

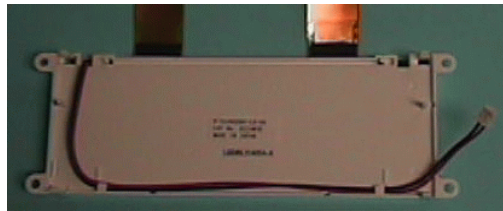
# CDS51405 Display Controller

The CDS51405 is an intelligent display controller with an integrated touch screen controller which works with the Optrex F-51405 and F-51851 displays. The controller mounts directly to the back of the display and communicates through a single RS-232 connection operating from a single 5 volt supply. All display voltages are generated onboard along with a non-volatile contrast adjustment.

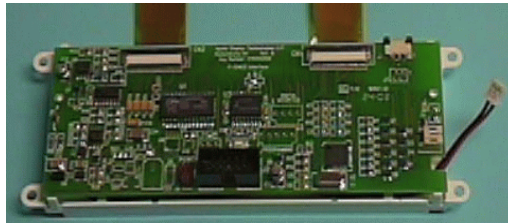
## *Mounting the controller board*

The controller mounts directly to the back of the display utilizing the four latches on the corners of the display. When handling the display and controller please be sure to be on a static free surface.

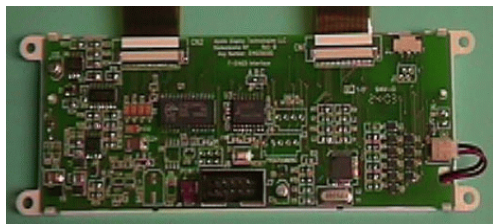
With the display face down and the two data connectors facing away from you be sure the backlight cable is routed to exit the lower right side of the display.



Carefully align the two plastic pins on the display to the controller board and snap the board in place, be sure the backlight wires are lined up with the slot in the controller or the board will not seat all the way down.



Carefully open the two display data connector latches CN1 and CN2 by pulling the brown latch outwards. Insert the display data cable into the connector being sure the cable is fully seated. After seating the cable push the latch back in being sure both ends are pushed all the way in. Insert the backlight cable into connector CN3.



If you have a touch screen carefully pull the latch on connector J8 out. Insert the touch screen cable into J8 being sure it is seated, push the latch back in.

## ***Connectors***

### **J2, RS232 Interface**

- |                       |                       |
|-----------------------|-----------------------|
| 1. NC                 | 2. Connected to pin 7 |
| 3. RS232 Out          | 4. Connected to pin 6 |
| 5. RS232 In           | 6. Connected to pin 4 |
| 7. Connected to pin 2 | 8. NC                 |
| 9. Ground             | 10. NC                |

### **J3, External Programming**

Used for reprogramming the microprocessor at the factory.

### **J4, RS-232 TTL Interface**

A RS-232 TTL interface is supplied at J4. Power may also be applied to J4 eliminating the need for J5. For TTL interface remove the connection between JP1 A-B and connect JP1- B-C.

Mating connector, Molex 22-01-3047. Pin, Molex 08-50-0114.

1. RS-232 TTL Out
2. RS-232 TTL IN
3. Ground
4. +5 Volts, 150ma

### **J5, Power**

Mating connector, Molex 22-01-3027. Pin, Molex 08-50-0114.

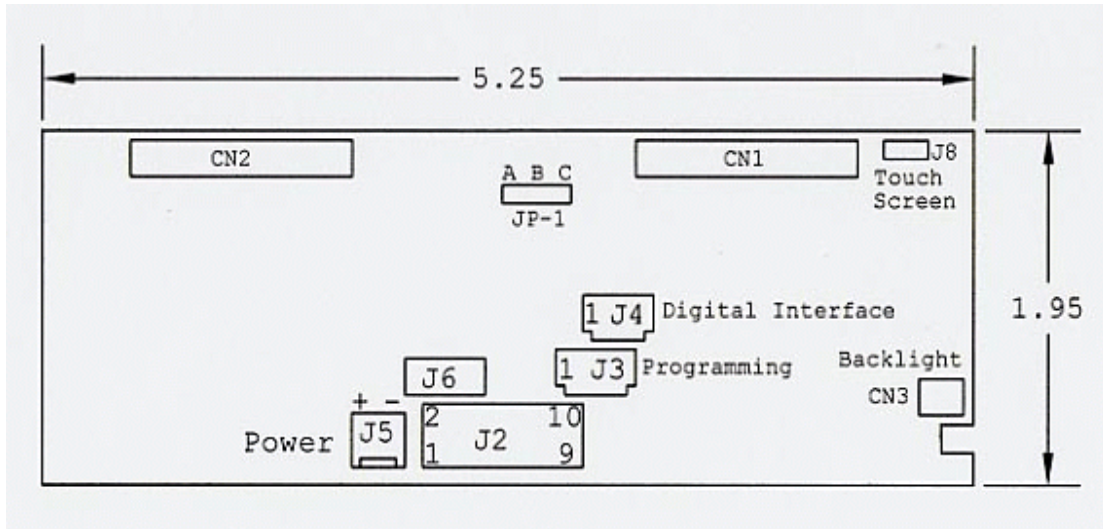
1. + 5 volts.
2. Ground

### **J6, Future Expansion Header**

Apollo Display Technologies LLC 85 Remington Blvd. Ronkonkoma NY 11779  
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## J8, Touch Screen

1. YU
2. XR
3. YL
4. XL



Connector Locations

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## ***Communication***

Communication parameters to the controller are: 9,600, 19,200 and 38,400 Baud, 8 Bit, No Parity and 1 Stop Bit. The baud rate is set by a command and stored. The CDS51405 is shipped set at 9,600 baud. A standard 10 pin IDC to 9 pin "D" connector is used between the computer and controller. Apollo offers this cable as part number CBL-004A. A small terminal program, 51405 Term is supplied to assist the customer in exercising the module.

## ***Command List***

Type in the first character followed by any other parameters and then a carriage return to start the command. The display returns a ">" when ready for the next command. The controller has three built in fonts:

Small, 5x7 pixels, 6 rows of 21 characters.  
Medium, 8x16 pixels, 4 rows of 16 characters.  
Large, 16x32 pixels, 2 rows of 8 characters.  
Huge, 32x64 pixels, 1 row of 4 characters.

### ***BMP***

A BMP may be sent to the controller with the BMP Utility, the 51405 terminal program or with a command with the BMP data embedded in the customers program. When a file, such as logo.bmp, is downloaded using the terminal program a file is created with the name logo.inc. The data in the file is of the form;

```
db 0h,0h,0h,0h,0h,0h,0h,0h,70h,50h,5Ch,44h,47h,40h,40h
db 40h,40h,40h,40h,47h,44h,5Ch,50h,70h,0h,0h,0h,70h,50h,5Ch,44h
db 47h,40h,40h,40h,40h,40h,40h,40h,47h,44h,5Ch,50h,70h,0h,0h,0h,70h
```

The user can either insert this data in his program by using an Include instruction or cut and paste. To send the data to the display screen, send a "<" followed by carriage return. Wait for a ">" and then send 64 bytes of data. Continue waiting for the ">" and sending 64 bytes until all the data is sent.

### ***[ - Display stored bmp screen***

Display a previously stored screen. The screen is 240 by 64 pixels and may be downloaded from a bmp type file using the utilities program. Screen 1 is the splash screen which will be displayed each time the unit is powered up.

**[5** - Displays the screen in location 5.

***J - Save current screen as bmp screen***

Save the currently displayed screen. Up to 99 screens may be saved. Screen 1 will be the splash screen which gets displayed each time the unit is powered on.

**J5** - Saves the current screen in location 5.

***( - Set normal display mode***

Sets display to normal mode. Use ")" to set to reverse display mode.

***) - Set reverse display mode***

Sets display to reverse mode. Use "(" to set to normal display mode.

***^ - Display revision screen***

Displays the current revision number.

***B - Set screen contrast***

Puts display in the set contrast mode. Send a "U" to increase contrast or "D" to decrease contrast. Send a carriage return to end this function and save the contrast level as the new default setting. The contrast setting is retained after powering the unit off.

***C - Clear screen***

Clears the screen to its background color. See "L" command for clearing a specific area.

***E - Turn on echo***

***EX - Turn echo off***

***G - Turn on vertical bits***

A "G" followed by the x value, a comma, y value, a comma and up to 32 zeros or ones. Starting at the xy location and going vertically, each 1 will turn on a pixel and each 0 will ignore a pixel. From 1 to 32 bits may be written.

**G0,0,1100110011** - Draws a vertical dashed line in location 0,0 which is the lower left corner of the display.

***H - Turn on horizontal bits***

A "H" followed by the x value, a comma, y value, a comma and up to 32 zeros or ones. Starting at the xy location and going horizontally, each 1 will turn on a pixel and each 0 will ignore a pixel. From 1 to 32 bits may be written.

**H0,0,1100110011** - Draws a horizontal dashed line in location 0,0 which is the lower left corner of the display.

### *I - Set display backlight intensity*

A "I" followed by a value from 0 to 100 sets the intensity of the backlight.

**I50** - Sets the backlight brightness to 50%.

### *L - Draw/Clear point, line or rectangle*

This controller simplifies line drawing by using a reference system that sets the 0,0 point at the lower left corner of the area. If a B follows the L, a rectangle will be drawn using the coordinates as the corners. If a F follows the B, then the rectangle will be filled. Placing a # symbol after the L in the command line clears the screen of the given area.

**L10,10** - Displays a signal point at x=10 and y=10.

**L10,10,20,25** - Displays a line from x=10 and y=10 to x=20 and y=25.

**L#10,10,20,25**- Clears the line drawn above.

**L-20,25** - Displays a line from the last plotted point to x=20 and y=25.

**LB10,10,100,20** - Displays a rectangle with corners at x=10, y=10, x=100, y=20.

**L#B10,10,100,20**- Clears the defined rectangle.

**LBF10,10,100,20** - Displays a rectangle with corners at x=10, y=10, x=100, y=20 and fills the rectangle.

**L#BF10,10,100,20**- Clears the defined rectangular area.

### *N - Write number to screen*

A "N" command is used to write a number string to the display. The "N" followed by s for small, m for medium, l for large or h for huge sets the font. The next character sets the row. Next one or two characters sets the column and is always followed by a comma. The rest of the line until a carriage return is displayed at the selected row and column in the selected font. The advantage of this command over the "T" command is that this command automatically removes leading zeros. When you use "DEC3", this adds leading zeros if needed to give 3 digits. The "N" command inserts blanks for any leading zeroes.

**NS520,Hello** -Writes the word Hello in the 5<sup>th</sup> line 20<sup>th</sup> column.

### *O - Draw a circle*

A "O" followed by an x value, a comma, a y value, a comma and a radius will draw a circle. Maximum radius is 64.

**O100,30,10** - Displays a circle with a center at x=100, y=30 and a radius of 10.

### ***Set Baud Rate***

- =0 9,600 Baud
- =1 19,200 Baud
- =2 38,400 Baud

The baud rate is stored and will default to this value.

### ***R- Reset***

Resets the CDS51405.

### ***T - Write text string to display***

A "T" command is used to write a string to the display. The "T" followed by s for small, m for medium, l for large or h for huge sets the font. The next character sets the row. Next one or two characters sets the column and is always followed by a comma. The rest of the line until a carriage return is displayed at the selected row and column in the selected font.

### ***W - Set wait before responding delay***

A "W" followed by a number between 0 and 250 sets a minimum delay in milliseconds before the controller responds to a command.

## ***BMP Editor Utility***

Enclosed on the distribution CD is a BMP editor which allows you to load a BMP to the controller directly. When a BMP file is loaded into the editor you may send it directly to the CDS51405 and assign a screen number or you may edit the BMP. When you choose to edit the BMP the image is saved in the current directory. The BMP editor will then start MSPAINT and allow you to edit the image. Please note that MSPAINT and all BMP files must reside in the same directory as the BMP editor. File GfxT\_Std.DLL must also reside in the BMP editor and is licensed by Power Basic Inc. and may not be distributed.

## ***Term Utility***

The Term Utility is also located on the distribution CD. It is a simple terminal program that allows you receive data, transfer BMP file and act as a terminal interface to the controller. The terminal interface allows you to exercise the command set.

## ***Touch Screen***

An optional touch screen may be mounted to the controller. A calibration routine is provided to compensate for the normal variation found in the touch screens. Two commands are available for reading the touchscreen data. One command will give the calibrated data while the other will provide the raw data from the touchscreen.

### ***: - Calibrate touch screen***

You will be asked to touch the lower left corner and then the upper right corner of the touch screen. A “Dot” will appear on the screen to indicate where to make the touch. After calibration the controller will return a 0,0 for the lower left corner while returning a 264,64 for the upper right corner.

### ***:C - Clears current touchscreen calibration.***

### **S - Read touch screen**

Reads the touch screen. A "S" followed by a carriage return, returns "RXXXX,YYYY", or "TXXXX,YYYY" or "X0000,0000". The R indicates that the touch has been removed. The T indicates that the screen is still being touched. The X indicates that there has been no touch since the last S command. The XXXX indicates the x coordinate and the YYYY indicates the y coordinate. If you calibrated the touchscreen you will receive the calibrated numbers.

A "SC" followed by a carriage return puts the controller into continuous mode and data will be transferred from the touch screen chip in the same manner as the touch screen controller board. Any character sent to the controller stops the continuous mode. The touch data being returned will be raw data from the touch controller, not calibrated data.

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