NetMedia 2x16 Serial LCD Display Module V1.2

- RS232 compatible serial interface (2400 & 9600 baud selectable)
- Externally selectable serial polarities (Inverted & Non-Inverted)
- Serially controllable contrast and backlight levels
- 8 user programmable custom characters
- 16 Byte serial receive buffer

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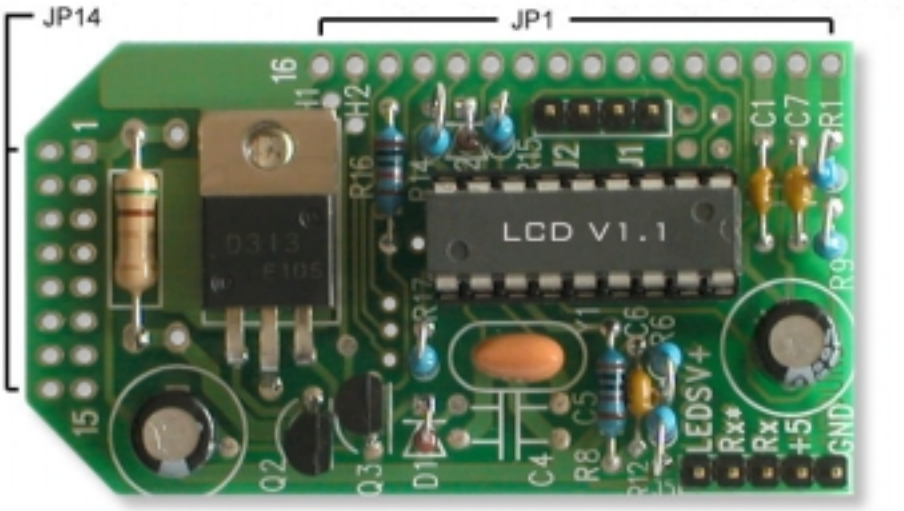
Warranty
NetMedia, Inc. warrants this product against defects in materials and workmanship for a period of 90 days from purchase date. Repaired/replaced products will be returned via standard shipping. Expedited return shipping is available at customer's expense. Any product that has been abused, modified or had its polarity reversed is not covered under warranty. Our technicians check all returns. Items damaged by customer abuse/misuse will not be warranted and will only be returned at the customer's request and expense.

Note: Extended warranties are available for large volume OEM customers. Please contact a NetMedia sales representative for more information.

Pinout

Power and communications connections are made via header J5. Jumper connections J1 and J2 are used to set the modules baud rate and display type. Connection JP1 connects the serial module to the LCD, header JP14 is for 2x8 pin style LCD modules.



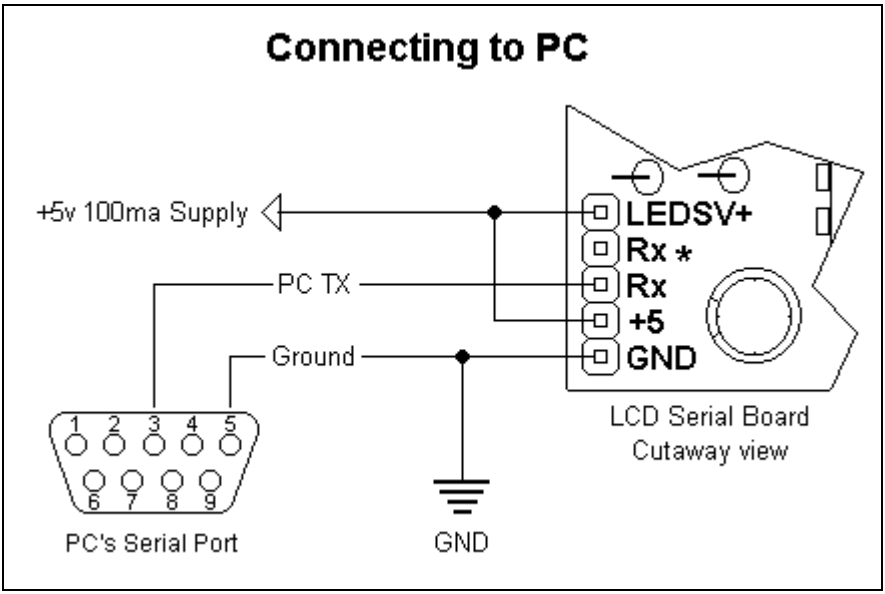
J5 Pins	Description	
GND	Power Ground	**Reversing Polarity voids warranty!**
+5	Power + 5 supply	**Reversing Polarity voids warranty!**
RX	Serial Input	RS232 or Logic Level
RX*	Serial Input (Inverted)	RS232 or Logic Level (Not commonly used)
LEDSV+	Backlight Power	Tie to +5 or provide a separate 5v 100ma supply

Note: Always disconnect power before changing jumper positions!

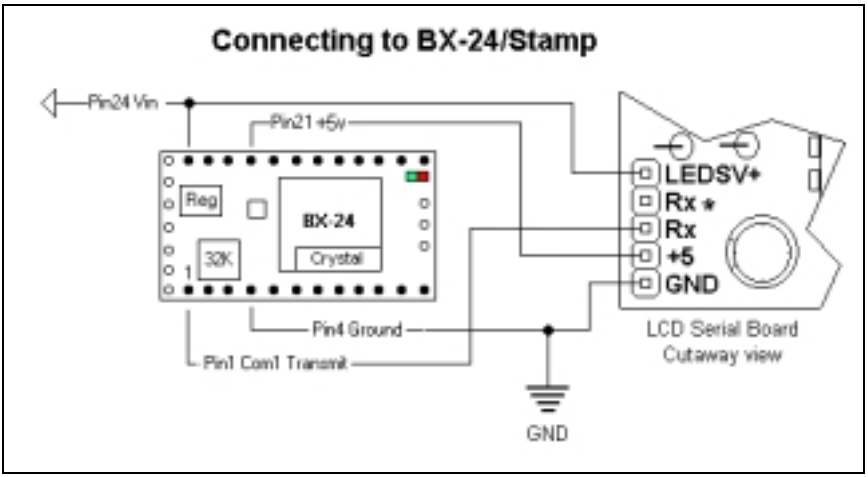
Jumpers J1 & J2	Description	
J1	J1 On = 9600 Baud, J2 Off = 2400 Baud	Factory setting = J1 On
J2	****Not Used****	Factory setting = J2 On

JP1/JP14 Pins 1 - 8	Description	JP1/JP14 Pins 9 -16	Description
Pin1	Ground	Pin9	D2 (Not Used)
Pin2	VCC (+5)	Pin10	D3 (Not Used)
Pin3	Contrast	Pin11	D4
Pin4	Data/Command (R/S)	Pin12	D5
Pin5	Read/Write (W)	Pin13	D6
Pin6	Enable (E1)	Pin14	D7
Pin7	D0 (Not Used)	Pin15	VCC (LEDSV+)
Pin8	D1 (Not Used)	Pin16	Ground

Interfacing
The diagrams below show two common methods for interfacing the 2x16 LCD.



Note: Never connect LEDSV+ to +5 on the BX-24! The BX-24 +5 regulator cannot supply enough current to power the LCD backlight and will overheat.



LCD Control Codes

Description	Keyboard Code	ASCII or Decimal value
Display custom character 0-7	Ctrl-@ -Through- Ctrl-G	0 - 7
BackSpace	Ctrl-H	8
Horizontal Tab	Ctrl-I	9
New Line	Ctrl-J	10
Vertical Tab	Ctrl-K	11
Form Feed (Clear Screen)	Ctrl-L	12
Carriage Return	Ctrl-M	13
Reset Controller	Ctrl-N	14
Set Geometry	Ctrl-O	15
Set Tab Size	Ctrl-P	16
Set Cursor Position	Ctrl-Q	17
*Not Used	*****	**
Set Contrast	Ctrl-S	19
Set Backlight	Ctrl-T	20
Command Escape	Ctrl-U	21
Data Escape	Ctrl-V	22
Raw Data Escape	Ctrl-W	23
*Not Used	*****	**
Display an ASCII Character	None	22 - 255

BackSpace Ctrl-H

Causes the cursor to move back once space. The cursor will wrap from the first column of a line to the last column of a previous line. Sending backspace when at the home position causes the cursor to wrap to the last character position of the last line.

HorizontalTab Ctrl-I

Causes the cursor to move forward to the next tab position. If the cursor is near the end of the line and no more tab positions are on the line, then the cursor will advance to the next line. The LCD Controller is initial set up with tab positions at every 4'th column. To set the tab position at a different column use the setTabSize command.

NewLine Ctrl-J

Causes the cursor to advance to column 1 of the next line. If the cursor is on the last line, it will wrap to the home position.

VerticalTab **Ctrl-K**

Causes the cursor to advance to the next line, but stay on the same column. If the cursor is on the last line of the screen, it will wrap to the first line of the screen.

FormFeed **Ctrl-L**

Causes the screen to be cleared and the cursor positioned to the home position. The form feed command takes some time to complete. It may take up to 2ms to complete. Since the LCD Controller has a finite amount of internal buffer space (16 bytes) for storing commands and data before sending to the LCD, you may overrun the internal buffer when sending multiple form feed commands in succession followed by other data.

CarriageReturn **Ctrl-M**
Causes the cursor to go to column 1 of the current line

ResetController **Ctrl-N**

Resets the LCD controller as if it had been just power on. This command will also cause the hardware jumpers to be reread, so you can use it if you want to change baud rate or display size. This command takes about 1 second to complete.

SetGeometry **Ctrl-O**

Defines the layout (or geometry of the LCD). This command needs to issued before any other commands if the LCD is not a 20 character by 4 line LCD. You need to send 5 addition bytes after sending a setGeometry command.

Example:

15,20,0x80, 0xC0,0x94,0xD4	Standard 20 column by 4 line display
15,16,0x80, 0xC0,0x94,0xD4	Standard 16 column by 4 line display
15,16,0x80, 0xC0,0x80,0x80	Standard 16 column by 2 line display

If the display is less than 4 lines then you still need to send the line 1 starting address for the unused starting addresses. See the appendix for the typical layout of various LCD modules.

SetTabSize **Ctrl-P**

Sets the size of a tab. You need to send a byte that is the negative of the tab size. The default tab size is 4. The tab size should be a power of 2 (i.e. 0, 1, 2, 4, 8, 16)

SetCursorPosition Ctrl-Q

Sets the cursor position. The following 2 bytes specify the zero based row and column of the cursor position. The bytes need to be within the display range. Sending bytes outside the display range will position the cursor to unpredictable locations.

SetContrast Ctrl-S

Sets the display contrast. The byte following the the setContrast command will set the display contrast. A contrast of 0 is no contrast and a contrast of 255 is full contrast. The contrast is set to 50% after power up.

SetBacklight Ctrl-T

Sets the display backlight brightness. The byte following the setBrightness command will set the display brightness. A brightness level of 0 will turn off the backlight completely. A brightness level of 255 is full brightness. The brightness is set to 80% after power up.

CommandEscape Ctrl-U

The following byte is sent to the LCD controller as a raw LCD controller command. See the appendix for a list of commands that the LCD controller supports. You will mostly use this command to define custom characters and to set the cursor shape and visibility.

DataEscape Ctrl-V

The following byte is treated as data. This command is used to send bytes that would normally be interpreted as commands. Some LCD displays (in particular the European font LCDs) have characters in the same range as the commands of the LCD controller. This command allows these characters to be sent. After data is output to the LCD controller, the cursor is updated properly.

RawDataEscape Ctrl-W

The following byte is treated as raw data. This command is used to send bytes that are used for the creation of custom characters. No attempt is made to advance the cursor since this would interfere with custom character creation.

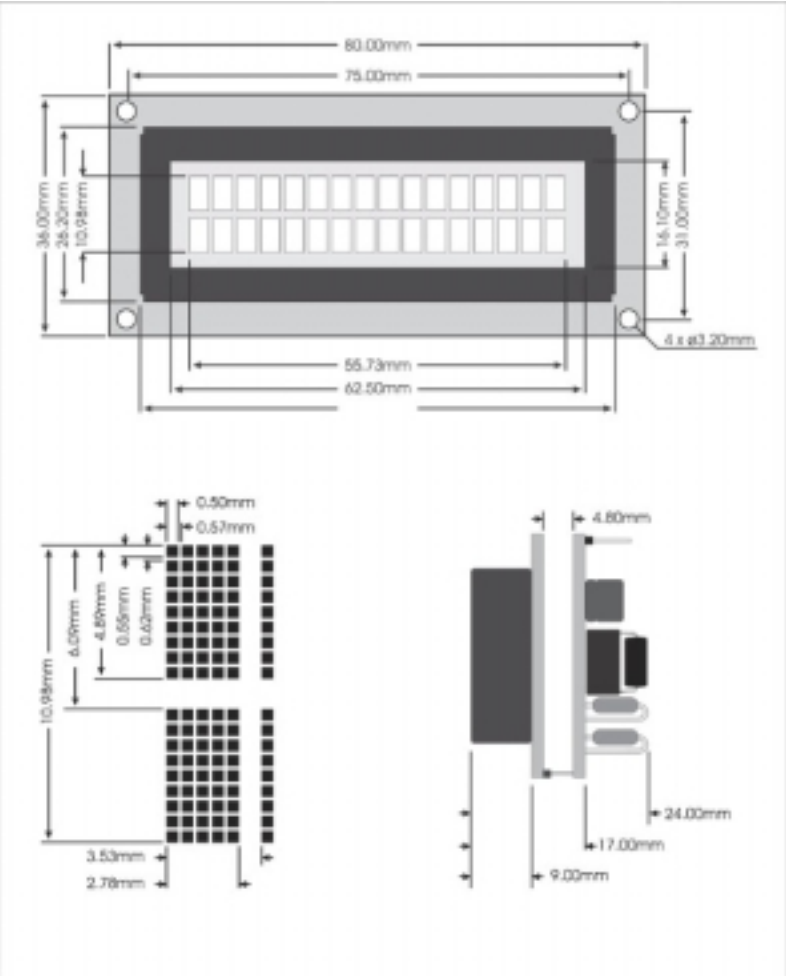
BasicX-24 Example Program:

```
‘Connections:
‘LCD Gnd              to          BasicX-24 Pin23
‘LCD +5   to          BasicX-24 Pin21
’LCD LEDSV+           to          BasicX-24 Pin 24
‘LCD RX  to           BasicX-24 Pin1

Dim Com1In(1 to 40) As Byte    ' Define Com1 In buffer size
Dim Com1Out(1 to 40) As Byte   ' Define Com1 Out buffer size

'*************************************************************
Sub Main()


Call OpenQueue(Com1In,40)                          ‘ Open Com1In Buffer
Call OpenQueue(Com1Out,40)                         ‘ Open Com1Out Buffer
Call OpenCom(1,9600,Com1In, Com1Out)               ‘ Open Com1

Call Greeting                                      ‘ Run subroutine that displays
greeting

Do                              ‘ After displaying greeting do nothing forever

Loop

End Sub

'*************************************************************
Sub Greeting()

Const BackLite As Byte = 20
Const Clear_LCD As Byte = 12
Const Set_Cursor As Byte = 17

Call Sleep(500)                 ' Wait 1/2 sec for the LCD to stabilize after power up

Call PutQueueStr(Com1Out,Chr(BackLite) & Chr(255))   ' Set backlight to full brightness

Call PutQueueStr(Com1Out,Chr(Clear_LCD) & "  Hello World!") ' Send Clear LCD -
command and  first 1/2 of message “Hello World!"

Call PutQueueStr(Com1Out,Chr(Set_cursor) & Chr(1) & Chr(3))   ' Move cursor to Row 2
column 4

Call PutQueueStr(Com1Out,"I'm Alive!")                ' Display "I'm Alive!"


End Sub                                            ‘ Return
```

2x16 Specifications

Power ……4.9-5.2 Vdc @15mA (No Backlight), 135mA (Full Backlight)
Serial Input……8N1, 9600 or 2400 Baud, RS232 or TTL/CMOS
Maximum Operating Temperature……0° - 50° C

Dimensions



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