

OPERATION AND USE OF THE ANIMATICS EXTERNAL LCD DISPLAYS

LCD2X20 (two line x twenty character display)

LCD4X20 (four line x twenty character display)



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1. Introduction

1.1 Product Description

The LCD2X20 and LCD4X20 are character-oriented LED-back lit LCD dot matrix displays built for the AniLink Network. They are generally intended for use as part of an operator interface for Animatics motion controls. The displays are divided into lines, each line capable of displaying twenty characters. The LCD2X20 uses a two line display, while the LCD4X20 is built around a four line display. Available characters include 96 ASCII and Japanese characters and 32 special symbols.

Generally operating from the +5 V and ground lines on the AniLink cable, these units are equipped with a voltage regulator, allowing support by an external +6 to +24 V source. Most applications do not need this external power supply.

The AniLink Network is a proprietary serial-based high-speed network shared by the Series 5000 and SmartMotor™ line of motion control products. The Animatics LCD units include the controller LSI, MPU and network support chips necessary for plug-in operation. The Series 5000 and SmartMotor™ command sets support both high- and low- level support for addressing the LCD's.

1.2 Features

- Simple plug in operation
- 20 character lines, 2 or 4 lines displays available
- Convenient size and mounting
- Extensive character and symbol support in built in driver
- Software support under both Series 5000 and SmartMotor™ command sets
- +5 V DC operation
 - can be drawn directly from AniLink network cable
 - alternate power supply port available
- AniLink Network Addressable (3-bit)
 - High speed serial communications (100K bps)
 - Multi-drop addressing,
- Built in contrast and back light controls

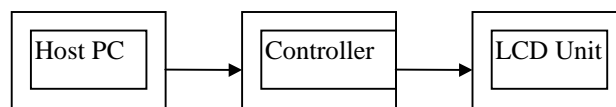
1.3 Part Numbering

The model number LCD2X20 denotes the standard two line by twenty character LCD display module. Model number LCD4X20 denotes the standard four line by twenty character LCD display. Certain special products of similar construction but differing in line and character count have been manufactured within the same family of part numbers. Please contact your application engineer for specific details about special products.

1.4 Theory of Operation

Animates LCD displays are typically used for character based operator feedback and messaging. The LCD2X20 or LCD4X20 display acts as a slave to an AniLink Network equipped controller. Serially communicated instructions and characters arrive in the form of two-byte strings. The first byte includes address information for the network interface chips, the second byte communicates the command or character. Different command sets address the requirements of the two byte strings in different ways. High and low level command support may require careful consideration of the communications details.

1.5 Simplified Schematic



System Block Diagram

2. Specifications

Note -- All listed specifications are believed correct as of the date of printing. See errata for latest details. Any and all product specifications are subject to change without notice by the manufacturer.

2.1 Electrical

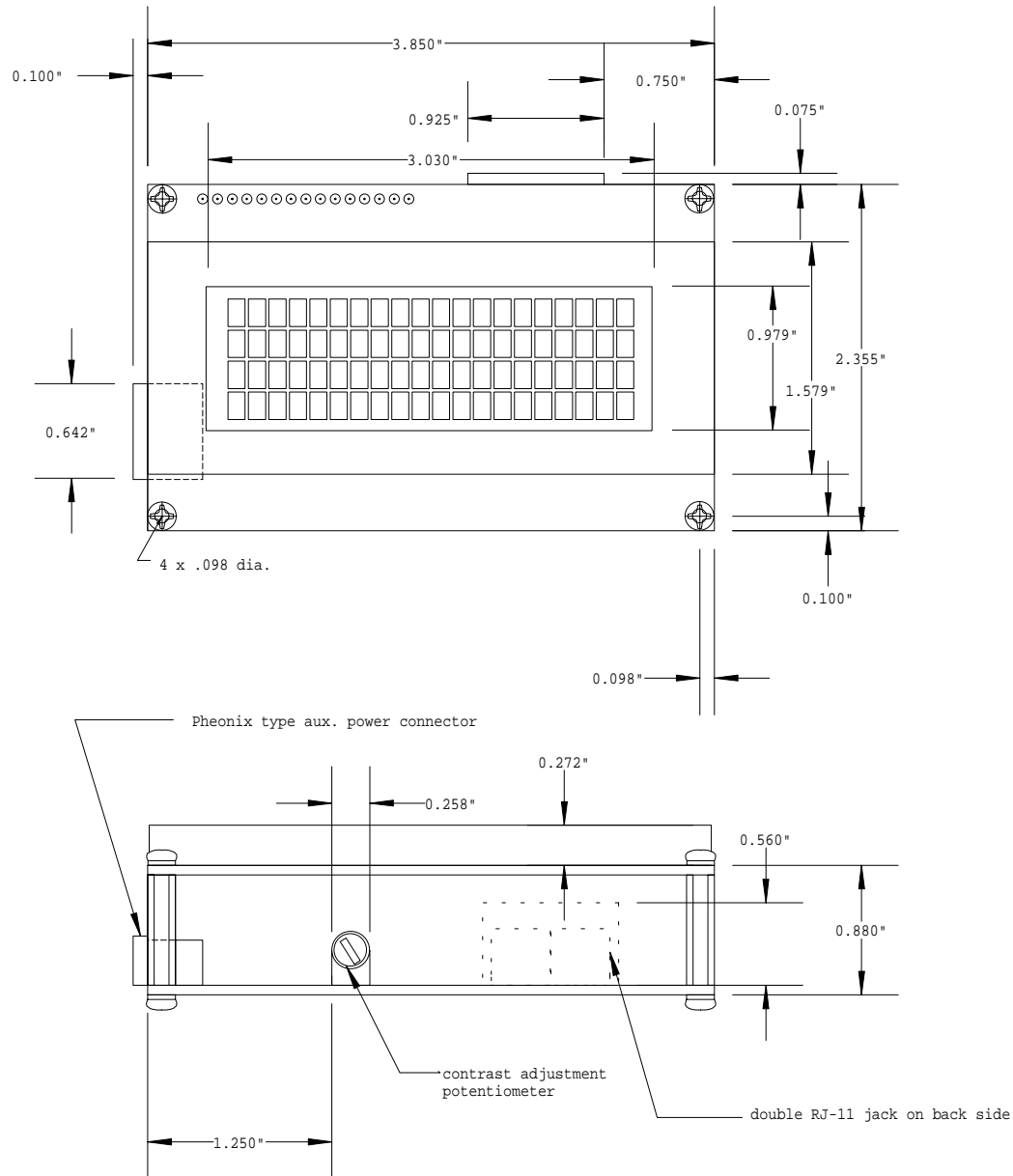
Bus DC line voltage	5V DC
Aux. Power Connector voltage	+6 to 24 V DC
Normal Maximum DC current (w/ back light)	100 ma
Back light DC current	20 ma

2.2 Mechanical

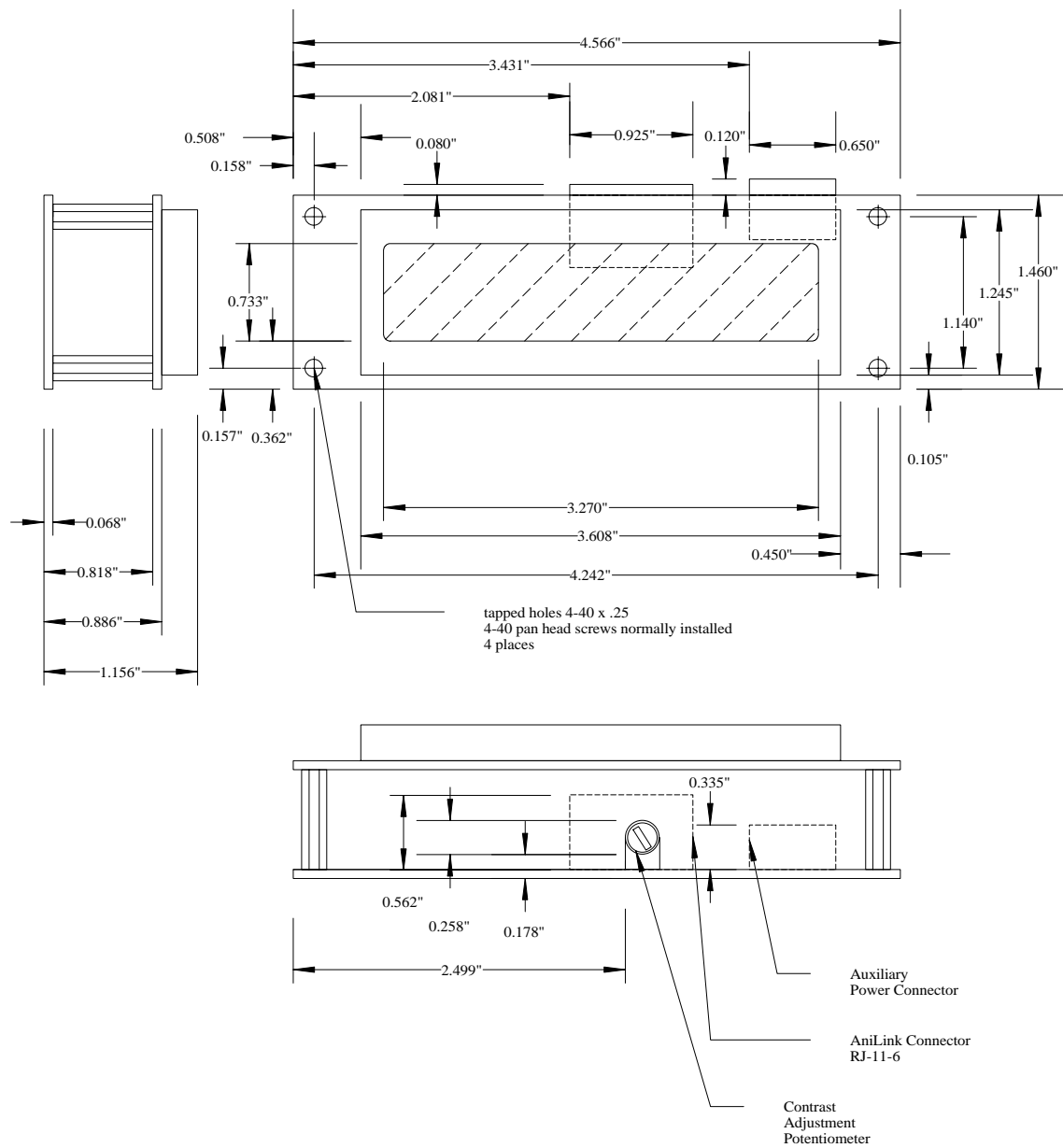
Dimensions: See Figure

Weight: 4 oz

Min. view area	LCD2X20	
	LCD4x20	76.0W x 25.2H mm
Character construction		5 x 7 dots
Character size		2.95W x 4.15H mm
Character pitch		3.55 mm



LCD4X20 Outline Drawing 1



LCD2x20 Outline Drawing 1

2.3 Environmental

Operating temperature	0°C to 50°C
Storage temperature	-20°C to 70°C
Humidity	0 % to 90 % (non-condensing)

3. Installation

3.1 Unpacking and Inspection

Upon receipt of the equipment, carefully inspect to ensure that no damage has occurred during shipment. If damage is detected, notify the carrier immediately. Equipment should be stored in its original shipping container until ready for use.

3.2 Mounting

It is suggested that the LCD unit be mounted inside a cabinet or suitable enclosure to protect it from physical and environmental damage. The LCD must be kept free of combustible or flammable material, oil vapor, steam, excessive moisture, corrosives and general debris.

The LCD unit can be mounted in any orientation, however the viewer's perspective will probably be determinant.

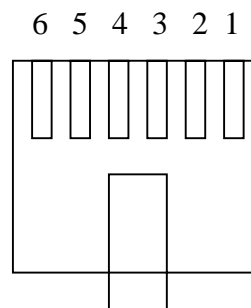
3.3 Wiring

Wiring the LCD unit is often as simple as plugging in the supplied "phone cable" into the RJ11-6 type connector on the bottom PCB of the unit, and plugging the opposite end of the cable into the controller. By using the second RJ11-6 (wired in parallel), additional AniLink module can be plugged in to the network.

Longer runs of AniLink cable are possible. Maximum tested runs for the "phone cable" wiring and RJ11-6 type connectors is about 3 feet. Use of higher efficiency shielded cable and better connectors will allow greatly expanded performance.

User looking for more industrial-type communications connections often remove the RJ11 jack and solder shielded cable directly to the lower p.c. board. While this is a generally accepted practice, understand that poor workmanship will void any warranty on this product.

3.3.1 Connector Pin Out



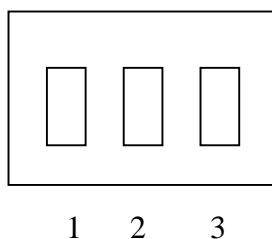
Connector C1 (RJ11-6 connector, x 2 in parallel)

PIN	SIGNAL	DESCRIPTION
1	IN #5	Reserved for other AniLink peripheral devices
2	GND	To Controller
3	+5 V DC	AniLink Power from controller (limited to about 150 Ma)
4	CLOCK	AniLink Clock
5	DATA	AniLink Data
6	IN #6	Reserved for other AniLink peripheral devices

When several AniLink devices are connected to the same network, the available controller power supply may not be able to supply enough current to maintain operating voltage to the peripherals.

In this case, an additional power source can be added to the network at the screw terminals provided at connector C2. If additional power is fed into on module of an AniLink network that power will be distributed to the other modules over the +5V line of the AniLink network.

Attention should be paid to the 7805 voltage regulator for any unit receiving external power: if the regulator gets too hot to touch, connect the additional power to the individual screw terminal ports of all the AniLink modules.



Connector C2, External Power Connector

PIN	SIGNAL	Description
1	+5-+24 VDC	
2	GND	
3	+5-+24 VDC	Internally connected to 1

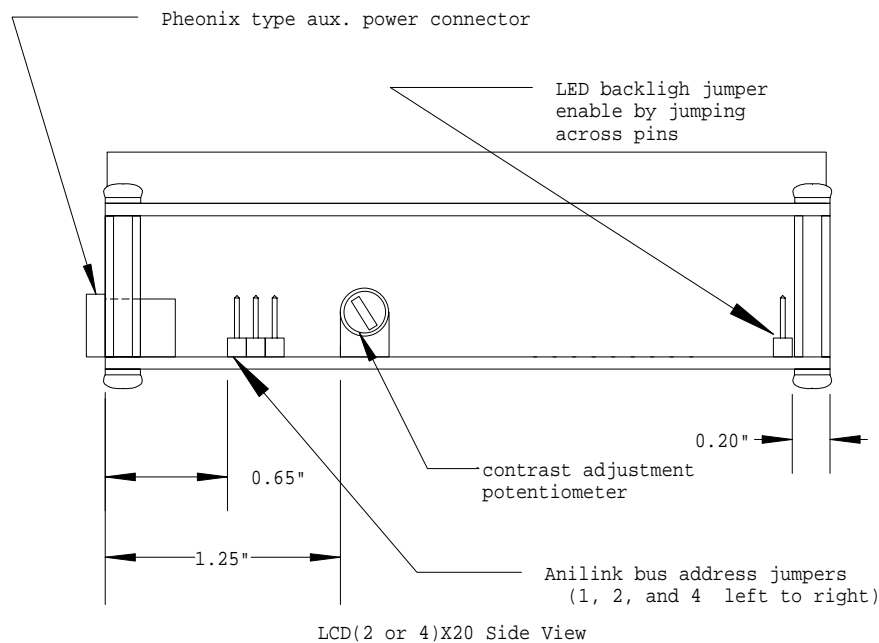
3.4 Power-up and Checkout

No particular power up procedure is necessary for these LCD units. When powered by +5V and ground, a unit should show alternating lines of blacked-out characters. When the unit is initialized by the controller these lines are blanked, and the screen appears clear.

Watch for these symptoms as you power up your LCD and initialize from the host.

Be sure to apply common safety practices when working on any motion based system: make sure that there is no possibility of personal injury or machine damage before first time power up.

4. Adjustments



4.1 AniLink Bus Unit Address

Peripherals on a AniLink network must have non-conflicting addresses to function properly. This normally means a unique address for each AniLink peripheral, however, many machines require identical displays in multiple on the locations. Here using more than one LCD unit with the same network address may be advisable.

The AniLink peripherals use a three bit address scheme based on the of jumpers 1, 2 and 4.

Module Address	Jumper State			X = jumper in place	O = jumper absent
	1	2	3		
A	O	O	O		
B	X	O	O		
C	O	X	O		
D	X	X	O		
E	O	O	X		
F	X	O	X		
G	O	X	X		
H	X	X	X		

4.2 Contrast Trimmer Potentiometer

The contrast trimpot controls the contrast definition of the LCD display. Clockwise rotation of the pot give greater contrast. While this feature is adjusted at the factory prior to shipment, you may want to adjust your contrast for maximum clarity given the lighting and viewing angle of your application. Try to run the LCD at the lowest contrast that give adequate character density. This will minimize the opportunity for background interference.

4.3 LED Back light Jumper

Removing the LED back light jumper disables the LCD's back light. Some users substitute a switch or potentiometer for the jumper allowing a select-able back light.

5. Maintenance and Repair

5.1 Maintenance

There are no user serviceable components on the LCD2X20 or LCD4X20 units. The only periodic maintenance requirement is to keep the screen clear of dust, dirt, or contaminant build up by cleaning with a damp cloth when necessary.

5.2 Indications

Since these are LCD display units, they can serve as their own status indicators. The appearance of the LED back light is a definite indicator of power. If power is available and unit is not displaying properly, check the cable.

5.3 Trouble Shooting

As these units have no user serviceable parts, trouble shooting is limited to checking for power and ground, and checking for communications signal.

If your unit is not working:

0. Check cabling for unplugged connectors or cable cuts
1. Check for power using a DMM
 - A. On connector C1: +5 between pins 2 and 3
 - B. On IC 7805: +5 between pins 1 and 2
 - C. External power source (if applicable)

If not receiving power, locate cause.

2. Check for signal on AniLink Clock and Data lines using a logic probe or oscilloscope. Logic and Data lines are normally high between data transmissions.
3. If power, data and clock all show correct signals, and your unit is still not working, return your LCD to Animates for inspection and repair.

6. Programming

6.1 Series 5000 Command Set

The Series 5000 command set supports two types of communications with the LCD unit. A low level method based on the IOA#,# command allows bytes of actual binary information to be transferred. A high level method based on the PRN(char) command is also available, allowing transfer of complete print statements.

Before characters can be transmitted by either the low or high level methods, the target LCD must be initialized using the following low level commands. Note that the follow example assumes you are addressing an LCD configured as "A".

IOA0,56	'Based on command IO(char A-H)(Channel 0 or 1), (# 0 to 255)
IOA0,14	
IOA0,6	
IOA0,1	'This command clears the screen and locates the cursor at the ' upper right hand corner

Cursor position commands are handled at the low level as well:

IOA0,128	'Cursor at upper left corner
IOA0,192	'Cursor at start of second line
IOA0,148	'Cursor at start of third line (LCD4X20 only)
IOA0,212	'Cursor at start of fourth line (LCD4X20 only)

Cursor positions to the right of the first position of each line are described by their line counter plus their offset.

Characters can be transmitted at the low level by use of the IOA1,# commands. The # part of this command generally matches the ASCII character code of the required character, thus:

IOA1,32	'prints a space
IOA1,69	'prints a capital E
IOA1,101	'prints a lower case e

The high level PRN(char) command allows several characters to be printed at once. An example:

PRNA("Hello World")

With data printed using the following formats:

PRNA([VARA])
PRNA([X])

There exists at this time no high level facility to manipulate multiple formatted strings at this time. Therefore a series of commands to position mixed text and data character strings. There also exists no formatting control for the display of numeric data.

IOA0,148
PRNA("Position: ")
IOA0,158
PRNA([X])

6.2 SmartMotor™ Command Set

The SmartMotor™ command set addresses the LCD modules with both a high level and a low level formats. The high level format of the SmartMotor™ command set is somewhat richer and more flexible than its Series 5000 counterpart.

Any LCD unit must be initialized before characters can be displayed. The SmartMotor™ allows both a high and a low level method to achieve this initialization.

High Level	Low Level
PRINTA(#56,#14,#6,#1)	DOUTA0,56 ' initialize unit as address A
	DOUTA0,14 ' turn cursor on
	DOUTA0,6 ' set cursor move direction
	DOUTA0,1 ' clear display and place cursor in
	' upper left position

Cursor position commands are handled at the low level and at the high level as well:

DOUTA0,128	PRINTA(#128)	'Cursor at upper left corner
DOUTA0,192	PRINTA(#192)	'Cursor at start of second line
DOUTA0,148	PRINTA(#148)	'Cursor at start of third line
		'(LCD4X20 only)
DOUTA0,212	PRINTA(#212)	'Cursor at start of fourth line
		'(LCD4X20 only)

Cursor positions to the right of the first position of each line are described by their line counter plus their offset.

Characters can be transmitted at the low level by use of the DOUTA1,# commands. The # part of this command generally matches the ASCII character code of the required character.

DOUT1,32	'prints a space
DOUT1,69	'prints a capital E
DOUT1,101	'prints a lower case e

The PRINT(char) command allows several characters to be printed at once. An example:

PRINTA("Hello World")

Some formatting is also supported by the PRINT(char) command:

```
PRINTA(#148,"Hello World")
```

Variables and other data types can also be transferred

```
WHILE 1
PRINTA(#150,@P," ")      'prints current position at position 150
PRINTA(#160,CTR," ")     'prints value of CTR at position 160
IF UGI==0                 'notice the trailing " " which allows shorter numbers to follow
GOSUB0                    'longer numbers without leaving artifactual digits behind
ENDIF                     'also notice that these first PRINTA statements will not have
LOOP                      'any effect until the LCD is initialized by the C0 subroutine
END
C0
MF0
O0
WAIT=300
PRINTA(#56,#14,#6,#1)
WAIT=300
PRINTA(#128,"enc. follow demo")
PRINTA(#168," Encoder Position ")
PRINTA(#212,"2000 COUNTS / REV.",#12)
MF4
RETURN
```

Partial Character Font Codes

Kanji Characters and unknown symbols not listed.

0	None	33	!	65	A	97	a	129	161	193	225	ä
1	None	34	“	66	B	98	b	130	162	194	226	
2	None	35	#	67	C	99	c	131	163	195	227	
3	None	36	\$	68	D	100	d	132	164	196	228	μ
4	None	37	%	69	E	101	e	133	165	197	229	
5	None	38	&	70	F	102	f	134	166	198	230	
6	None	39	‘	71	G	103	g	135	167	199	231	
7	None	40	(	72	H	104	h	136	168	200	232	
8	None	41	)	73	I	105	i	137	169	201	233	
9	None	42	*	74	J	106	j	138	170	202	234	
10	None	43	+	75	K	107	k	139	171	203	235	
11	None	44	,	76	L	108	l	140	172	204	236	
12	None	45	-	77	M	109	m	141	173	205	237	
13	None	46	.	78	N	110	n	142	174	206	238	
14	None	47	/	79	O	111	o	143	175	207	239	
15	None	48	0	80	P	112	p	144	176	208	240	
16	None	49	1	81	Q	113	q	145	177	209	241	
17	None	50	2	82	R	114	r	146	178	210	242	θ
18	None	51	3	83	S	115	s	147	179	211	243	
19	None	52	4	84	T	116	t	148	180	212	244	Ω
20	None	53	5	85	U	117	u	149	181	213	245	
21	None	54	6	86	V	118	v	150	182	214	246	
											Σ	
22	None	55	7	87	W	119	w	151	183	215	247	π
24	None	56	8	88	X	120	x	152	184	216	248	
25	None	57	9	89	Y	121	y	153	185	217	249	
26	None	58	:	90	Z	122	z	154	186	218	250	
27	None	59	;	91	[	123	{	155	187	219	251	
28	None	60	<	92	¥	124	|	156	188	220	252	
29	None	61	=	93	]	125	}	157	189	221	253	÷
30	None	62	>	94	^	126	→	158	190	222	254	
31	None	63	?	95	_	127	←	159	191	223	255	
32	space	64	@	96		128	space	160	192	224	∞	256

Position Guides

