TS Engineering SERIAL LCD BOARD

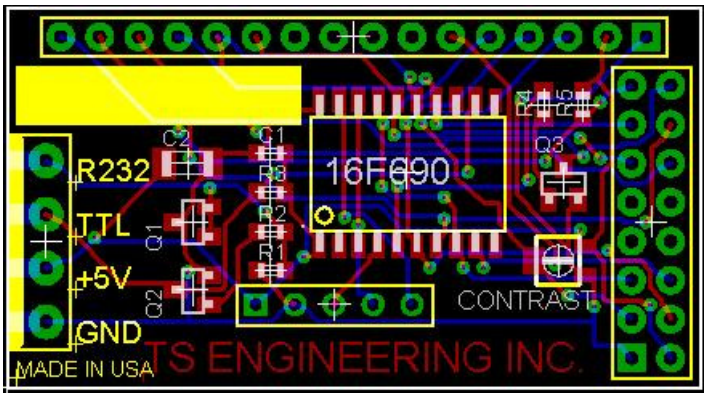
1. Overview

The TS Engineering Serial LCD Board (CSLB) allows simple interfacing with your project using just 3 wires. It can be used with any micro controller or connected to PC using its serial interface. This board is very compact and is ideal for hand-held and/or portable applications.

- **May be used with character LCD's with up to 4 lines**.
- **Up to 20 characters per line are available.**
- Easy to use - simple Decimal commands.
- Only 3 lines needed - 5V power, ground and signal input.
- Compact size - 1.78in long by 0.98in wide.
- Turn display ON/OFF remotely.
- **Automatic baud rate selection** from 1,200 to 57,600. Standard RS-232 or TTL level signals.
- Software controlled LED backlight, **255 brightness levels.**

2. Connection

Connect the CSLB to a regulated 5 volt power supply at the +5V and GND positions on the rear of the display (4-position terminal block). Please ensure that the correct polarity is observed and that the power supply is within 4.75 to 5.25 volts. Exceeding 5.25 volts may damage the display.



To connect it directly to a micro controller, connect the position marked TTL to the MCU's TX pin. Connection to PC is done using the terminal marked RS232. The TS Engineering Serial LCD board can communicate at **57600, 38400, 19200, 9600, 4800, 2,400 or 1,200 Baud**.

It has a unique feature called **AutoSYNC** that will automatically adjust to the baud rate of the incoming data. When the display is powered-up (and after waiting for it to settle and the splash screen to appear), send the character **"U" [85]** and the display will automatically set its baud rate within about 500mS (the splash screen will change from "AutoSYNC" to "Connected" when this is accomplished).

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3. Text & Setup Commands

**** IMPORTANT NOTE ** When sending commands to the LCD, send only the decimal value between the square brackets - do NOT include the square brackets (or any other characters) in the command.**

DECIMAL	FUNCTION
170	Set backlight brightness, followed by **[0-255].**
171	Toggles output #1 (output state saved to non-volatile memory).
172	Toggles output #2 (output state saved to non-volatile memory).
177	Shifts entire display 1 position to the LEFT.
178	Shifts entire display 1 position to the RIGHT.
179	Setup LCD size, followed by number of columns (1-20), number of rows (1-4).
180	Turns on underline cursor.
181	Turns on blinking cursor.
182	Turns cursor OFF
186	Clears the screen and sets current position to row 1, column 1
187	Toggle splash screen at display boot-up
188	Turns display OFF (contents retained, backlight turned off).
189	Turns display ON (contents retained, backlight brightness restored).
COL+135	Set new column position (1 to 20)
ROW+126	Set new row position (1 to 4), column set to 1

To clear the display, send **[186].** Upon clearing the display, the current text position will be at row 1, column 1.

When text is written to the screen, it is displayed at the current position. The current position is updated as each character is displayed. If the text extends beyond the end of the line, it will automatically wrap to the next line. When the text reaches the bottom-right corner, it will automatically wrap to the top-left of the display.

Text strings are limited to 80 characters and must be terminated with a carriage return [13].
To set the current position to any row (1 to 8) send **[row+127]** to the display. To set the current position to any column (1 to 21 for large fonts and 1-32 for small fonts) send **[column+135]** to the display. Any text sent after either of these commands, will be displayed **STARTING** at the current position.

The backlight brightness can be adjusted by sending **[170]** followed by a level (0-255) to the display.

The CSLB will display a splash screen when it is powered up. It can be disabled by sending **[187]** to the display. To enable the splash screen send **[187]** again.

There are 2 outputs available on the controller board. The connections for these outputs are located at the 5-pin header connection (just below the MCU) as follows:
1 - No connection.
2 - 5Volt DC.
3 - GND.
4 - Output #1.
5 - Output #2.

Please note that these outputs are limited to 25mA and **should NOT be exceeded.** They may used to

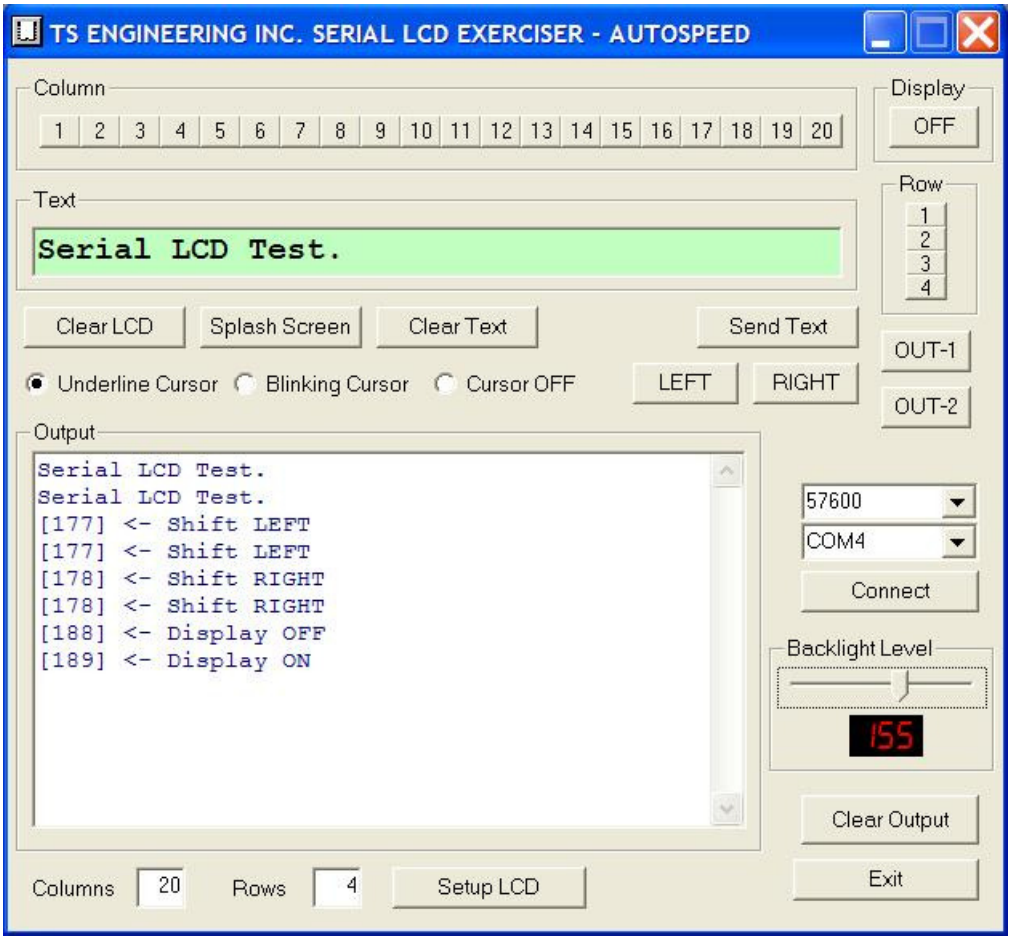
drive LED's, buzzers etc. If you need a higher current output, an NPN transistor or MOSFET may be used. The state of these outputs is retained in non-volatile memory, so upon start-up they will be in the state they were set when the display was last shut down.

To restore the factory default baud rate, temporarily connect the TTL terminal to GND while powering up the display.

4. Specifications

Size: 1.78in. X 0.98in. (45mm x 25mm)
Power: 5V (+/- 5%) regulated supply. **** Do Not Exceed ****
15mA - backlight off, up to 200mA - backlight on.
Baud Rates: 1,200-57,600 - no parity, 8 data bits, 1 stop bit.

An exerciser program is available that will allow you to evaluate the features of the CSLB. It will also allow you to set up your LCD (number of rows and columns), change baud rates etc.



This software may be downloaded from our website.