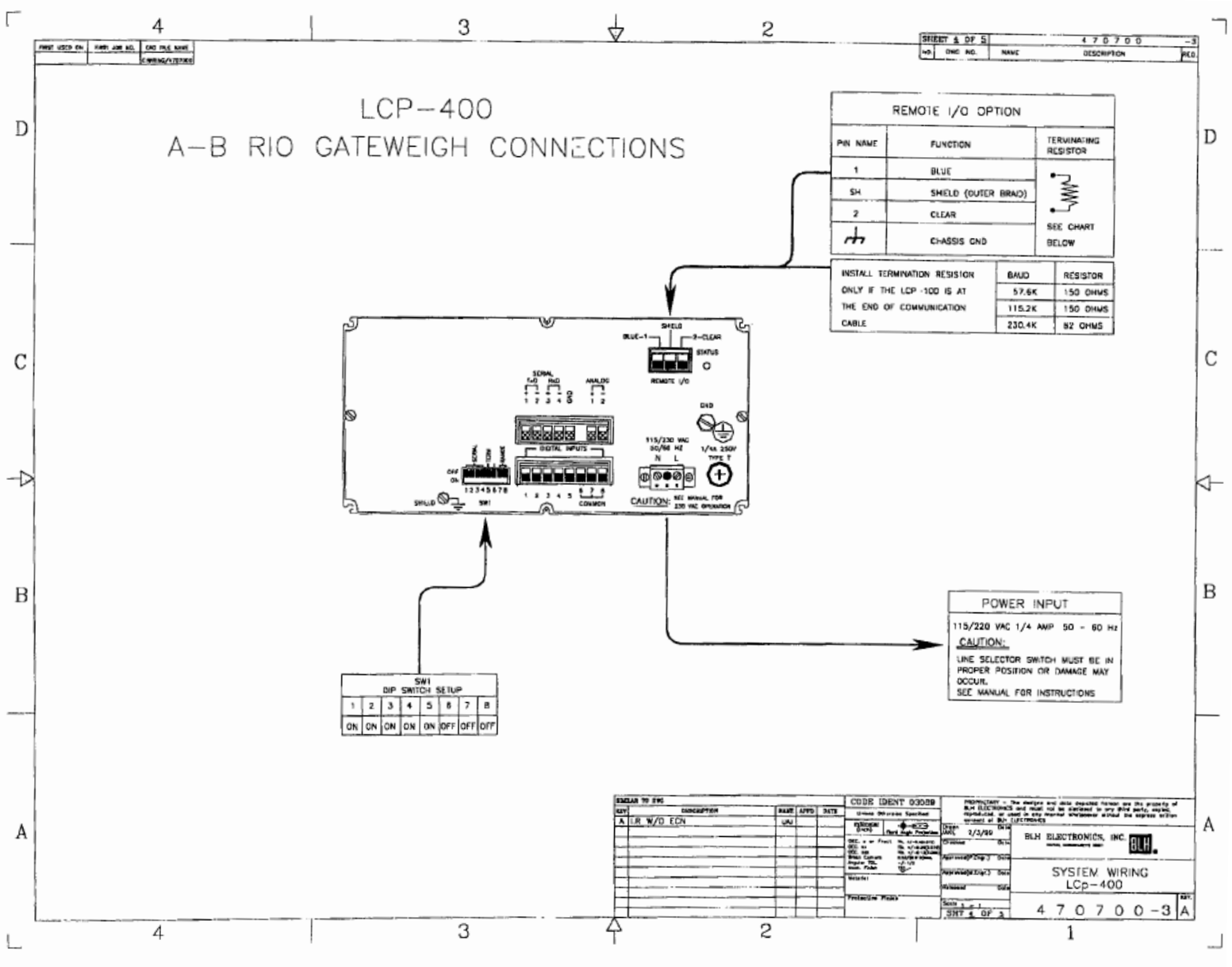
Appendix - LCp-400 Outline and Wiring Drawings


9.00
5.25
10.0
SEE NOTE 1
3.78
3.50
4.00
8.56
8.75
7.57
.375
8.18
6.18
2.00
7.62
4.44
3.595
CUT - OUT
3.88
R 0.125 4 PL
0.845
0.28
.208 DIA
8 PL
7.31
FACTORY MUTUAL APPROVED
CLI DIV2 GR A,B,C,D
NOTE:
1. IF UNIT IS TO BE INSTALLED IN A WASHDOWN AREA A STABLE GREASE TYPE GASKET CEMENT SUCH AS LOCTITE 515 SHOULD BE APPLIED TO BOTH SIDES OF NEOPRENE GASKET TO INSURE A WATER-TIGHT SEAL
BLH ELECTRONICS, INC.
OUTLINE
LCp NEMA 4/4X PANEL MOUNT DIV 2
4 6 8 1 9 1 -3
A


13.50
13.00
1.500
10.00
DIA .312 4 HOLES B REF.
LCp - 100
EXPERT Series
Weight Processor
7.00
7.75
10.84
10.34
8.50
7.75
0.125
1.52
1.75
1.75
3.50
2.00
2.00
2.00
.843 DIA 8 HOLES REF A
REF DWG
WIRING 468984-3
OUTLINE ENCLOSURE
LCP-100 NEMA 4X
4 6 8 9 8 2 -3
BLH ELECTRONICS, INC.


LCP-400 REAR VIEW
NETWORK CONNECTIONS
LCP-400 to LCP-100/200
TxD
RxD
+
-
+
-
GND
1
2
3
4
5
TO OTHER NODES
SW1
DIP SWITCH SETUP
1 2 3 4 5 6 7 8
ON ON ON ON ON OFF OFF OFF
LCp-100/200
REAR VIEW
SW1
DIP SWITCH SETUP
1 2 3 4 5 6 5 6
ON ON ON ON OFF OFF OFF OFF
SEE NOTE 5
Lcp-100/200 SETUP NOTES
1. SET DIP SWITCHES AS SHOWN
2. SET SERIAL FORMAT TO NETWORK
3. SET Lcp100/200 NODE ADDRESS
4. SET BAUD RATE ON Lcp-100/200 TO MATCH BAUD RATE SET UP ON Lcp-400
5. SET DIP SWITCH 5 TO ON POSITION ON LAST NODE IN NETWORK TO CONNECT TERMINATION RESISTOR
CODE IDENT 03089
BLH ELECTRONICS, INC.
SYSTEM WIRING
LCp-400
4 7 0 7 0 0 - 3
A

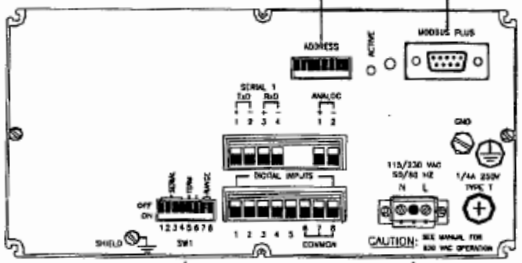

LCP-400 REAR VIEW
NETWORK CONNECTIONS
LCP-400 to BALDWIN 2010
TxD
RxD
+
−
+
−
GND
1
2
3
4
5
TO OTHER NODES
SEE NOTE 5
TERM
A
B
SW1
DIP SWITCH SETUP
1 2 3 4 5 6 7 8
ON ON ON ON ON OFF OFF OFF
BALDWIN 2010
AC POWER SIDE
SETUP NOTES
1. SET DIP SWICHES ON Lcp-400 AS SHOWN
2. SET BAUD RATE INBALDWIN 2010 TO AGREE WITHT Lcp-400
3. SET BALDWIN 2010 SERIAL FORMAT TO NETWORK
4. SET BALDWIN 2010 NODE ADDRESS
5. CONNECT JUMPER WIRE ACROSS TERM TERMINALS ON LAST NODE IN NETWORK TO CONNECT TERMINATION RESISTOR
CODE IDENT 03069
BLH ELECTRONICS, INC.
SYSTEM WIRING
LCp-400
470700-3
A
SHT 1 OF 5


LCP-400
A-B RIO GATEWEIGH CONNECTIONS
REMOTE I/O OPTION
PIN NAME
FUNCTION
TERMINATING RESISTOR
1
BLUE
SH
SHIELD (OUTER BRAID)
2
CLEAR
CHASSIS GND
SEE CHART BELOW
INSTALL TERMINATION RESISTOR ONLY IF THE LCP-100 IS AT THE END OF COMMUNICATION CABLE
BAUD
RESISTOR
57.6K
150 OHMS
115.2K
150 OHMS
230.4K
82 OHMS
SHIELD
BLUE-1
2-CLEAR
STATUS
REMOTE I/O
SERIAL
ANALOG
DIGITAL INPUTS
115/230 VAC 50/60 HZ
1/4A 250V TYPE T
CAUTION:
SW1
DIP SWITCH SETUP
1 2 3 4 5 6 7 8
ON ON ON ON ON OFF OFF OFF
POWER INPUT
115/220 VAC 1/4 AMP 50 - 60 Hz
CAUTION:
LINE SELECTOR SWITCH MUST BE IN PROPER POSITION OR DAMAGE MAY OCCUR.
SEE MANUAL FOR INSTRUCTIONS
A LR W/O ECN
CODE IDENT 03089
BLH ELECTRONICS, INC.
SYSTEM WIRING
LCp-400
4 7 0 7 0 0 -3
A

LCP-400
MODBUS PLUS GATEWEIGH CONNECTIONS

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		
26	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



SW1 DIP SWITCH SETUP							
1	2	3	4	5	6	7	8
ON	ON	ON	ON	ON	OFF	OFF	OFF

POWER INPUT
113/220 VAC 1/4 AMP 50 ~ 60 Hz
CAUTION:
LINE SELECTOR SWITCH MUST BE IN PROPER POSITION OR DAMAGE MAY OCCUR. SEE MANUAL FOR INSTRUCTIONS

SHEET 3 OF 3 — 470700 -3

NO.	DWG. NO.	NAME	DESCRIPTION	REQ.

SIMILAR TO DWG				
REV	DESCRIPTION	NAME	APPD	DATE
A	LR W/O ECN	LAU		

CODE IDENT 03088

BUI ELECTRONICS, INC.

SYSTEM WIRING
LCp-400

470 / 00 -3 | A

SHT 3 OF 3

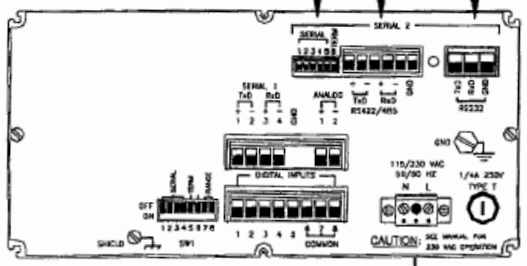
LCP-400
MODBUS RTU GATEWEIGH CONNECTIONS

DIP SWITCH SETTINGS					
S1	S2	S3	S4	S5	
OFF	OFF	ON	OFF	OFF	422 FULL DUPLEX
OFF	OFF	ON	ON	OFF	422 MULTI DROP
ON	ON	ON	ON	ON	485 STANDARD
X	X	OFF	X	X	232

DIP SWITCH SETTING	
S6	
OFF	NO TERMINATION
ON	120 OHM REC. TERM

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		

RS 232	
PIN#	FUNCTION
1	TxD
2	RxD
3	GND



POWER INPUT
115/220 VAC 1/4 AMP 50 - 60 Hz
CAUTION:
LINE SELECTOR SWITCH MUST BE IN PROPER POSITION OR DAMAGE MAY OCCUR. SEE MANUAL FOR INSTRUCTIONS

REVISIONS			
REV	DESCRIPTION	NAME	DATE
A	I.R. W/D ECN	JMJ	

CODE IDENT 03089

BLH ELECTRONICS, INC.

SYSTEM WIRING
LCP-400

470700-3 A

SHT 5 OF 5

BLH

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