LC COMMUNICATOR

USER MANUAL

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This technical document describes the features, specifications, and operations of the product.

> For specific wiring connections, dimensions, and operational specifications of I/O modules and mounting racks please refer to the:
>
> I/O SYSTEMS COMPONENTS data book, Form 132.

The information in this manual has been carefully checked and is believed to be accurate; however, no responsibility is assumed for possible inaccuracies or omissions. Specifications are subject to change without notice.

Opto 22 warrants all its products to be free from defects in material or workmanship for 24 months from the manufacturing date code.

This warranty is limited to the original cost of the unit only and does not cover installation labor or any other contingent costs.

TABLE OF CONTENTS

INTRODUCTION

DESCRIPTION

The Opto 22 LC Communicator is an ASCII-based operator terminal with a 20 key numeric keypad and a two line, 16 character/line alphanumeric LCD display.

The LC Communicator communicates on an RS232 or RS422/485 network as an addressable device. The communications protocol is similar to the OPTOMUX protocol and can thereby reside on an OPTOMUX network. Address, baud rate, and setup parameters are programmable from the keyboard. The LC Communicator uses non-volatile memory for storing the setup parameters.

Power requirements for the LC Communicator are either a regulated 5 VDC or an unregulated 9 to 12 VDC external power supply both at 300 milliamperes.

DISPLAY

The back-lited LCD display consists of a two line, 16 character/line display. The first line is called the PROMPT field and is the primary line for displaying text prompts or messages. The second line is called the RESPONSE field and is the primary line for displaying numeric data values or operator entered values.

KEYPAD

The keypad is a 4 by 5 matrix (20 keys) which include the numerals 0 to 9, cursor control keys, and system function keys.

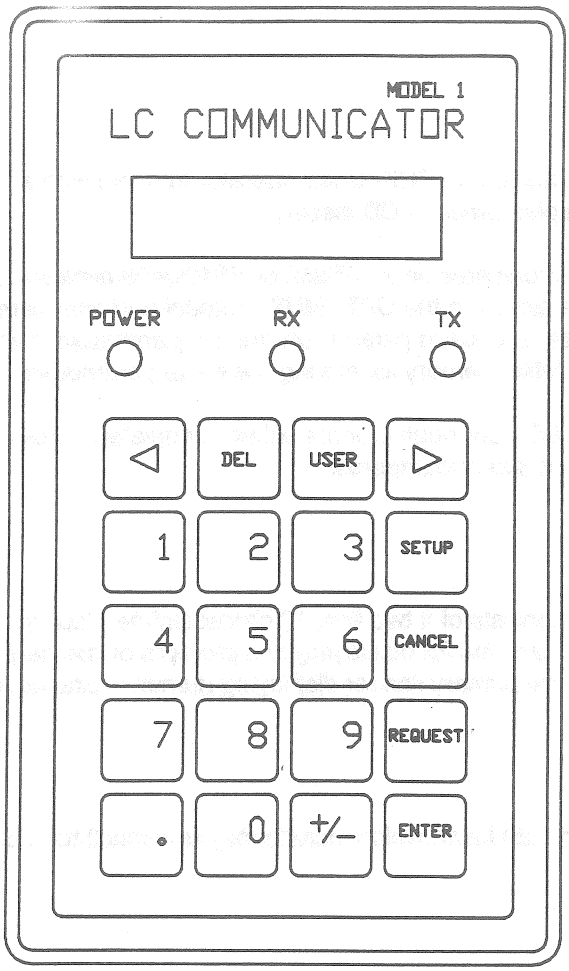

Figure 1 - LC Communicator

Each key is described as follows:

0 through 9	Numeric digits.
.	Decimal point.
+/-	Change sign key.
<- and ->	Non-destructive, cursor keys. Moves cursor along bottom display line, one character at a time.
DEL	Backspace key, positions cursor one position to the left and deletes character at that position.
USER	Not Used.
SETUP	Toggles the setup mode.
CANCEL	Cancels current request and entry. Returns LC Communicator to "* READY *".
REQUEST	Data request key.
ENTER	Data entry key.

OPERATIONS

Setup

This allows the operator to configure the address, baud rate, terminal lockout condition, mode, and password of the LC Communicator.

The operator can cycle through the different selections. This sets the LC Communicator with the proper communication parameters and proper mode. The SETUP mode can be activated at any time.

Request

At the * READY * prompt, an operator enters a number, then presses the REQUEST key. The display should then show the message "nnnnnnnnnnnn REQ", where nnnnnnnnnnnn is the register requested by the operator. This request message is displayed on the top line of the display. The request number can have a maximum of 16 digits, although only 12 digits are displayed on the PROMPT field.

A host computer polling the LC Communicator, would normally poll for status. As soon as the REQUEST is made, the status bit for the REQUEST key will be set. The host can then use the READ REQUEST command to read the operator entered register number. At this time, the host computer may overwrite the message "nnnnnnnnnnnn REQ" with a prompt, tag name, or instruction. This gives the operator some feedback that the host computer has received and accepted the message. The host should also display the existing value for the requested register on the second line of the display at this time.

Data Entry

After a request has been made and accepted by the host (data value displayed, and prompt or acknowledge message shown on first line) the cursor would be positioned at the first (left-most) digit of the data value in the second line of the display. An operator can now view the data value or enter a new value, overwriting the existing value. When the operator is finished entering the value, he must press the ENTER key to have the value accepted by the LC Communicator. The enter number can have a maximum of 16 digits, although only 12 digits are displayed on the PROMPT field.

A host computer would typically poll for STATUS after the READ REQUEST command. The host should also be looking for the ENTER bit to be set with each read of the status. As soon as the ENTER key is detected, the host would then use the READ ENTRY command to get the data value.

COMMAND MESSAGE FORMAT

The LC Communicator uses the following command message format:

ADDR CMD [DATA] CKSM cr

Where:

>	Start Of Message character (SOM).
ADDR	2 Hex digits (00 to FF) representing the address of the unit.
CMD	A single command letter.
DATA	Data of the command message, if required.
CKSM	2 Hex digits representing the checksum. "??" is a wild card, the question marks replaces the checksum value.
cr	Carriage return for End Of Message(EOM).

Address Field (ADDR)

The Address field is a two digit ASCII-Hex character in the range of 00 to FF Hex (0 - 255 decimal). The address field contains the address of the LC Communicator.

Command Field (CMD)

The Command field is a one character field which specifies the command to be processed at the given address. The LC COMMUNICATOR COMMANDS section listed below specifies all the commands accepted by the LC Communicator in the OPTOMUX Slave mode.

Data Field (DATA)

The Data field consists of a variable number of ASCII-Hex characters which vary depending on the command used. Please refer to the COMMAND DESCRIPTIONS section for specific information on what is included in the Data field.

Checksum Field (CKSM)

The Checksum field consists of two ASCII-Hex characters representing the checksum total of the ASCII values of all characters in the message excluding the start of message character (>). Two question marks (??) can be used as a wildcard to represent any checksum value.

RESPONSE MESSAGE FORMAT

There are three possible types of responses:

1. Response with data.

   A DATA CKSM cr

2. Simple acknowledge with no data (ACK).

   A cr

3. Error response (NAK) with a two character error code.

   N EE cr

LC COMMUNICATOR COMMANDS

Below is a list of commands performed by the LC Communicator:

A	Power Up Clear
B	Reset
C	Set Turn Around Delay
D	Not Used
E	Not Used
F	Identify OPTOMUX Type (2)
G	Set Configuration
H	Save Configuration
I	Display Pre-defined Message
J	Display Message (Top Line)
K	Display Message (Bottom Line)
L	Clear Display (Top and/or Bottom Lines)
M	Read Key
N	Read Status Word
O	Read And Clear Status
P	Read Request Value
Q	Read Entry Value
R	Read Password
S	Set Password
T	Read Current Cursor Position
U	Set Current Cursor Position
V	Read Top Line
W	Read Bottom Line
X	Write String At Current Cursor Position
Y	Scroll Display
Z	Clear Keypad Buffer

ERROR CODES

The following is a list of Error Codes:

00	Power Up Clear Expected
01	Undefined Command
02	Checksum Error
03	Input Buffer Overrun
04	Non-printable ASCII Character Received
05	Data Field Error
06	Communications Link Watchdog Time Out Error
07	Specified Limits Invalid
08	Terminal Busy

PRE-DEFINED MESSAGES

The LC Communicator contains a set of pre-defined messages which are displayed depending on the state of the LC Communicator. These messages may also be displayed using the DISPLAY PRE-DEFINED MESSAGE command (I, upper case i).

These messages include the following:

Message Number	Message
00	"* READY *"
01	"* ERROR *"
02	"ENTER PASSWORD"
03	"INVALID ENTRY"
04	"TERMINAL LOCKOUT"
05	"BAUD RATE"
06	"ADDRESS"
07	"NEW PASSWORD ?"
08	"PRESS ANY KEY..."
09	"COMMAND ACCEPTED"
0A	"VALUE ACCEPTED"
0B	"YES"
0C	"NO"
0D	"ON"
0E	"OFF"
0F	"OLD:"
10	"NEW:"
11	"STOP"
12	"START"
13	"OPEN"
14	"CLOSED"
15	"MANUAL"
16	"AUTOMATIC"
17	"BYPASS"
18	"TRUE"
19	"FALSE"
1A	"RUNNING"
1B	"SETPOINT"
1C	"PROPORTIONAL"
1D	"RESET RATE"
1E	"DERIVATIVE"
1F	"GAIN"
20	"BIAS"
21	"* ALARM *"
22	"* WARNING *"
23	"* DANGER *"
24	"* EMERGENCY *"
25	"* SHUTDOWN *"
26	"OUT OF RANGE"
27	"LOW-LOW"

PRE-DEFINED MESSAGES (Continued)

Message Number	Message
28	"LOW"
29	"HIGH"
2A	"HIGH-HIGH"
2B	"DEADBAND"
2C	"RATE"
2D	"OFFSET"
2E	"DEVIATION"
2F	"COUNT"

STATUS WORD

The status word consists of 16 status bits (flags) which may be read at any time using the READ STATUS WORD (N) or READ AND CLEAR STATUS WORD (O) commands. The description of each bit of the status word is listed below:

Bit 0 (LSB) :	Key Ready Flag
Bit 1:	Request Flag
Bit 2:	Entry Flag
Bit 3:	Cancel Flag
Bit 4:	Set Up Flag
Bit 5:	Reserved
Bit 6:	Reserved
Bit 7:	Reserved
Bit 8:	Auto Clear REQUEST Enable
Bit 9:	Auto Clear ENTRY Enable
Bit 10:	Terminal Lockout Enable
Bit 11:	Reserved
Bit 12:	Parity Bit 7 Strip Disable
Bit 13:	Reserved
Bit 14:	Reserved
Bit 15 (MSB):	Reserved

Status Word Descriptions

Key Ready Flag (Bit 0): When this bit is set (1) it indicates that a key has been pressed and the character is in the keypad buffer. The READ KEY command (M) can be used to read the contents of the key buffer.

Request Key Flag (Bit 1): When this bit is set (1), it indicates that the REQUEST key has been pressed and the value has been placed in the Request Buffer. The Request Buffer can be read using the READ REQUEST VALUE command (P).

Entry Key Flag (Bit 2): When this bit is set (1), it indicates that the ENTER key has been pressed and the value has been placed in the Entry Buffer. The Entry Buffer can be read using the READ ENTRY VALUE command (Q).

Cancel Flag (Bit 3): When this bit is set (1), it indicates the CANCEL key has been pressed, and both the Request and Entry Buffers have been cleared. The LC Communicator displays message 00 (* READY *) on the top line.

Setup Flag (Bit 4): When this bit is set (1), the LC Communicator is in setup mode and will ignore all commands from the host except the READ STATUS commands (N and O).

Auto Clear REQUEST Enable (Bit 8): When this bit is set (1), the REQUEST buffer will be cleared automatically after a READ REQUEST VALUE command (P). If this bit is 0, the REQUEST buffer is only cleared when a new value replaces the old one. This bit can be set or cleared using the SET CONFIGURATION command (G).

Auto Clear ENTRY Enable (Bit 9): When this bit is set (1), the ENTRY buffer will be cleared automatically after a READ ENTRY VALUE command (Q). If this bit is 0, the ENTRY buffer is only cleared when a new value replaces the old one. This bit can be set or cleared using the SET CONFIGURATION command (G).

Terminal Lockout Enable (Bit 10): When this bit is set (1), it indicates that the LC Communicator is in Lockout mode. Lockout mode prevents any unauthorized keypad entry by an operator. This bit can be set or cleared using the SET CONFIGURATION command (G).

Parity Bit 7 Strip Disable (Bit 12): When this bit is set (1), the most significant bit (MSB) of each incoming character is NOT stripped off. OPTOMUX uses only 7 bit ASCII characters (0 to 127), therefore, the default condition for the LC Communicator is to strip off (set to 0) bit 7. Bit 12 of the status word can be set or cleared using the SET CONFIGURATION command (G).

HARDWARE INSTALLATION

TERMINATING JUMPER INSTALLATION

The LC Communicator is factory set with the terminating jumpers installed on the receive (Rx) and transmit (Tx) lines. The terminating jumpers are required only if the LC Communicator is the last station on the network. Figure 2 shows the rear view of the LC Communicator with the Tx and Rx jumper locations. The values of the terminating resistors are 220 ohms.

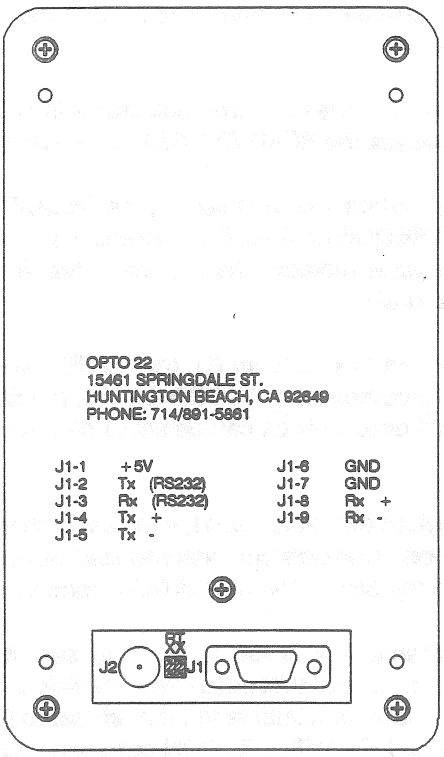

Figure 2 - LC Communicator Rear View

RS422/485 WIRING (HOST MODE)

The LC Communicator can also be configured as an host device to transmit commands to OPTOMUX stations and slave LC Communicator. Figure 5 shows how to wire the LC Communicator as an OPTOMUX host device.

The LC Communicator, in the host mode, is normally located at one end of the OPTOMUX network. Therefore, the RX and TX terminating jumpers must be installed (factory settings). When the LC Communicator is used as the host device, biasing resistors must be installed as shown in Figure 5. Note that the host mode wiring is reverse of the slave mode wiring. In the host mode wiring, you can use the LC Communicator's OPTOSCAN or OPTOMUX HOST modes to checkout your OPTOMUX network.

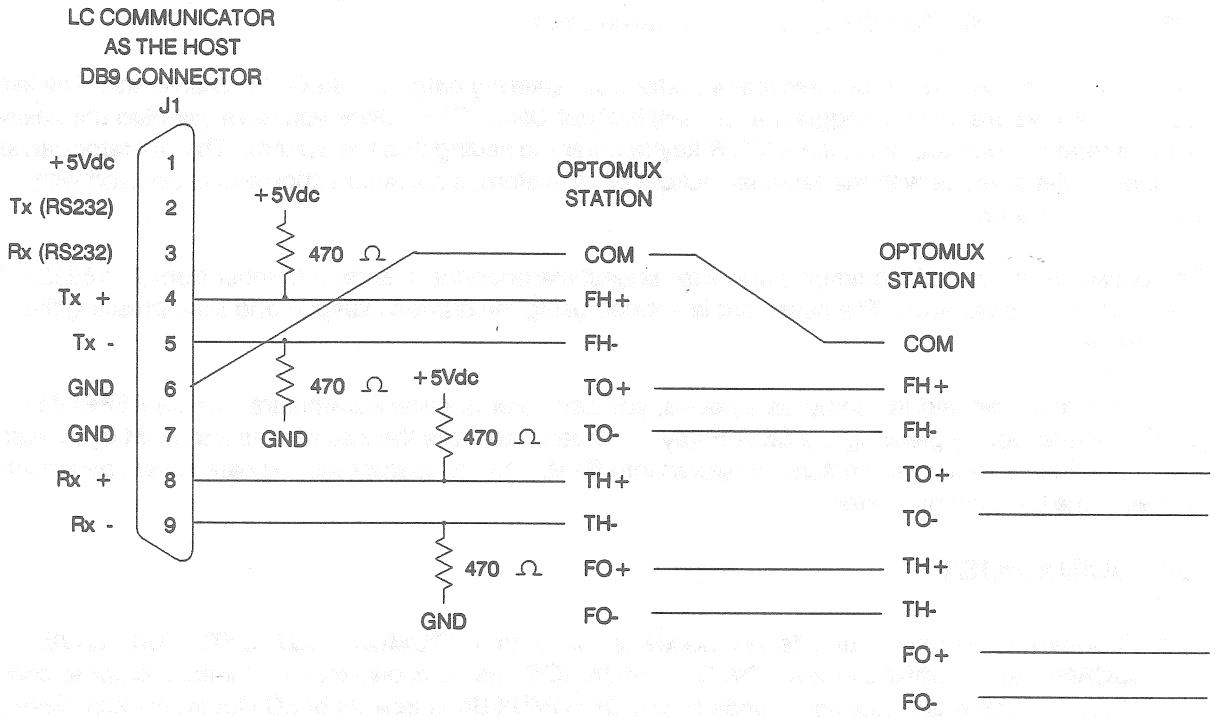

Figure 5 - RS422/485 Wiring Diagram With LC Comm. As Host

SETUP

The SETUP key allows you to change the mode of operation of the LC Communicator. Besides the mode of operation, you can also set the address, baud rate, terminal lockout (OFF/ON), and password of the LC Communicator.

The LC Communicator address setting is similar to the OPTOMUX address. If you are using the LC Communicator as an OPTOMUX station, then the address cannot be duplicated in the network. The left and right arrow keys are used to decrement and increment the address, respectively. Once you have selected the desired address, press the ENTER key to enter the address into the system. The range for the address is from 0 to 255.

The baud rate can be selected similar to the OPTOMUX address. The left and right arrow keys are used to decrement and increment the baud rate, respectively. Once you have selected the desired baud rate, press the ENTER key to enter the baud rate into the system. The valid baud rate settings are 110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, and 38400 baud.

Terminal Lockout is used to prevent the operator from entering data on the LC Communicator. The left or right arrow keys are used to toggle the terminal lockout ON or OFF. Once you have selected the desired state of terminal lockout, press the ENTER key to enter the setting into the system. The operator can still enable the Setup mode with the terminal lockout on, therefore, a password should also be used with terminal lockout on.

The password for the LC Communicator is to request the operator to enter a number from 1 to 65535, 0 is reserved for no password. The password is entered using the numeric keypad and then pressing the ENTER key.

Once you have selected the setup parameters, you can enter the new parameters into the EEPROM of the LC Communicator by pressing the SETUP key. You can also store the parameters into RAM by pressing the CANCEL key. If the parameters are stored into RAM, you can restore the old parameters by recycling power to the LC Communicator.

OPTOMUX HOST

The LC Communicator has four different modes of operation: OPTOMUX HOST, OPTOMUX SLAVE, OPTOSCAN, and TERMINAL mode. The OPTOMUX HOST mode allows the LC Communicator to send OPTOMUX/LC Communicator commands to any OPTOMUX Brain Boards or LC Communicator slave on the network. In this mode, the start of OPTOMUX/LC Communicator command character (>, a greater than sign) is automatically inserted at the beginning and you start by entering the OPTOMUX/LC Communicator address, command, and data, if necessary. The LC Communicator will automatically append the proper checksum to the command message.

RS232 WIRING

To connect the LC Communicator to a host or slave device using the RS232 port, use the Transmit RS232 (J1-2), Receive RS232 (J1-3), and Ground (J1-6 or J1-7) lines.

Besides connecting to the host or slave device, you must also terminate the RS422/485 Transmit (+ and -) and Receive (+ and -) lines. Figure 3 shows how to wire the LC Communicator to a RS232 host or slave device.

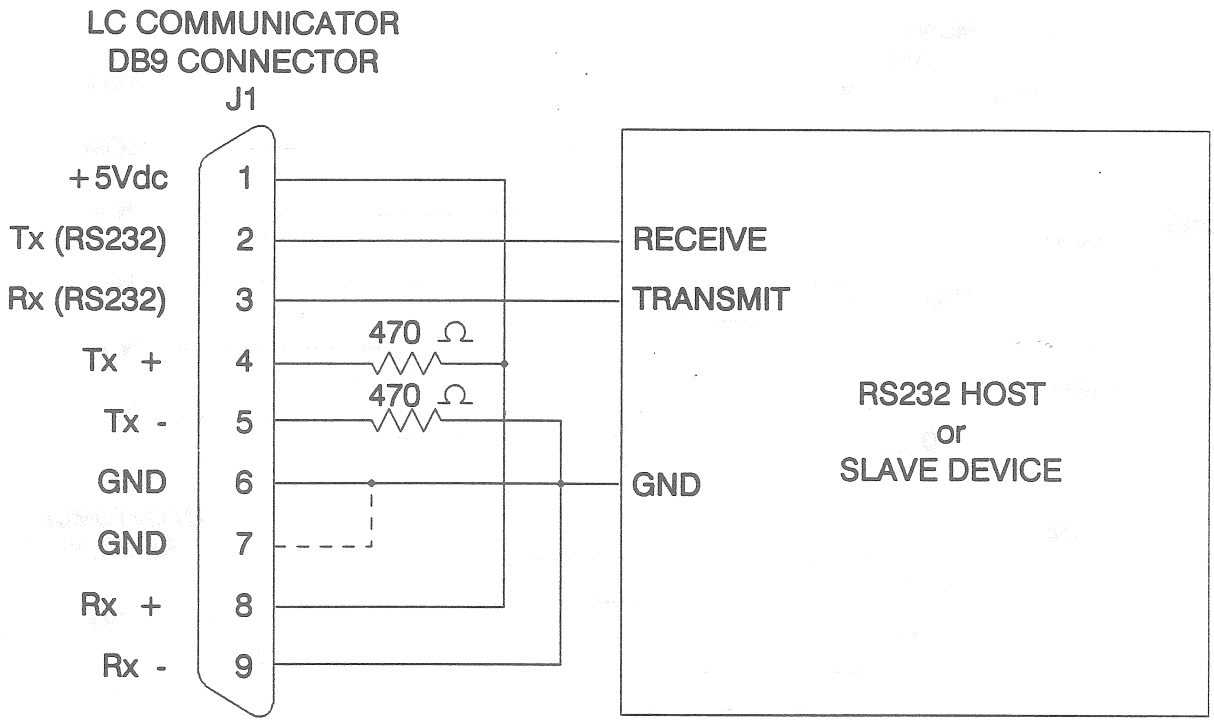

Figure 3 - RS232 Wiring Diagram

RS422/485 WIRING (SLAVE MODE)

To connect the LC Communicator to an OPTOMUX network using the RS422/485 port, use the Transmit + and - (J1-4 and J1-5) and Receive + and - (J1-8 and J1-9) lines. The LC Communicator can be setup as a slave device on the OPTOMUX network. Figure 4 shows how to wire the LC Communicator as an OPTOMUX slave device.

The LC Communicator has the terminating jumpers factory installed. Therefore, the LC Communicator is setup to be the last station on the OPTOMUX network. If the LC Communicator is located elsewhere on the OPTOMUX network, the RX and TX terminating jumpers must be removed.

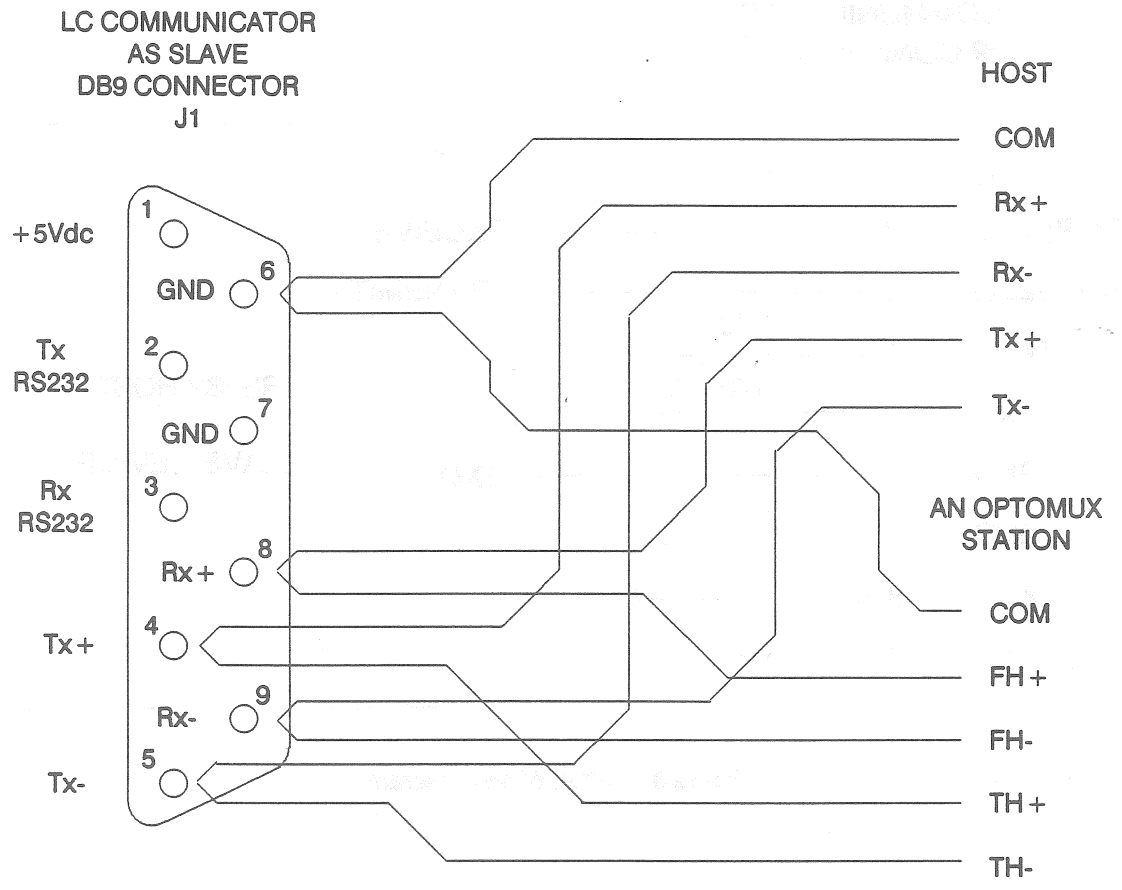

Figure 4 - RS422/485 Wiring Diagram With LC Comm. As Slave

OPTOMUX HOST (continue)

The left and right arrow keys are used to decrement and increment the character on the display, respectively. Press the ENTER key to enter that character and move to the next character. (Press the DEL key to move back to the previous entry.) Press the REQUEST key to calculate the checksum. The LC Communicator will calculate and display the checksum and carriage return (cr). Press the ENTER key to transmit that message out of the LC Communicator. Press the REQUEST key to continuously transmit that OPTOMUX/LC Communicator command. To stop continuous transmission, press the CANCEL key. Press the CANCEL key, at any time, to enter a new OPTOMUX/LC Communicator command.

OPTOMUX SLAVE

The OPTOMUX SLAVE mode allows the LC Communicator to function as an OPTOMUX station. The LC Communicator is addressable and accepts any command described in the COMMAND DESCRIPTION section. Please refer to that section for a detailed description of all the commands.

In the OPTOMUX SLAVE mode, an operator can enter numeric values into the REQUEST and ENTRY registers using the REQUEST and ENTER keys, respectively. A host computer, using the LC Communicator commands, can retrieve the values from the registers. The left and right arrow keys move the cursor left and right, respectively. The DEL key deletes the character to the left of the cursor and moves the cursor to the left. The CANCEL key clears the REQUEST and ENTRY registers and returns the LC Communicator to the "* READY *" mode.

OPTOSCAN

In the OPTOSCAN mode, the operator can determine what OPTOMUX stations and/or LC Communicator are on the OPTOMUX network. Press the ENTER key to start OPTOSCAN, it starts at address FF Hex and decrements down to 00 Hex. OPTOSCAN sends the Power Up Clear (A) and Identify OPTOMUX Type (F) command to each address. When an OPTOMUX station or LC Communicator (in OPTOMUX SLAVE mode) is detected, the LC Communicator will stop and display a message identifying the station to be an analog (A0161cr) OPTOMUX station, a digital (A0060cr) OPTOMUX station, or a LC Communicator (A0262cr). Press the ENTER key to continue searching for additional OPTOMUX stations. OPTOSCAN will restart at FF Hex after decrementing to 00 Hex. Press the CANCEL key at any time to return OPTOSCAN to the beginning.

Once OPTOSCAN has found an OPTOMUX station or LC Communicator, you can have the LC Communicator continuously transmit that command by pressing the REQUEST key. (This is useful for testing out the wiring of the network.) Press any key except SETUP to stop transmission. Now you can press the CANCEL key to return to the beginning of OPTOSCAN or press the ENTER key to continue scanning for additional OPTOMUX stations and/or LC Communicator.

TERMINAL

In the TERMINAL mode, the LC Communicator can accept ASCII characters from 0 to 255. ASCII characters from 0 to 127 are standard characters, while ASCII characters from 128 to 255 are custom characters by Hitachi's Liquid Crystal Display Module, Model LM016L. You must set the "Parity Bit 7 Strip Disable" bit in the status word (command G) to display the characters from 128 to 255.

The cursor starts at the upper left hand corner and moves to the right as characters enter the LC Communicator. The display can handle two rows of 16 characters. When the cursor reaches the sixteenth position, it does a carriage return line feed and continues on the bottom line. If the cursor is on the bottom line, right-most position, then entering another character will scroll the existing lines up one (the bottom line will write over the top line, and the bottom line will be cleared) and continue displaying characters. The lines will continued to scroll up as more characters are received by the LC Communicator.

The LC Communicator, besides receiving characters, can also transmit characters out to a host computer. The following is a list of ASCII characters send out by the LC Communicator from its keypad.

ASCII Character	Decimal Code
0	30
1	31
2	32
3	33
4	34
5	35
6	36
7	37
8	38
9	39
+/-	45 (Minus sign)
<-	8 (Back space)
->	32 (Space)
DEL	127 (DEL)
USER	7 (BEL)
CANCEL	27 (ESC)
REQUEST	10 (LF)
ENTER	13 (CR)
SETUP	(Used for Setup Mode)

COMMAND DESCRIPTIONS

POWER UP CLEAR

Purpose:

Prevents LC Communicator from returning a Power Up Clear Expected error message in response to the first instruction following application of power.

Format:

A

Remarks:

Only functions if this is the first command sent after power up; a "Power Up Clear Expected" error is returned if any other command is sent first, and that command is NOT executed. After a "Power Up Clear Expected" error is returned this command does not need to be sent, the next command will be executed normally.

This command has no effect on LC Communicator operation or setup. The "Power Up Clear Expected" error provides an indication to the host that there has been a power failure.

Example:

To perform a Power Up Clear on an LC Communicator at address 121.

>79AB1cr

RESET

Purpose:

Clears display RAM, clears key buffer, and restores system variables from EEPROM.

Format:

B

Example:

To reset the LC Communicator at address 34.

>22BA6cr

SET TURN AROUND DELAY

Purpose:

Sets the LC Communicator to wait for a specified time before responding to commands sent from the host.

Format:

C [d]

Remarks:

[d] is 0 = No delay (default)
1 = 10 milliseconds
2 = 100 milliseconds
3 = 500 milliseconds

Example:

To set the turn around delay at address 146 to 100 milliseconds.

>92C2E0cr

IDENTIFY OPTOMUX

Purpose:

Instructs an OPTOMUX station to identify itself as either an analog station, digital station, or LC Communicator.

Format:

F

Remarks:

LC Communicator identification code is 2. Therefore, the response by the LC Communicator will always be A0262cr.

Example:

To identify what is at address 208.

>D0FBAcr

SET CONFIGURATION

Purpose:

Used to set the option flags in MSB of status word.

Format:

G mmll

Remarks:

mmll is the status word, however, only the most significant byte (mm) of the status word can be set. The LC Communicator ignores the least significant byte (ll).

Example:

To enable Terminal Lockout at address 150.

>96G04007Acr

SAVE CONFIGURATION

Purpose:

Saves all system variables in EEPROM.

Format:

H

Remarks:

System variables include the following: Address, baud rate, turn around delay, password, and most significant byte of status word.

Example:

To save the system variables at address 255.

>FFH04cr

DISPLAY PRE-DEFINED MESSAGE

Purpose:

Displays a pre-defined message on either line of the display.

Format:

I nnmm (Upper case i)

Remarks:

nn defines which line to display the message. If nn = 00, then the message is displayed on the top line. If nn = 01, then the message is displayed on the bottom line.

mm is the message number. For a list of internal messages refer to the PRE-DEFINED MESSAGES section. The cursor will be positioned after the last character of the internal message.

Example:

To display the pre-defined message (#1A) "RUNNING" on the top line at address 200.

>C8I001A96cr

DISPLAY STRING ON TOP LINE

Purpose:

Displays up to a 16 character string on the top line of the display.

Format:

J [sssssssssssssss]

Remarks:

sssssssssssssss is a variable length string from 0 to 16 ASCII characters. If a larger string is sent, it will continue on the bottom line. The string starts at the left-most position regardless of cursor position.

Example:

To display "HELLO WORLD!" on the top line at address 0.

>00JHELLO WORLD!E7cr

DISPLAY STRING ON BOTTOM LINE

Purpose:

Displays up to a 16 character string on the bottom line of the display.

Format:

K [sssssssssssssss]

Remarks:

sssssssssssssss is a variable length string from 0 to 16 ASCII characters. If a larger string is sent, it will wrap around on the bottom line. The string starts at the left-most position regardless of cursor position.

Example:

To display "HELLO OPTO 22!!!" on the bottom line at address 0.

>00KHELLO OPTO 22!!!68cr

CLEAR DISPLAY

Purpose:

Clears either or both lines of the display.

Format:

L [mmmm]

Remarks:

If mmmm is 0000 or is not included, both lines of the display are cleared and the cursor is positioned at the beginning of the bottom line.

If mmmm is 1, the top line is cleared and the cursor remains at the current location.

If mmmm is 2, the bottom line is cleared and the cursor is positioned at the beginning of the bottom line.

Example:

To clear both lines of the display on address 0.

>00L00006Ccr

READ KEY

Purpose:

Reads a key from the keypad buffer and returns the scan code for that key.

Format:

M

Remarks:

If the buffer is empty, a 00 is returned for the scan code. The following is a list of scan codes in hexadecimal for all the keys:

Scan Code	Key
00	Not Used
01	Left Arrow
02	DEL
03	USER
04	Right Arrow
05	1
06	2
07	3
08	SETUP
09	4
0A	5
0B	6
0C	CANCEL
0D	7
0E	8
0F	9
10	REQUEST
11	.
12	0
13	+/-
14	ENTER

Example:

A response of A1061cr, indicates that the "REQUEST" key was in the buffer. The "REQUEST" key has a scan code of 10.

A1061cr

READ STATUS WORD

Purpose:

Reads the status word of the LC Communicator.

Format:

N

Remarks:

The status word will be returned as four ASCII-Hex digits describing a 16 bit number. Each bit is described in the STATUS WORD section.

Example:

To read the status word at address 0.

>00NAEcr
A0001C1cr

Bit 0 (LSB) is set, meaning Key Ready Flag is set.

READ AND CLEAR STATUS WORD

Purpose:

Reads the status word of the LC Communicator, then clears the least significant byte of the status word.

Format:

O

Remarks:

The status word will be returned as four ASCII-Hex digits describing a 16 bit number. Each bit is described in the STATUS WORD section.

Example:

To read and clear the status word at address 255.

>FFODBcr

READ REQUEST VALUE

Purpose:

Returns the value stored in the REQUEST buffer (up to 16 digits).

Format:

P

Remarks:

If the Auto Clear REQUEST Bit is set in the status word, then the REQUEST buffer will also be cleared after this command is executed. Up to 16 digits are returned or until the first space is encountered.

This command will read up to 16 digits, however, only 12 digits will be display on the top line.

Example:

To read the value (8856) in the REQUEST buffer at address 0.

>00PB0cr
A8856DBcr

READ ENTRY VALUE

Purpose:

Returns the value stored in the ENTRY buffer (up to 16 digits).

Format:

Q

Remarks:

If the Auto Clear ENTRY Bit is set in the status word, then the ENTRY buffer will also be cleared after this command is executed. Up to 16 digits are returned or until the first space is encountered.

This command will read up to 16 digits, however, only 12 digits will be display on the top line.

Example:

To read the value (124.45) in the ENTRY buffer at address 0.

>00QB1cr
A124.452Ecr

READ PASSWORD

Purpose:

Returns the password stored in the LC Communicator's RAM.

Format:

R

Remarks:

If a password of 0000 is returned, then no password is defined for the LC Communicator.

The range of the password is from 0 to 65535. The value returned by this command is a hexadecimal value.

Example:

To read the password (12345) of an LC Communicator at address 45.

>2DRC8cr
A3039CFcr

3039 Hex is equal to 12345 decimal.

SET PASSWORD

Purpose:

Sets a PASSWORD value in the LC Communicator's RAM.

Format:

S [dddd]

Remarks:

dddd is the hexadecimal value of the decimal value of the password. The range of dddd is from 0 to FFFF Hex.

Example:

To set the password to 14521 (38B9 Hex) at address 45.

>2DS38B9AFcr

READ CURRENT CURSOR POSITION

Purpose:

Returns the cursor's latest position.

Format:

T

Remarks:

Two ASCII-Hex characters (00 to 1F) are returned which indicate an absolute cursor position on either the top display or the bottom display. The possible cursor positions for the top display are from 00 (left-most) to 0F (right-most). The possible cursor positions for the bottom display are from 10 (left-most) to 1F (right-most). All values are in hexadecimal.

Example:

To read the cursor position at address 25.

>19TBEcr

SET CURSOR POSITION

Purpose:

Sets the cursor position.

Format:

U [dd]

Remarks:

dd is an ASCII-Hex value (00 to 1F) which the cursor position on either the top display or the bottom display will be set to. The possible cursor positions for the top display are from 00 (left-most) to 0F (right-most). The possible cursor positions for the bottom display are from 10 (left-most) to 1F (right-most). All values are in hexadecimal. A value greater than 1F will cause the cursor to disappear.

Example:

To position the cursor at the top line far right at address 25.

>19U0F35cr

READ TOP LINE

Purpose:

Reads the entire top line of the display.

Format:

V

Remarks:

Sixteen characters are returned which match the ASCII data of the top line of the display (cursor positions 00 to 0F).

Example:

To read the top line (* READY *) at address 0.

>00VB6cr
A* READY * E9cr

READ BOTTOM LINE

Purpose:

Reads the entire bottom line of the display.

Format:

W

Remarks:

Sixteen characters are returned which match the ASCII data of the bottom line of the display (cursor positions 10 to 1F).

Example:

To read the bottom line (1234567890123456) at address 0.

>00WB7cr
A12345678901234 5642cr

WRITE STRING AT CURRENT CURSOR POSITION

Purpose:

Writes a character or string of characters starting at the current cursor location.

Format:

X

Remarks:

Up to 16 characters may be written in one command. If the cursor is on the top line and not located at the far left, then it is possible for the string to write onto the bottom line. If the cursor is on the bottom line and the cursor is not on the far left, then the string will wrap around.

Example:

To write "HELLO WORLD!!!" on the top line at address 0.

```
>00U0015cr
Acr
>00XHELLO WORLD!!!37cr
```

SCROLL DISPLAY

Purpose:

This command scrolls the top and bottom lines of the display.

Format:

Y

Remarks:

The bottom line of the display replaces the top line of the display. The bottom line is then cleared and the cursor is positioned at the beginning of the bottom line.

Example:

To clear the display at address 0.

```
>00YB9cr
Acr
>00YB9cr
Acr
```

CLEAR KEYPAD BUFFER

Purpose:

Clear the keypad buffer of any characters.

Format:

Z

Remarks:

The keypad buffer can store upto 16 characters.

Example:

To clear the keypad buffer at address 0.

>00ZBAcr

APPENDIX

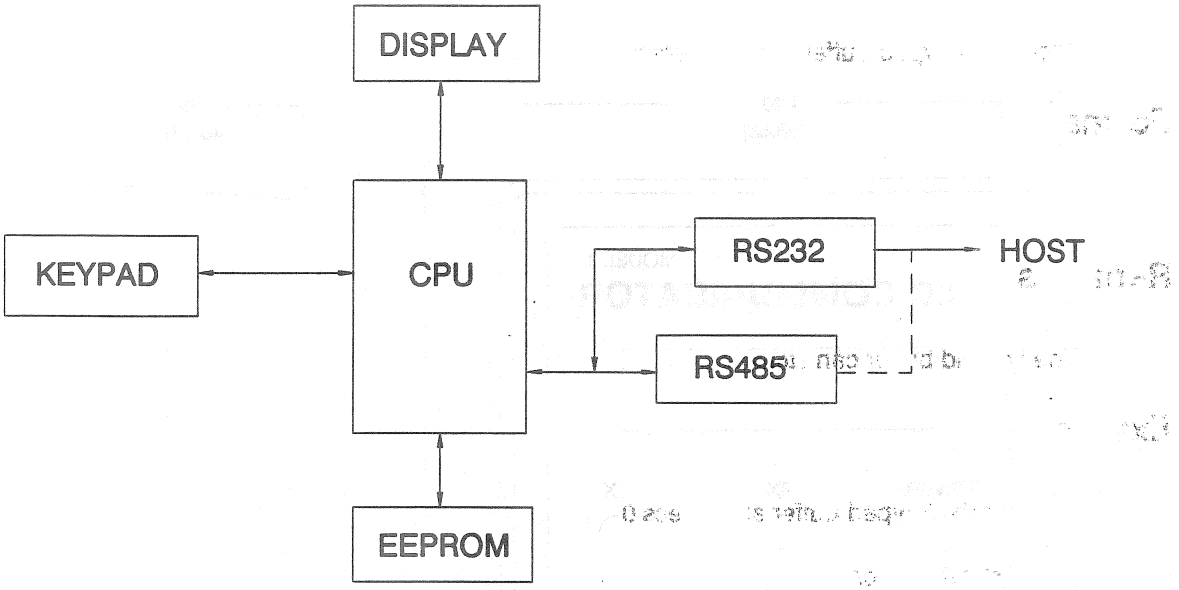

Figure A-1 LC Communicator Block Diagram

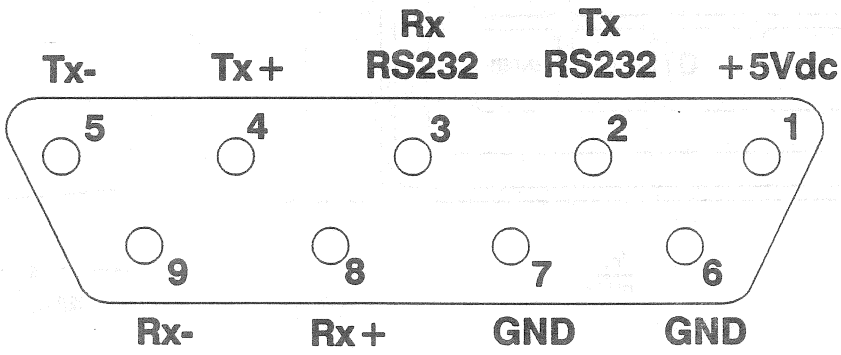

Figure A-2 LC Communicator DB 9 Connector Pinout

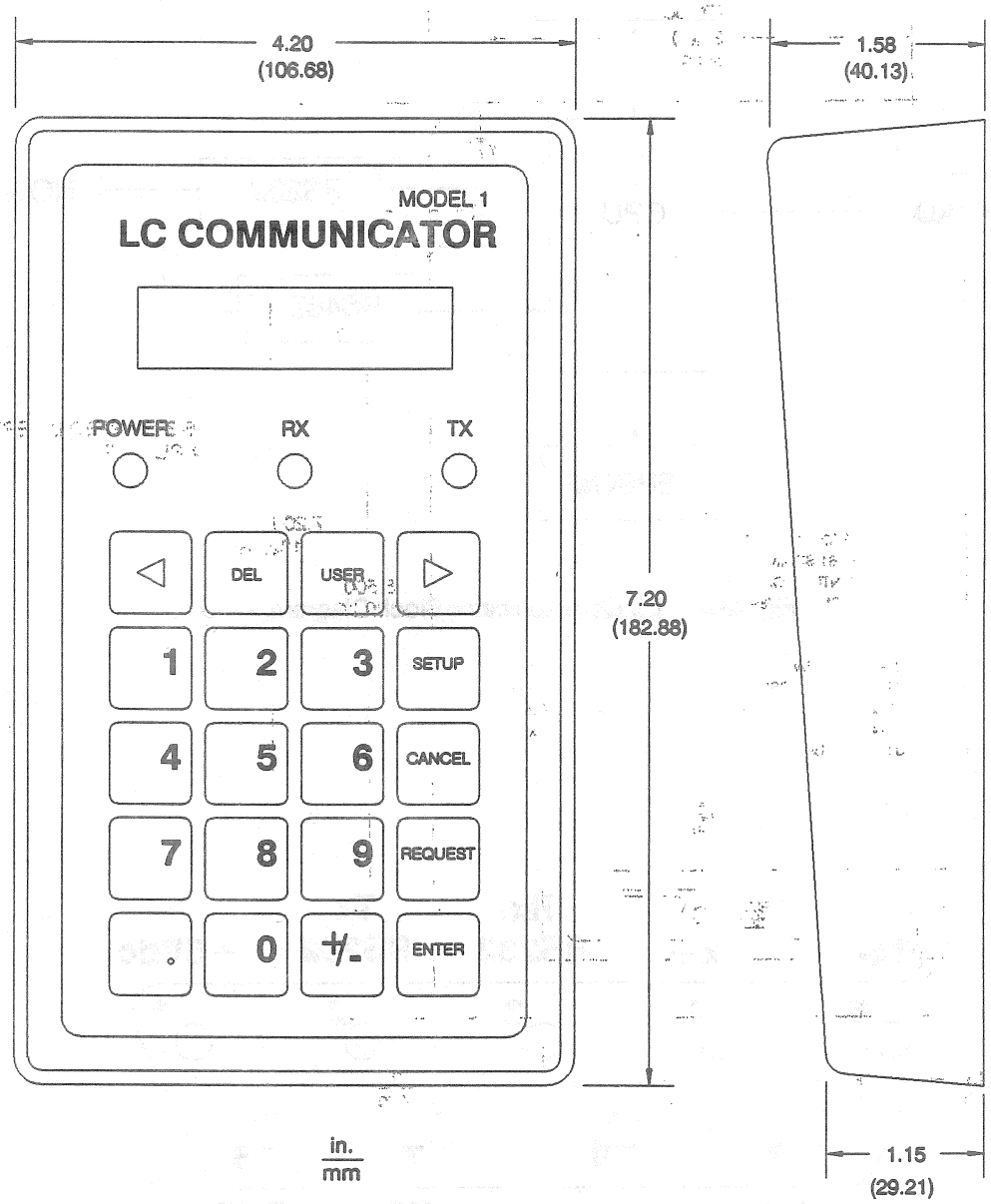

Figure A-3 LC Communicator Dimensions

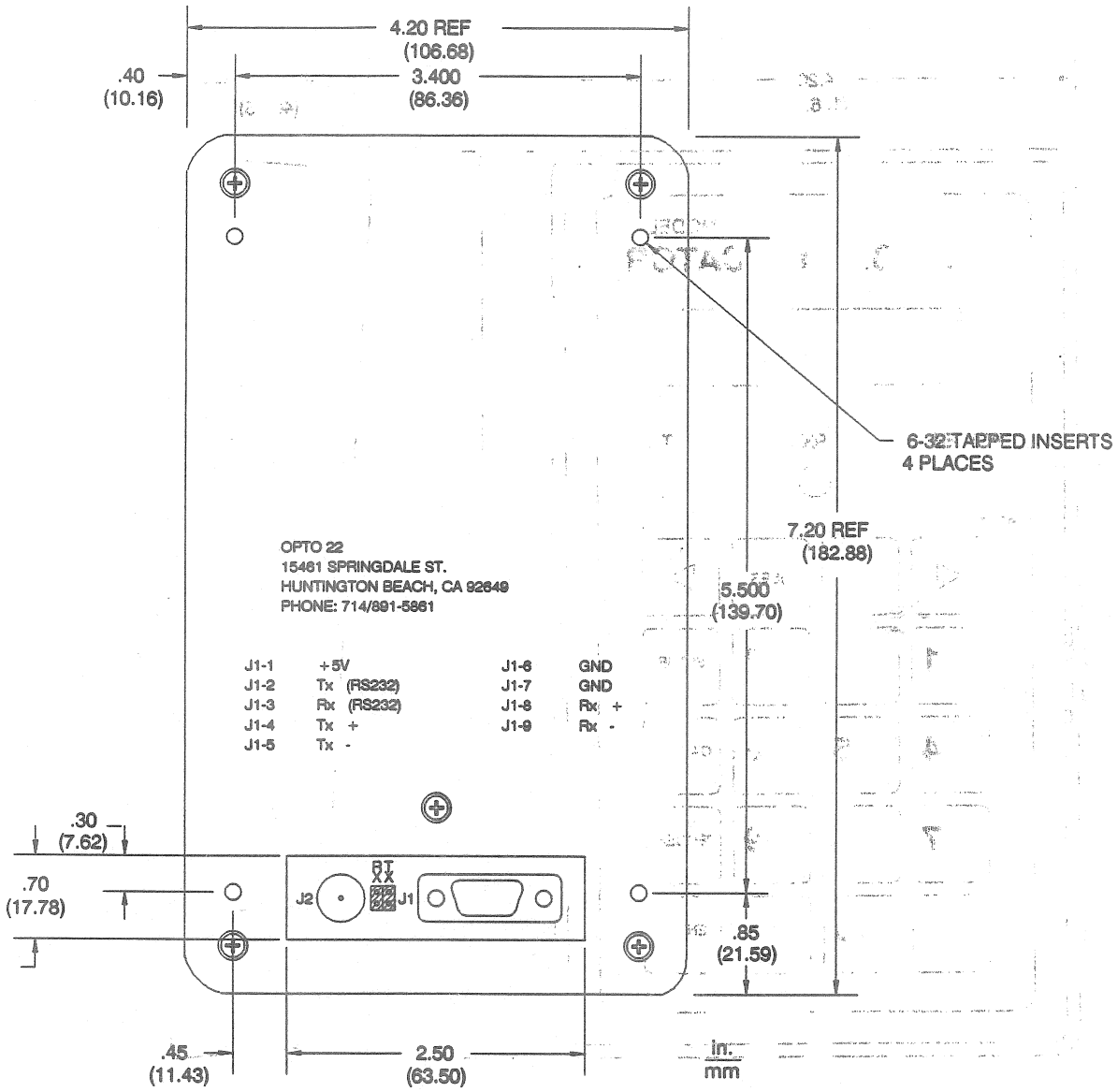

Figure A-4 LC Communicator Rear Mounting Dimensions