CDS-51553/51852 Display Controller

Preliminary

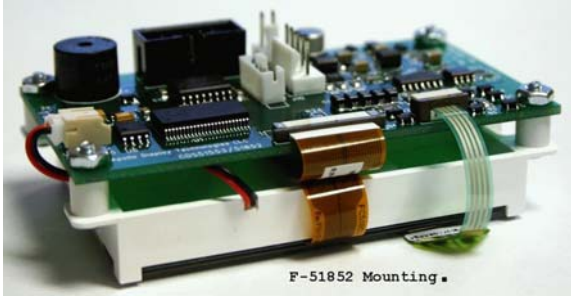
The CDS51553/51852 is an intelligent display controller with an integrated touch screen controller which works with the Optrex F-51553 and F-51852 displays. The controller mounts directly to the back of the display and communicates through a single RS-232 connection operating from a single 5 volt power supply. All display voltages are generated onboard along with a non-volatile contrast adjustment.

An optional 4 wire resistive touch screen, Apollo part number TSG-51 may be added to either display.

Mounting

Carefully open the display data connector latch CN1 by pulling the brown latch outwards. Insert the display data cable into the connector being sure the cable is fully seated, push the latch back in being sure both ends are pushed all the way in. Insert the backlight cable into connector CN2 for F-51852, for F-51553 solder wires from the display LED pad + to Led+ on controller and display LED pad - to LED- on controller. You may also pass a wire through the holes and solder on the F-51553 LED pads with the corresponding holes on the controller.

If you have a touch screen carefully pull the latch on connector J4 out. Insert the touch screen cable into J4 being sure it is seated, push the latch back in.



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Connectors

J1, Power

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

1. + 5 volts.
2. Ground

Optional power supply available for 3 to 15 volt operation.

J2, RS232 Interface

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

J3, Touch Screen

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

J4, RS-232 TTL Interface

A 5 volt RS-232 TTL interface is supplied at J4. Power may also be applied to J4 eliminating the need for J5.

Mating connector, Molex 22-01-3057. Pin, Molex 08-50-0114.

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

J5, External Programming

Used for reprogramming the microprocessor at the factory.

CN1, Display data cable connection

CN2, F-51852 Backlight connection

Jumpers

JP-1, Selects 5 volt operation or optional 2-15 volt operation.
A-B, 5 volt (Factory Default)
B-C, 5 2-15 volt operation

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.

Fonts

The controller supports 4 non-proportional font sizes:

Small, 5x7 pixels, 8 lines of 21 characters
Medium, 8x16 pixels, lines of 16 characters
Large, 5x6 pixels, 2 lines of 8 characters
Huge, 64x32 pixels, 1 line of 8 characters

Small and medium fonts are pre-loaded and can not be changed. The large and huge fonts are contained in bmp files on the distribution CD. L0.bmp-L5.bmp are the large fonts, H0.bmp-H23.bmp are the huge fonts. The large and huge fonts may be edited in PC Paint or other compatible program**.**

The medium font uses half line spacing. This is done to allow lining the small and medium font together. To properly space two lines of the medium font the lines are separated by two. Example:

TM11,Line 1 first character
TM31, Line 2 first character

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:

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,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,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.

] - Save current screen as bmp screen

Save the currently displayed screen. Up to 100 (0-99) screens may be saved. Screen 0 will be the splash screen which gets displayed each time the unit is powered on.

]5 - 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

The number following the “B” determines the contrast level. Allowable number are 30 to 63, 63 being the brightest. The contrast setting is retained after powering the unit off.

B45

C - Clear screen
Clears the screen to its background color. See “L” command for clearing a specific area.

D- Beep

The number following the “D” specifies the length of the beep. Each unit represents 10ms of on time so “D30" will give you a 300ms beep.

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.

NS15,Hello -Writes the word Hello in the first line 5th 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.

R- Reset

Resets the CDS51405.

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.

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.

Specifications:

Supply voltage: 5 volts ± 10%
Supply current: 360ma
Touch screen interface: 4 wire resistive
Maximum number of saved screens: 100

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