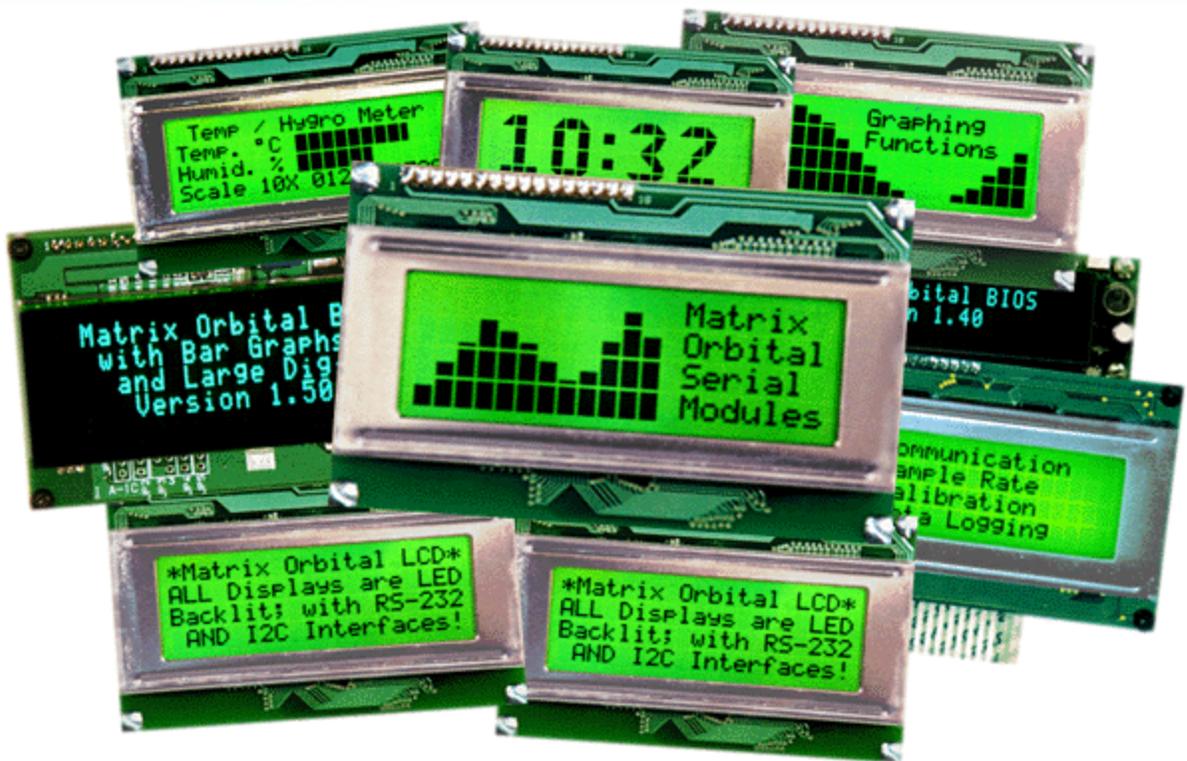


Matrix Orbital Corporation



LK202-25 User Manual



Important: Read page 2 before applying power.

Connecting LK202-25

Regular Voltage

Power is applied to the white or brown four pin SIP connector as follows:

- Pin 1: +5Vdc
- Pin 2: = SCL (I²C clock)
- Pin 3: = SDA (I²C data)
- Pin 4: Gnd

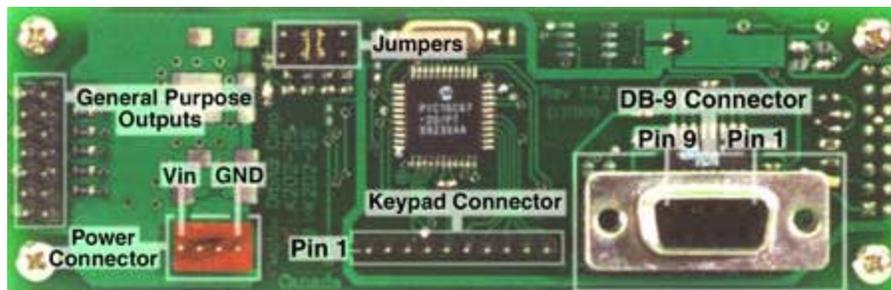
If the sole data source is via the RS-232, the data input is via the DB9 connector. Pins 2 and 3 are not used.

Wide Voltage Option (V)

Power is applied to the white or brown four pin SIP connector as follows:

- Pin 1: +7 - +15Vdc
- Pin 2: = SCL (I²C clock)
- Pin 3: = SDA (I²C data)
- Pin 4: Gnd

If the sole data source is via the RS-232, the data input is via the DB9 connector. Pins 2 and 3 are not used



WARNING:

DO NOT APPLY ANY POWER WITH A REVERSED CABLE.

DO NOT APPLY AN VOLTAGE OTHER THAN THE SPECIFIED VOLTAGE.

DO NOT USE ANY CABLES OTHER THAN THE CABLES SUPPLIED BY MATRIX ORBITAL, UNLESS YOU ARE AWARE OF THE MODIFICATIONS REQUIRED.

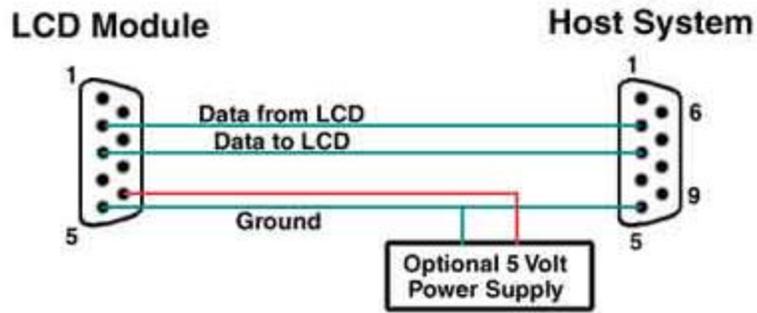
DO NOT UNDER ANY CIRCUMSTANCES USE AN UNMODIFIED FLOPPY DRIVE POWER CABLE.

DB9 Connector Pin Out

RS - 232 port: This connector is wired so that a standard “straight through” 9 pin D-sub cable may be used to connect the modules on a standard serial port such as comm ports on PCs. Note that this device complies to the EIA232 standard in that it uses signal levels from +/- 3V to +/- 12V. It will not operate correctly at TTL (0 to +5V) levels.

Pin Number	Description
2	Data Out
3	Data In
5	Ground
9	+5Vdc

Note: Signals are shown as interpreted by the Liquid Crystal Display module.



Power may be provided to the module by pin 9 of the DB9 connector instead of through the 4-pin SIP. If power is to be applied using the DB9, it must be a regulated 5Vdc supply. If the user intends to use pin 9 as the power source, the user must solder the 5 volt jumper point beside the DB9 connector. If you have any further questions or concerns don't hesitate to contact Matrix Orbital at support@matrix-orbital.com.

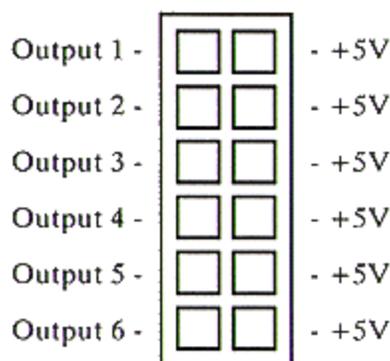
Warning: Use this method of power up at your own risk. Application of a voltage to pin 9 greater than 5.5volts will cause immediate destruction of unit and void the warranty.

Note: This applies to wide voltage units (V and VPT extensions) as well as to standard 5 volt units.

General Purpose Output (GPO)

Each of the GPO's are meant to be used as a pair. The positive side of the GPO's are connected to a power source of +5Vdc supplied by the module at 20mA. The negative side of the GPO's are capable of finding a path to ground through a 240 ohm resistor. This resistor will limit the current flow through a GPO to approximately 20mA in the event of a short circuit. If the device which is being driven by a GPO requires a relatively high current (such as a relay) and has an internal resistance of it's own greater than 250 ohms, then the 240 ohm resistor may be shorted. You will find this resistor directly below the negative pin of the general purpose output.

Note: This operation requires soldering. The GPO's do not have any over current or over/under voltage protection so care must be taken if the user decides to connect the negative side differently. For instance if the external device is a relay it must be fully clamped to absorb any generated back electromotive force (EMF).



The Keypad Interface

Keypad Interface via I²C

The keypad is read by I²C master read. In short, this means that a read of the module will always return the first unread key press. A read is initiated by writing to the module with its base address plus 1, then clocking the module's return byte after the module releases the SDA line. Much more detail on this basic I²C function can be found in the I²C specification by Philips.

The module contains a ten key press buffer so that it can be polled for key presses at an infrequent rate (every 500 to 1000 mS is typical). All returned key presses indicate the presence or absence of additional logged key presses by the most significant bit (MSB - bit 7). If the user has pressed two keys since the last poll of the keypad interface, the first read will return the key code with bit 7 set and the second read will return the key code with bit 7 clear. The application must take into account this bit to keep up with user key presses. If there are no keypresses detected, the module will return zero (0x00).

Keypad Interface via RS - 232

By default on any press of a key, the module will immediately send out the key code at the selected baud rate.

Auto Transmit:

If the auto transmit mode is on (default) then on any keypress, the module will immediately send out the key code at the selected baud rate. If auto transmit is off, when the poll command is sent, the module will immediately send the key code.

Keypad Interface (Both I²C and RS - 232)

Auto Repeat:

Two Modes of auto repeat are available and are set via the same command.

1) Resend Key Code: This mode is similar to the action of a keyboard on a PC and is set via the '~' command with a value of 0 as outlined in the Command Set section of this manual. In this mode, when a key is held down, the key code is transmitted immediately followed by a 1/2 second delay. After this delay, key codes will be sent via the RS - 232 interface at a rate of about 5 codes per second. This mode has no effect if polling or if using the I²C interface.

2) Key down / Key up codes: This mode may be used when the typematic parameters of the Resend Key code mode are unacceptable or if the unit being operated in polled mode. The host system detects the press of a key and simulates an auto repeat inside the host system until the key release is detected. This mode is entered via the '~' command with a data value of (0x01). In this mode, when a key is held down, the key code is transmitted immediately and no other codes will be sent until the key is released. On the release of the key, the key release code transmitted will be a value equal to the key down code plus 40 hex. The key code associated with key code '0' (0x30) is pressed, the release code is 'p' (0x70). In RS - 232 polled mode or via the I²C interface, these codes are available in the same manner as keypresses without auto repeat; however, the user should be careful to ensure that the poll rate is high enough so that simulated key repeats are avoided after the release of the key but before the next poll.

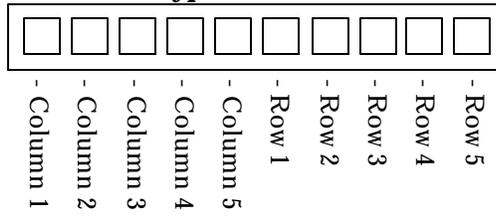
Physical Layout:

The returned key codes are as follows, but note that your keypad may be laid out in a different pattern. If this is the case, the user will need to interpret the key codes differently. The diagram 1 shows the logical layout (row 1, column 1 in upper left). The connector for the keypad is a 10 pin .1" spacing male header. Pin 1 is indicated on the connector layout diagram. Pins 1 through 5 are columns and pins 6 through 10 are row. The keypad is scanned whenever a key is pressed. There is no continuous key scan. This means that key presses are dealt with immediately without any appreciable latency. This also prevents electrical noise which is often caused by continuous key scans.

Diagram A

		<i>COLUMNS</i>				
		1	2	3	4	5
<i>R O W S</i>	1	A	B	C	D	E
	2	F	G	H	I	J
	3	K	L	M	N	O
	4	P	Q	R	S	T
	5	U	V	W	X	Y

Keypad Connector



LK202-25 Command Set

Write Text

This section of the manual allows the user to send commands to the LK to alter the appearance or behavior of the display. To utilize a command, the user must send a command prefix followed by the command in the format described in this portion of the manual. Any characters sent without a command prefix will be interpreted as text and will be displayed on the module at the current cursor position. The current cursor position will be incremented for each character received. Please note that unless line wrap is turned on, the text will follow the memory map of the module.

The command set discusses in detail what the LK's capabilities of and how to execute each command. The basic format of all the commands listed in this segment that do not require parameters is:

< command prefix> < command>

For commands that do require parameters however the format is as follows:

< command prefix> < command> [< parameter> < parameter>]

All commands are prefixed by the command 0xFE, Hex FE, Decimal 254

Set I²C Address

ASCII '3', Hex 33, Decimal 51

Syntax 0xFE 0x33

To write the I²C address of the module, send a command prefix followed by the character '3', followed by a write address. This command sets the I²C write address of the module. This value must be an even number and the read address is one higher. For example if the I²C write address is set to 0x50, then the read address is 0x51. The change in address is immediate. This address is 0x50 by default, and is reset temporarily back to that value when the "Manual Over-ride" jumper is used on power up. Refer to the Appendix for more details.

Set Serial Number

ASCII '4', Hex 34, Decimal 52

Syntax 0xFE 0x34< serial number byte one> < serial number byte two>

To set the serial number of the module, send a command prefix followed by the character '4', followed by two values defining the first and second serial byte. This command sets the two byte serial number of the module. Upon the execution of this command, the module will echo these two bytes back over the RS-232 interface. The serial number may be set only once. Any future attempt to execute this command will result in no change and the module will return to the originally set serial number.

Read Serial Number

ASCII '5', Hex 35, Decimal 53

Syntax 0xFE 0x35

To read the serial number, send a command prefix followed by the character '5'. This command will return, over the RS-232 interface, the serial number of the module as it was previously stored.

Read Version Number

ASCII '6', Hex 36, Decimal 54

Syntax 0xFE 0x36

To read the version number send a command prefix followed by the character '6'. This command will return, over the RS-232 interface, the firmware revision number of the module as it is stored.

Read Module Type Value

ASCII '7', Hex 37, Decimal 55

Syntax 0xFE 0x37

To read the module type value, send a command prefix followed by the character '7'. This command will return, over the RS-232 interface, the model type value of the module. Values for various modules at the time of this publication are as follows:

LCD0821 - 0x01	LCD2021 - 0x03	LCD1641 - 0x04
LCD2041 - 0x05	LCD4021 - 0x06	LCD4041 - 0x07
LK202-25 - 0x08	LK204-25 - 0x09	LK404-55 - 0x0A
VFD2021 - 0x0B	VFD2041 - 0x0C	VFD4021 - 0x0D
VK202-25 - 0x0E	VK204-25 - 0x0F	GLC12232 - 0x10
GLC12864 - 0x11	GLC128128 - 0x12	GLC24064 - 0x13
GLK12864-25 - 0x14	GLK24064-25 - 0x15	GLK128128-25 - 0x21
GLK12232-25 - 0x22	LK404-AT - 0x31	VFD1621 - 0x32
LK402-12 - 0x33	LK162-12 - 0x34	LK204-25PC - 0x35

Set RS - 232 Port Speed

ASCII '9', Hex 39, Decimal 57

Syntax 0xFE 0x39< speed>

To set the RS-232 port speed, send a command prefix followed by the character '9', followed by a value defining the desired speed. This command sets the LK's RS-232 port to the specified. The change takes place immediately. < speed> is a single byte specifying the desired port speed. Valid speeds are shown in the table below. The LK can be manually reset to 19,200 baud in the event of an error during transmission (including transmitting a value not listed below).

Hex Value	Speed
FF Hex	1200 baud
81 Hex	2400 baud
20 Hex	9600 baud
0F Hex	19200 baud

Load New Start Up Screen

ASCII '@', Hex 40, Decimal 64

Syntax 0xFE 0x40< 20 characters>

To load a new start up screen the user must send a command prefix followed by the character '@' followed by 40 characters. Defining the screen of the LK. Example:

Set Contrast

ASCII 'P', Hex 50, Decimal 80

Syntax 0xFE 0x39< contrast>

To set the contrast of the display, send a command prefix followed by the character 'P', followed by a hex value defining the contrast. This command sets the display's contrast to , where is a value between 0x00 and 0xFF (between 0 and 255). Lower values cause "on" elements in the display area to appear lighter, while higher values cause "on" elements to appear darker. Lighting conditions will affect the actual value used for optimal viewing. Individual LK modules will also differ slightly from each other in appearance. In addition, values for optimal viewing while the LK backlight is on may differ from values used when backlight is off.

Set Contrast and Save Value

Hex 91, Decimal 145

Syntax 0xFE 0x91

This command works in exactly the same way as the “Set Contrast” command. The only difference is this saves the contrast value in the memory of the module, whereas, the previous command only changes the value for the duration of use.

Auto Repeat Mode On

ASCII '~', Hex 7E, Decimal 126

Syntax 0xFE 0x7E

To turn auto repeat on and select mode, send a command prefix followed by the character '~', followed by either 0x00 or 0x01:

= 0: 200ms typematic rate

= 1: Key down / Key up codes are sent

In either case, auto repeat is turned on.

Please see details in Keypad Interface section.

Auto Repeat Mode Off

ASCII '^', Hex 60 Decimal 96

Syntax 0xFE 0x60

To turn auto repeat off, send a command prefix followed by the character '^'.

Auto Line Wrap On

ASCII 'C', Hex 43, Decimal 67

Syntax 0xFE 0x43

This command enables the automatic line wrap function. Transmitted characters which overrun the width of the display will automatically wrap to the next line. The bottom line wraps to line 1 of the display. To carry out this command the user must send a command prefix followed the character 'C'.

Auto Line Wrap Off

ASCII 'D', Hex 44, Decimal 68

Syntax 0xFE 0x44

This command disables the automatic line wrapping function. To turn off the the auto line wrapping, send a command prefix followed by the character 'D'.

Auto Scroll On

ASCII 'Q', Hex 51, Decimal 81
Syntax 0xFE 0x51

To enable auto scroll, send a command prefix followed by the character 'Q'.

Auto Scroll Off

ASCII 'R', Hex 52, Decimal 82
Syntax 0xFE 0x52

When auto scrolling is disabled, text will wrap to the top left corner of the display area.

Auto Transmit Keypresses On

ASCII 'A', Hex 41, Decimal 65
Syntax 0xFE 0x41

To activate the automatic transmission of keypresses, send a command prefix followed by the character 'A'. In this mode, all keypresses are sent immediately to the host system without the use of poll keypad command. This is the default mode on power up.

Auto Transmit Keypresses Off

ASCII 'O', Hex 4F, Decimal 79
Syntax 0xFE 0x4F

To disable the automatic transmission of keypresses, send a command prefix followed by the character 'O'. In this mode, up to 10 keypresses are buffered until the unit is polled by the host system via the poll keypad command.

Poll Keypad

ASCII '&', Hex 26, Decimal 38
Syntax 0xFE 0x26

To return any unbuffered keypresses via the RS - 232 interface, send a command prefix followed by the character '&' and then set up the host system to receive the key codes. When a keypad module receives this command it will immediately return any unbuffered keypresses which may have not been read already. If there is more than one keypress buffered, then the high order bit of this returned keycode will be set. If this is the only buffered keypress, then the high order bit will be cleared. If there are no buffered keypresses, then the returned code will be 0x00.

Enter Buffer Return Status Mode

ASCII ':', Hex 3A, Decimal 58
Syntax 0xFE 0x3A < almost full > < almost empty >

To enter buffer return status mode, send a command prefix followed by the character ':'. The module will now wait for the two bytes which define the parameters: Where < almost full > is the number of bytes that will be left in the buffer when the unit sends a "buffer is almost full" message to the host system, and where < almost empty > is the number of unprocessed bytes that will be left in the buffer when the unit sends a "buffer is almost empty" message.

Entering this mode tells the host system when the buffer of the display is almost full or almost empty. When the data being sent to the module reaches the user defined value of almost full, the module will relay the message 0xFE to the host system. The module will also relay this message for every byte that overruns the limit defined by the value for . When the buffer is almost empty the module will then relate back to the host system the message 0xFF, this informs the host system that the buffer is almost empty.

Whether the user is in 'Buffer Return Status Mode' or not, the module will ignore display or command bytes which would overrun the buffer. While in 'Buffer Return Status Mode' the unit will return 0xFE when buffer is almost full even though it may have already thrown rejected data away.

When using this command in an application, selection of the value for the buffer almost full should be considered very carefully. This is a critical aspect of using this command to its full potential. When using a host system or PC which contains a FIFO, the user should set the value of equal to or greater than the size of the FIFO. The reason for this is that the FIFO may be full when the host system receives 0xFE. In the case of 16550 UART the size at its maximum is 16, therefore the value of should be set to 16 or greater.

Exit Buffer Return Status Mode

ASCII ';', Hex 3B, Decimal 59

Syntax 0xFE 0x3B

The command allows the user exit buffer return status mode.

Backlight On

ASCII 'B', Hex 42, Decimal 66

Syntax 0xFE 0x42< number of minutes>

To turn the backlight on, send a command prefix followed by the character 'B' and the number of minutes for the backlight to remain on. If < minutes> is sent as zero then the backlight will remain on indefinitely. The maximum value for < minutes> is 100. Example:

< command prefix>	0xFE
< command>	0x42
< minutes>	0 to 100

Backlight Off

ASCII 'F', Hex 46, Decimal 70

Syntax 0xFE 0x46

To turn the backlight off, send a command prefix followed by the character 'F'.

Clear Display

ASCII 'X', Hex 58, Decimal 88

Syntax 0xFE 0x58

This command clears any text and graphics off the display. To clear the display, send a command prefix followed the character 'X'.

Clear Key Buffer

ASCII 'E', Hex 45, Decimal 69

Syntax 0xFE 0x45

This command clears any unread keypresses. In a menuing application, if the user presses a key which changes the menu context, any following key presses may be inaccurate and can be cleared out of the buffer between menu changes to prevent jumping around the menu tree. It may also be used to, in effect, reset the keypad in case the application resets for whatever reason. To execute this command, send a command prefix followed by the character 'E'.

Contrast

ASCII 'P', Hex 50, Decimal 80

Syntax 0xFE 0x80< hex value defining contrast>

This command allows you to set the display contrast to a level between 0(light) and 256(dark). To execute this command, send a command prefix followed by the character 'P' and a hex value between 0x00 and 0xFF. Different displays and lighting conditions will affect the actual value used. Different modules have different power up contrast settings. Example:

< command prefix>	0xFE
< command>	0x50
< hex value>	0x00 to 0xFF (level of contrast)

Cursor On

ASCII 'J', Hex 4A, Decimal 74

Syntax 0xFE 0x4A

To turn the cursor on at the current position, send a command prefix followed by the character 'J'. Note cursor is on by default at power up.

Cursor Off

ASCII 'K', Hex 4B, Decimal 75

Syntax 0xFE 0x4B

To turn the cursor off at the current position , send a command prefix followed by the character 'K'.

Cursor Left

ASCII 'L', Hex 4C, Decimal 76

Syntax 0xFE 0x4C

To move the cursor one space to the left of current position, send a command prefix followed by the character 'L'.

Cursor Right

ASCII 'M', Hex 4D, Decimal 77

Syntax 0xFE x04D

To move the cursor one space to the right of the current position, send a command prefix followed by the character 'M'.

Cursor Blink On

ASCII 'S', Hex 53, Decimal 83

Syntax 0xFE 0x53

To turn on the blinking cursor at the current position, send a command prefix followed by the character 'S'. Please note that the blinking cursor is on by default at power up.

Cursor Blink Off

ASCII 'T', Hex 54, Decimal 84

Syntax 0xFE 0x54

To turn off the blinking cursor at the current position send a command prefix followed by the character 'T'.

Set Debounce Time

ASCII 'U', Hex 55, Decimal 85

Syntax 0xFE 0x55 < number to define debounce time >

To set the time between key press and key read, send a command prefix followed by the character 'U' and a number to define the debounce time. All key types with the exception of latched piezo switches will "bounce" for a varying time, depending on their physical characteristics. The default debounce time for the module is about 65mS, which is adequate for most membrane keypads. This time equates to a setting of 8 using this command as there is a debounce time resolution of 8192 microseconds.

Create Custom Character

ASCII 'N', Hex 4E, Decimal 78

Syntax 0xFE 0x4E < character between 0x00 and 0x07 > < 8 bytes >

This command creates a custom character. For the LK202-25 the user can have up to eight custom characters. To execute this command, send a command prefix followed by the character 'N'. The display will now await the number which identifies the custom character. This number must be between 0x00 and 0x07. When the module determines what character it's working on, then the user must send 8 bytes which define the display character. See the diagram below for an explanation of the display character structure.

Diagram A

MSB								LSB	
*	*	*	1	2	3	4	5	Data Byte 1	
*	*	*	6	7	8	9	10	Data Byte 2	
*	*	*	11	12	13	14	15	Data Byte 3	
*	*	*	16	17	18	19	20	Data Byte 4	
*	*	*	21	22	23	24	25	Data Byte 5	
*	*	*	26	27	28	29	30	Data Byte 6	
*	*	*	31	32	33	34	35	Data Byte 7	
*	*	*	36	37	38	39	40	Data Byte 8	

Pixel Layout of Display Characters

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30
31	32	33	34	35
36	37	38	39	40
Cursor Line				

General Purpose Output On

ASCII 'V', Hex 56, Decimal 86

Syntax 0xFE 0x56 < hex number corresponding to output >

To turn a general output purpose on, send a command prefix followed by the character 'V' and hex number which corresponds to the output which will be turned on. To turn on output five, the sequence would be:

```

< command prefix>      0xFE
< command>             0x56
< hex number corresponding to output>  05H

```

General Purpose Output Off

ASCII 'W', Hex 57, Decimal 87

Syntax 0xFE 0x57 < hex number corresponding to output >

To turn a general output purpose off, send a command prefix followed by the character 'W' and a hex number which corresponds to the output which will be turned off.

Go To Position

ASCII 'G', Hex 47, Decimal 71

Syntax 0xFE 0x47 < column number > < row number >

To set the current cursor position, send a command prefix followed by the character 'G' and two values defining the column and row of the desired cursor position.

Go To Top Left

ASCII 'H', Hex 48, Decimal 72

Syntax 0xFE 0x48

This command resets the current cursor position to the top left of the LK screen. To execute this command send a command prefix followed by character 'H'.

Initialize Horizontal Bar Graph

ASCII 'h', Hex 68, Decimal 104

Syntax 0xFE 0x68

Before any horizontal bar graphs may be created, this command must be executed. It only needs to be sent once to initialize the custom characters for bar graph creation. Due to the fact bar graphs use custom characters, no user custom characters may be displayed or created while bar graphs are in use.

Make Horizontal Bar Graph

ASCII '|', Hex 7C, Decimal 124

Syntax 0xFE 0x7C < column number > < row number > < direction > < bar length >

This command places a horizontal bar graph at the specified column and row with the specified width. The format of the command is as follows:

< command prefix >	0xFE
< command >	0x7C
< column number >	0x01 to 0x14 for a twenty column display
< row number >	0x01 to 0x02 for a two line display
< direction >	0 for left to right, 1 for right to left
< bar length >	0x00 to 0x64 (0 to 100) for a twenty column display

Bar length is in pixel widths. On a twenty column display the maximum bar graph width is one hundred (if the bar graph starts at the edge). This is due to the fact that each of the twenty columns on the display are five pixels wide. The width of the space between columns is not taken into account.

Initialize Thick Vertical Bar Graph

ASCII 'v', Hex 76, Decimal 118

Syntax 0xFE 0x76

Before any thick vertical bar graphs may be created, this command must be executed. It only needs to be sent once to initialize the custom characters required for bar graph creation. Bar graphs use custom characters, therefore no user custom characters may be displayed or created while bar graphs are in use.

Initialize Thin Bar Vertical Graph

ASCII 's', Hex 73, Decimal 115

Syntax 0xFE 0x73

This command is executed in exactly the same manner as the 'Initialize Thick Bar Graph' command.

Make Vertical Bar Graph

ASCII '=', Hex 3D, Decimal 61

Syntax 0xFE 0x3D < column number > < bar length >

This command places a bar graph at the specified column with the specified height. The style of the vertical bar graph whether it be thick or thin is selected by the initialize vertical bar graph command. If thick bar graphs are preferred, the 'v' command should be sent to initialize the bar graph. If a thin vertical bar graph is desired, the 's' command should be sent to initialize the bar graph. The format for the command is as follows:

< command prefix >	0xFE
< command >	0x3D
< column number >	0x01 to 0x14 for an twenty column display
< bar length >	0x00 to 0x20 (1 to 32) for a two line display.

Bar height is in pixel widths. On a two line display the maximum bar graph height is sixteen, this is because each of the lines in the display are eight pixels high. The width of the space between the lines is not taken into account.

Note: Vertical bar graphs may not be used with horizontal bar graphs, and thick bar graphs may not be used with thin bar graphs. This is because all these functions make use of the same "custom character" spaces. As a result, custom characters are also unavailable while any of these functions are in use.

LK Character Font Chart

					D7	0	0	0	0	0	0	0	1	1	1	1	1	1	1		
					D6	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
					D5	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
					D4	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
D3	D2	D1	D0		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
0	0	0	0	0				0	0	P	`	P				-	9	E	0	P	
0	0	0	1	1			!	1	A	Q	a	a			.	7	†	4	ä	9	
0	0	1	0	2			"	2	B	R	b	r			ƒ	ı	ı	ı	ı	ı	
0	0	1	1	3			#	3	C	S	c	s			ı	ı	ı	ı	ı	ı	
0	1	0	0	4			\$	4	D	T	d	t			\	ı	ı	ı	ı	ı	
0	1	0	1	5			%	5	E	U	e	u			=	ı	ı	ı	ı	ı	
0	1	1	0	6			&	6	F	V	f	v			ı	ı	ı	ı	ı	ı	
0	1	1	1	7			'	7	G	W	w				ı	ı	ı	ı	ı	ı	
1	0	0	0	8			<	8	H	X	h	x			ı	ı	ı	ı	ı	ı	
1	0	0	1	9			>	9	I	Y	i	y			ı	ı	ı	ı	ı	ı	
1	0	1	0	A			*	A	J	Z	j	z			ı	ı	ı	ı	ı	ı	
1	0	1	1	B			+	B	K	ı	k	ı			ı	ı	ı	ı	ı	ı	
1	1	0	0	C			,	C	L	#	ı	ı			ı	ı	ı	ı	ı	ı	
1	1	0	1	D			-	D	=	N	ı	n	>		ı	ı	ı	ı	ı	ı	
1	1	1	0	E			.	E	>	N	^	n	ı		ı	ı	ı	ı	ı	ı	
1	1	1	1	F			/	F	?	0	_	o	ı		ı	ı	ı	ı	ı	ı	

Specifications

Environmental Specifications

	Standard Temp.	Extended Temp.
Operating Temperature	0° to +50° C	-20° to +70° C
Storage Temperature	-20° to +70° C	-40° to +85° C
Operating Relative Humidity	90% max non-condensing	

Electrical Specifications

Supply Voltage	4.75 - 5.25 Vdc (optional 7 - 15Vdc)
Supply Current	9mA typical
Backlight Supply Current	115mA typical

Optical Characteristics

Number of characters	40 (20 Characters x 2 Lines)
Matrix format	5 x 7 with underline
Display area	82.20 x 18.20 mm (XxY)
Character size	3.20 x 5.55 mm (XxY), not including underline
Character pitch	3.70 mm
Line pitch	5.95 mm
Dot size	0.60 x 0.65 mm (XxY)
Dot pitch	0.65 x 0.70 mm (XxY)
LED Backlight life	100,000 hours typical
Color of illumination	Yellow green

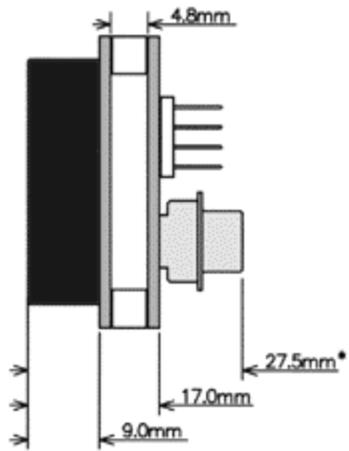
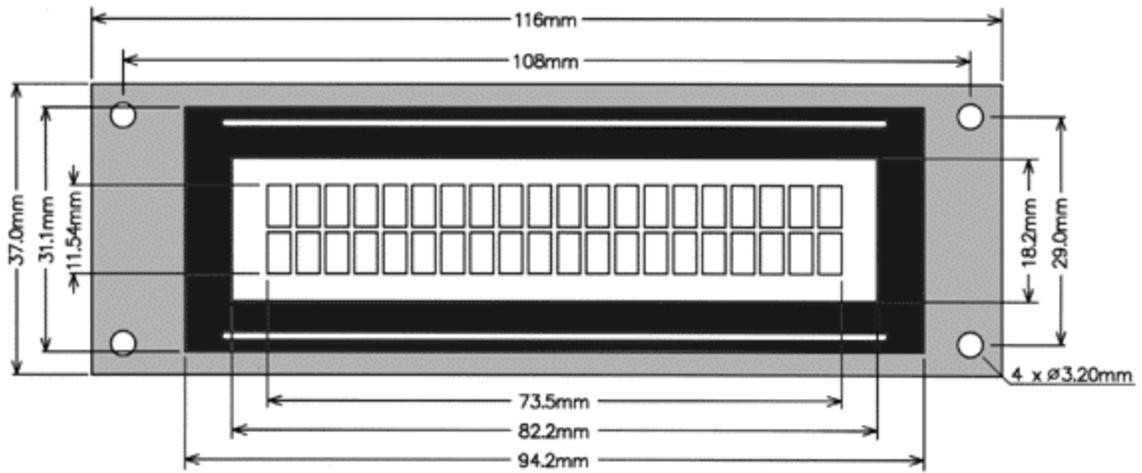
Appendix

Hex numbers are specified in C language convention as 0xUL - where U is the upper nibble and L is the lower nibble. Eg: 0xFE is 1111 1110 in binary. This is equivalent to ULH or ULh as in the binary number

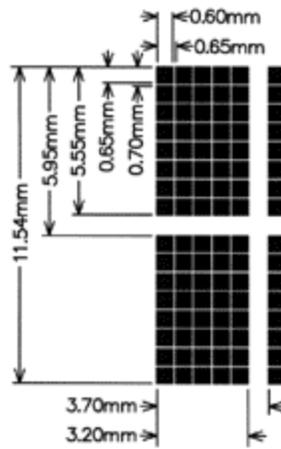
1111	1110
upper	lower
nibble	nibble

.....which would be FEH or FEh

LK202-25



* Max depth 21.0mm without connectors



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Note: Currently only carries LCD2041, LK204-25

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