

Alphanumeric Display Programmer's Guide

This document describes the programming of the alphanumeric displays with graphics capabilities. The first commands discussed are the text commands starting with simply writing text to the display then progressing through scrolling the display, setting the text and background colors, finishing with writing display information to memory and reading the information back to the display. The second section of the document covers the graphics commands used on the display.

Connection and Communication

The displays are to be driven from an RS422 source with both transmit (TX) and receive (RX) connections. An example is using the Alzatex PS422A1 to drive the display and an RS232 interface such as a hyperterminal to drive the PS422A1. Power is provided to the display from the RS422 connection. Do not connect power to the power jack in the back of the display. Displays can be daisy-chained together to form a system of displays all controlled by the same serial port.

General Configurations.

There are three configurations of these displays; the DA-244, the DA-248, and the DA-478A. The DA-244 Display is 8 pixels by 32 pixels. The DA-248 is 8 pixels by 64 pixels. The DA-478A is 7 pixels by 40 pixels.



	DA-244	DA-248	DA478A
Width [Pixels]	32	64	40
Height [Pixels]	8	8	7
Text Display Buffer	20 Characters	64 Characters	20 Characters
Text Storage Buffer	15 Text plus 1 Control	63 Text plus 1 Control	15 Text plus 1 Control
Graphics Buffer [Pixels]	8 x 32	8 x 64	7 x 40

Text Commands

Commands are common to all three configurations. Commands are in capital (upper case) letters and are in many cases preceded by the quote character (“).

Command DSPxxxx

The command DSP will write characters to all displays at one time. In a single display configuration there is no difference between this command and the command to direct characters to a specific address to display (The “Ln command). The exception is if the address in the “Ln command is not the address of the display.

Command “Lnxxxx

Command “Lnxxxx will write up to 20 characters to one of 32 display addresses n (n has potential values of 0-9, A-O {note, capital letters only}, and the characters : ; < = > ? @). For example to write “Hello” to address 2 use the command:

“L2Hello

In a single display system this is identical to the DSP command, except that the DSP will force a

display even if the intended address *s* is not the address of the display.

The default address of a display is zero ("0") but can be changed with the configuration button. Refer to the Configuration Button for instructions about setting the display's address.

Command "Cn

This command is used to control scrolling through the display. There are four versions of this command; "C@", "CA", "CB", "CC.

"C@" sets to "NO SCROLLING" where the characters appear stationary on the screen. If the display was scrolling the "C@" command stops scrolling and puts the left most characters of the text into the display

"CA is called smooth scrolling. In this mode the entire display buffer contents continue to scroll through the display in a continuous cycle. The entire memory contents are scrolled through and finally off the screen, leaving a clear screen, before the new pass is started.

"CB scrolls through all the text and scrolls the final characters off the end of the screen leaving a blank screen when the scrolling is completed. It then reloads the display from the start of the buffer, then pauses before starting to scroll again.

"CC scrolls through part of the text buffer and scrolls until the screen is filled with the last characters in the memory.

Command RLY@

This command is used to set display text color and background color. One issue to be aware of is that if the text color is the same as the background color the text will be indistinguishable. This is best avoided by setting the background color first and then the character colors.

Setting Background Colors:

RLY@1 – Sets the background to green.

RLY@2 - Sets the background to yellow.

RLY@< - Sets the background to red.

RLY@8 – Clears the background.

Setting Character Colors:

RLY@A – Sets the characters to green.

RLY@B – Sets the characters to yellow.

RLY@D – Sets the characters to red.

Command RLY01P1

This command is used to operate an external device by closing a switch to ground. The switch will handle up to a maximum 0.25 Amperes at 12V or the power supply value. This is used to drive a relay to activate a higher current device such as a beeper, a siren, or a light.

Contact Alzatec, Inc. for further information.

Command "KPz

This command is used to write from the text display to memory or read from memory to the text display. Thus this command has two 'personalities'. There are 15 memory locations. The memories are designated A through O or a through o. In write mode the command is "KPa, the lower case letter indicating that this is a write to memory A. Reading from the same address the command is "KPA, where the upper case letter indicates that this is a read. These commands are only used to store and recall text in the EEPROM. Graphics are not stored.

In addition, the memories of each display are independent of any other displays daisy chained together. The "KPA command on a daisy chain will display the contents of memory on each display in the chain. But, the contents of memory A will be the information loaded into that specific memory. At the factory, the memories are preloaded with a capital letter that is the same as the memory designation. For example, memory A is loaded with an "A". In a similar manner the write command "KPa will write the display of each unit on a daisy chain to the memory A of each unit.

Command "KPn can also be accessed through the six pin connector RJ11. The RJ11 port has four lines that can be closed to ground (there are pullup resistors in the display).

The connector pins on the RJ11 are assigned as follows:

Pin 6 is D4, the MSB

Pin 5 is D2, the next bit

Pin 4 is ground

Pin 3 is D1, the next bit
 Pin 2 is a Voltage out 11V to 15V DC and
 less than 0.5 Amp.
 Pin 1 is D3, is the LSB

The switch closures activate a "KP{Upper Case letter} where the binary code indicates the letter. Hexadecimal 0 (0000 binary or all switches open) is no change or no action. A switch setting of 0001 or 1 Hex is equivalent to "KPA, 0010 is equivalent to "KPB and so forth up to a 1111 which is equivalent to "KPO.

The following command sets are reserved for future use:

"KPP "KPp
 "KPQ "KPq
 "KPR "KPr
 "KPS "KPs
 "KPT "KPt
 "KPU "KPU
 "KPV "KPV
 "KPW "KPw

The procedure for using the "KPX command is to setup the display buffer Text with the DSP command or the "Lnxxx command, then set the text color and/or background color(s) with the RLY@ command. Then, if desired, set the scrolling command. The last step is to save the display buffer into memory, for example memory A, using the "KPA. Once one or more displays are saved each can be recalled using the command "KPA.

Graphics Commands:

The following three commands deal with placing graphics onto the display. These commands are "X", "G", and "B". One issue to keep in mind is that there are two graphic buffers driving the display and it might be necessary to execute the command twice or write the image twice to get the desired buffer to display.

Command "G

This command is used to load in graphics display into the memory. The "G command uses only legal ASCII characters. These cannot be stored into EEPROM.

The command format is:

```
"Gxxyyabcdabcdabcd
```

Where xx is the width across

(in multiples of 2 pixels only)

yy is the height down (up to 8 on a single line display)

abcd is the Hex code for the colors

Each letter (a, b, c, or d) is the code for two pixels.

the settings of the individual pixels is set two at a time or bitwise. The color coding is:

- 00 – blank
- 01 – Green
- 10 – Yellow
- 11- Red

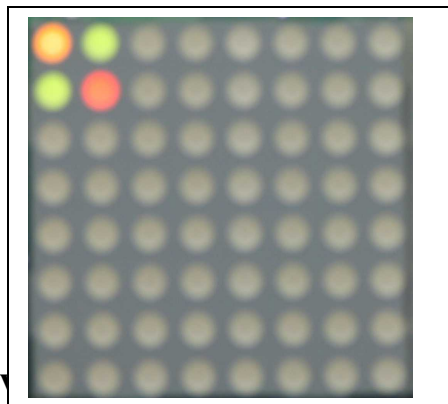
For example, the easiest command to start with is:

```
"G02026D
```

This would match the above form as:

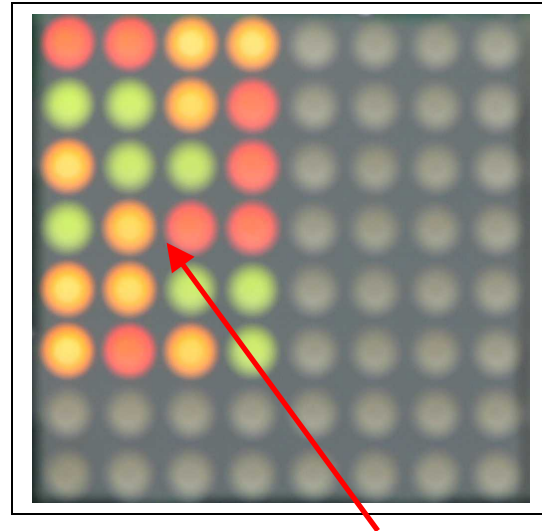
```
"Gxxyyab
```

This gives a two pixel wide and two pixel high pattern where the hexadecimal 6 decomposes into 01 and 10 in binary which is a Yellow pixel and a Green pixel. Below this the hex D which decodes to a 11 and 01 which turns on a Green pixel and a Red Pixel.



A second example is a 4 wide by 6 high graphic using the command:

```
"G0406fa5e6d9fa5e6
```



This would read as 2 Reds(F), 2 Yellows(A), 2 Greens(5), Yellow Red pair(E), Yellow Green pair(6), Green Red pair(D), Green Yellow pair(9) then repeat (Arrow points to repeat start)

If the screen becomes garbled use the DSP command with no text to clear the screen followed by a "G07070000000000000000 (lots of zeros) command executed twice to clear the graphics buffers.

Command "X

This command controls the position of the graphics and is used in combination with the "G and the "B commands.

The format is

```
"Xxxyy
```

Where xx is the right offset from the upper left corner and yy is the downward offset from the upper left corner. These values are in hexadecimal. For example, to put the display in the third position down the command would be:

```
"X0002
```

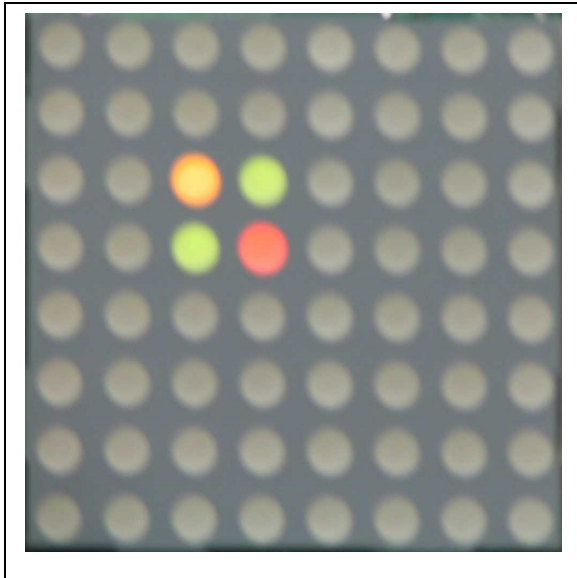
The limit on xx is 32,40, 64, or 128 depending on how many units are linked together.

The limit on yy is 8 for a single line display or 16 for a double line. In reality, the yy limit is 06 because a 08 would cause the display to wrap around.

Also note that the "X setting applies to BOTH buffers.

The effect of adding the "X command to move the image down and left is shown in the following example of the sequence:

```
"X0202
"G02026D
```



Note that the four colored pixels are moved down two and right two.

To move the graphics origin back to the upper left corner use the command "X0000 followed by the appropriate "G command

Command "B

This command is used to load in binary. If the communication port can handle binary this is the most efficient way to transmit the data. The format is:

```
"Bxylhhlhhlhhlh
```

Where:

x = the image width in a binary number of pixels
(in multiples of 4 pixels)

y = the image height in a binary number of pixels
(up to 8 on a single line display)

lhhlh = The data to be displayed.

There are two bits per pixel as follows:

- 00 – blank
- 01 – Green
- 10 – Yellow
- 11 - Red

The X and Y parameters can use ASCII as follows. Each takes the ASCII character, then strips off left three (MSB) bits and uses the remaining bits for the width. For example a capital A has an ASCII code of 41. After removing the three most significant bits that leaves a binary 00001 or 1 wide or high.

Setting the pixel color works in a similar manner, without dropping the three MSBs. For example the character { has an ASCII binary of 01111011 or 7B in hex. This would turn on four pixels as Green, Red, Yellow, Red.

Another example would be the command:

```
"BHDUUUUUUUUU
```

Would turn an eight wide, four high area green. (U in ASCII is 55 or 01010101, or four pixels of green.)

Test and Configuration Button Functions

The CONFIG button is located on the rear of the unit near the connectors.

- To activate the test/configuration mode hold the button down for three seconds.
- First to appear is the Diagnostic Mode. If you continue to click, you will continue to cycle through the set up modes.
- By pausing at a set up mode for 3 seconds you then can choose the various values of that mode.
- To exit the configuration mode, either
 - perform any other operation or
 - press and hold the mode button for 3 seconds.

Diagnostic Mode:

Press and hold the CONFIG button for three seconds to enter the diagnostic test mode. One of four different displays will appear.

- First momentary press, the Red-Green bi-color X will be displayed.

- Second momentary press,
All green LEDs will be displayed.
- Third momentary press,
All yellow LEDs will be displayed.
- Fourth momentary press,
All red LEDs will be displayed.
- Fifth momentary press,
Repeat above sequence.

Automatic sequencing of the test displays.

- Press and hold the CONFIG button for 3 seconds, then release.
After one second, the display will automatically cycle to the next test display each second.
- The sequence is:
Red-Green X; All green, All Yellow, All red; ...repeat...

Display the version number.

- Press and hold the CONFIG button for 3 seconds.
- Press the CONFIG button one time to cycle through the selections until the message "Ver02", will be displayed.

Setting the Mode.

- Press and hold the CONFIG button for 3 seconds.
- Press the CONFIG button two times to cycle through the selections until the message "Mode 0" will be displayed.
- Wait 3 seconds.
- Press the CONFIG button to cycle through each of the modes.
- NOTE: This setting is not implemented.

Setting the Beep Mode.

- Beep Mode is not implemented.
- Press and hold the CONFIG button for 3 seconds.
 - Press the CONFIG button three times to cycle through the selections until the message "Beep 1" will be displayed.
 - Wait 3 seconds.
 - Press the CONFIG button to cycle through each of the beeper modes.
- NOTE: This setting is not implemented.
The beeper modes are:
- 0 = Off.
 - 1 = Beep on timer zero.
 - 2 = Beep relay activated while the timer is running.
 - 3 = Unused.

Setting the Unit Address:

- For use with the "Lnxxxxx command.
- Press and hold the CONFIG button for 3 seconds.
 - Press the CONFIG button four times to cycle through the selections until the message. "Addr 0" is displayed .
 - Wait 3 seconds.
 - Press the CONFIG button to cycle through each of the unit addresses.
 - The unit addresses available are:
00-0F = 0123 4567 89; <=>?
10-1F = @ABC DEFG HIJK LMNO

Setting the baud rate:

- Press and hold the CONFIG button for 3 seconds.
- Press the CONFIG button five times to cycle through the selections until the message "Baud 1" is displayed.
- Wait 3 seconds.
- Press the CONFIG button to cycle through each of the baud rates.

The baud rates for different settings are:

- 0 = 1,200 Baud
- 1 = 2,400 Baud– the default value
- 2 = 4,800 Baud
- 3 = 9,600 Baud
- 4 = 19,200 Baud
- 5 = 38,400 Baud
- 6 = 56,800 Baud
- 7 = 115,200 Baud