# Application Notes

**Interfacing AMPIRE 7" UART TFT Touch Panel Display Module with Microprocessors**

AMP Display

## INTRODUCTIONS

Interfacing a touch panel display with a microprocessor or a PC can be a very complex and time-consuming task since it requires full understanding of the clock timings and many technical details. This is true especially for the companies, which need a working prototype however don't have too much time or limited human resources for the display development.

AMP Display's UART TFT display solution greatly simplifies the development process by providing customers with a simple USB interface and a very easy-to-use serial interface. With the tools provided, image data can be downloaded from a PC through the USB/Serial port to the memory on the UART board easily. Developers may also take advantage of the functions included, such as, draw pixel, draw line, draw arc, draw rectangle and show text of certain font to design a simple GUI for their application. It saves time and money for the customer to design and manufacture a PCB to interface with the LCD module for prototyping. Also, hardware development can be minimized or totally eliminated. Customers may also design their own applications to communicate with the touch panel/display, and the display simply acts as a generic USB/Serial peripheral.

This document will help customers to figure out what UART solution is, and whether they would be able to use UART board for their application, its benefits and disadvantages and how to control the system through commands. Details on all the commands can be found from the product specification.

AMP Display current supports displays of 5.7", 7", 8", and 10.4" with the following resolutions:

| # | Resolution | Example Model |
|---|---|---|
| 1 | 320 x 240 | AM320240N/N1 |
| 2 | 480 x 272 | AM480272C/D |
| 3 | 640 x 480 | AM640480E |
| 4 | 800 x 480 | AM800480E |

Tab. 1 UART Display Resolutions and models

## ARCHITECTURE

The UART board receives image data from either a serial port (TXD, RXD) or a USB port and stores them in local Flash memory. Thus, data do not need to be transferred from the host every time the display updates, which dramatically increases system efficiency and lowers CPU workload.

There is 1 GB of Flash memory available on the UART board for storing image data. After images are downloaded, they can be called to display by their "image ID" to RGB data format and send it to the display controller.

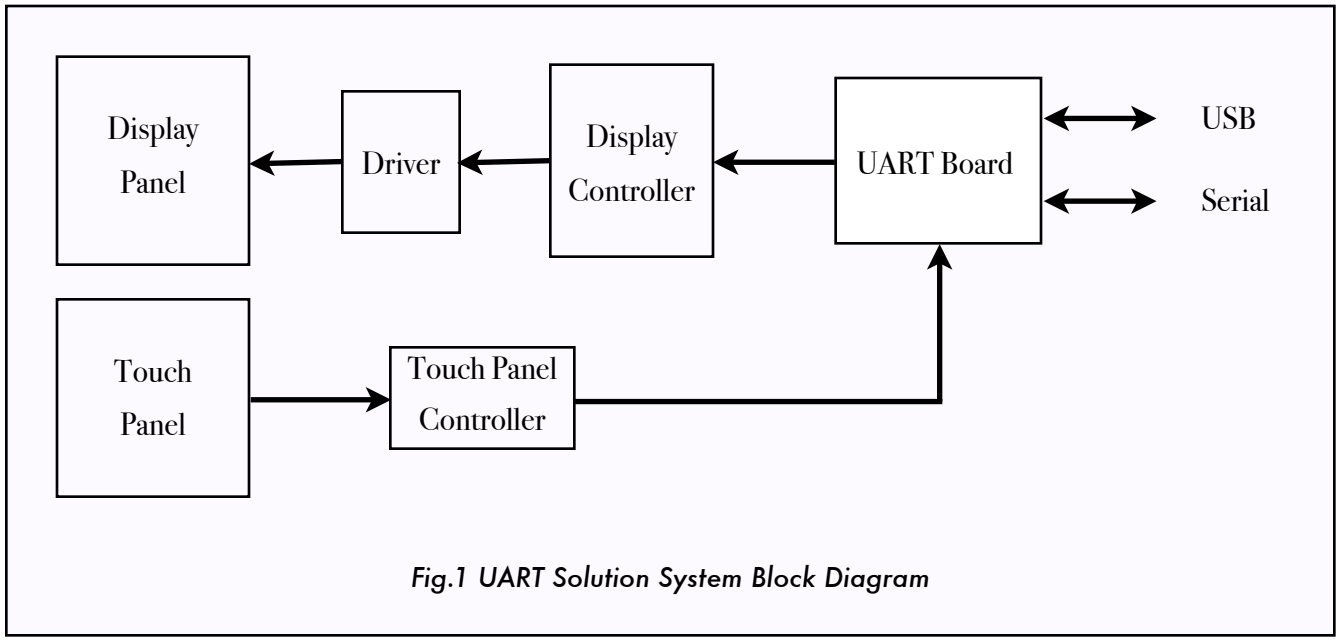


*Fig.1 UART Solution System Block Diagram*

## SYSTEM SETUPS

After connecting the UART board to a PC via USB or serial port, DotNet Framework (DotNetfx2.0,exe) and the USB driver (CP2102 USB to UART driver) need to be installed. They enables the PC to communicate with the USB chip mounted on the board and send data to it. Next, the jumpers from RA4, RA5 to RA6 should be configured according to the type of connection selected ( please refer to table #). Before precede, make sure all the connections are tight and then power up the system.

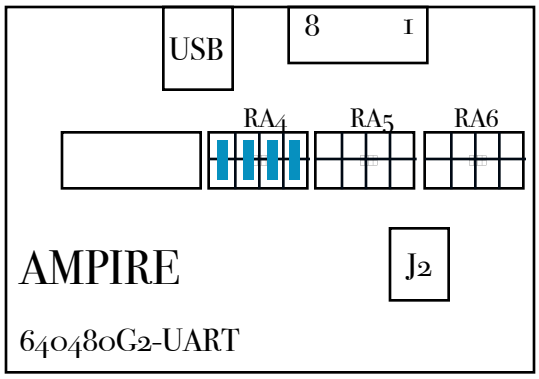


*Fig.2 UART board configured for USB connection*

| Jumper | Function |
|---|---|
| RA4 | USB |
| RA5 | UART |
| RA5 | RS232 |

Tab. 2 UART Display Jumper Setting

## RUNNING TEST SOFTWARE

Run Terminal Assistant V2 from the installation folder as shown in Fig.3 and from the "serial control" panel, click on the "Port Test" button to determine the port available for use to communicate with the board and select the one that connects to the board. Then set the Baud Rate to 921600. Please note that for the test software, the baud rate should be set to 921600 only.

Next, select "on" bullet to turn on the serial/USB port and select the correct display resolution from the "Resolution" drop down menu in the "Terminal Parameter Panel". The resolution can also be customized by specify the "Width" and "Height" text box if not listed above. Now, all the settings from the status bar can be viewed at the bottom of the window and it's ready to send data to the board.

Currently, the system supports storing up to 1GB of image data in BMP, JPG, and GIF format in the Flash memory. Each picture is saved with a "picture number", which will be used to specify a picture when the user wants to display it on the screen.

Text and cursor can also be generated by a little configurations in the "Function Panel" on the top right of the window and all the commands sent and received can be found in the "Communication Record" window below.

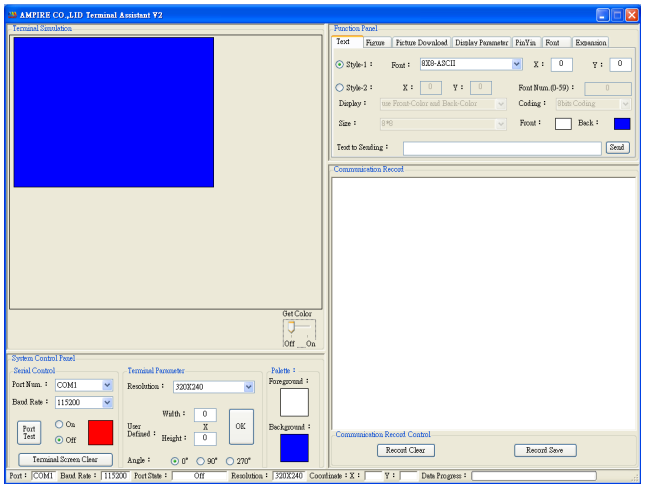

*Fig.3 Screenshot of the "AMPIRE Terminal Assistant V2" demo program*

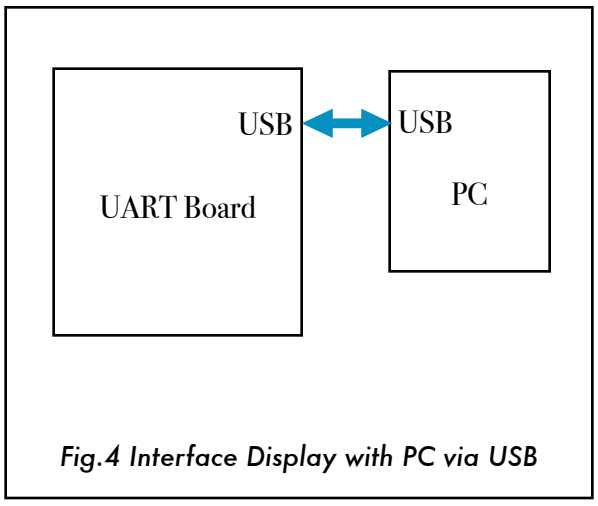


*Fig.4 Interface Display with PC via USB*

## Connect Display through USB

The USB interface provided with the UART display supports is a quick way to build your product prototype. With the provided library and detailed documentation explaining each command, images can be shown on the displays in minutes.

Users do not need to have knowledge of C programming to test the display. All they need to do is send a simple command to the display through the USB port. In order to show how the system works, we picked two commands for demonstration. One tells the display to show a image already downloaded to the Flash memory, and the other one reads the user input from the touch screen and sends data back.

### Example 1: Display Image Command

The following command tells the display to show image # 0:

0xAA 0x70 0x00 0xCC 0x33 0xC3 0x3C

0xAA stands for the start of the command.
0x70 stands for show full picture.
0x00 corresponds to the picture identified by PICNUM 0.
0xCC 0x33 0xC3 0x3C stands for the end of the command.

### Example 2: Touch Panel Command

The following command reads the outputs of the touch panel automatically after the user's input and interprets it to a coordinate and represent it in 8-byte Hex number.

0xAA 0x73 0x00 0x80 0x00 0x40 0xCC 0x33 0xC3 0x3C

0xAA stands for the start of the command.
0x73 stands for the location has been pressed.
0x00 0x80 0x00 0x40 corresponds to position (128, 64) on the touch panel.
0xCC 0x33 0xC3 0x3C stands for the end of the command.

** Note: Please find document 'AMPIRE UART TFT PC Software User Guide' and 'AMPIRE UART TFT Touch Panel Application' for all the commands and detailed explanations.*

## Connect Display through Serial Port

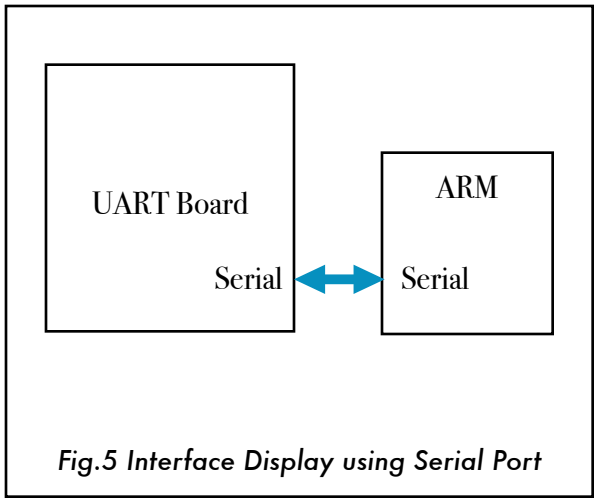


*Fig.5 Interface Display using Serial Port*

Another way to operate the UART display is to send commands through a serial port as illustrated in Fig 3. In order to achieve this, we need to change the Jumper setting to RA6 position and configure the serial port setting as shown in tab.3.

| Setting | Parameter |
|---|---|
| Max Baudrate of Serial Port: | 115200 bps |
| Data Bit | 8 |
| No. of Stop Bits | 1 |
| Parity | OFF |
| Verify Bit | None |

*Tab.3 Serial Port Settings*

The pin assignment of the serial port can be found in Tab.4.

| Pin # | Signal | Function |
|---|---|---|
| 1, 2 | VIN | Power ( 4.6 - 26 ) |
| 3 | /BUSY | Internal CPU Status |
| 4 | TXD | Host Serial Transmit |
| 5 | RXD | Host Serial Receive |
| 6 | RSVD | Reserved |
| 7, 8 | GND | Ground |

*Tab.4 8-pin Serial Port Signals mapping*

Any technical information may be changed without prior notice since we are continuing improving our product quality. For further information, please contact AMP Display, Inc.

AMP Display, Inc.

Add:

Tel:

Fax

Email: