



**FocusLCDs.com**  
LCDs MADE SIMPLE®

Ph. 480-503-4295 | [NOPP@FocusLCD.com](mailto:NOPP@FocusLCD.com)

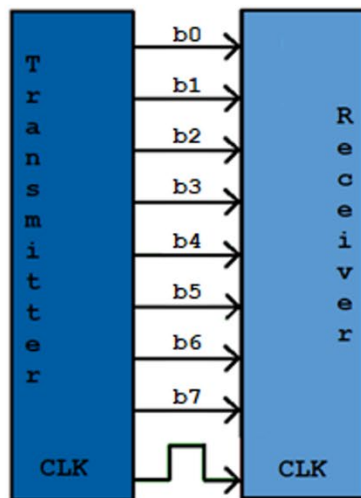
TFT | CHARACTER | UWVD | FSC | SEGMENT | CUSTOM | REPLACEMENT

**LCD Resources:**  
*Serial vs. Parallel*

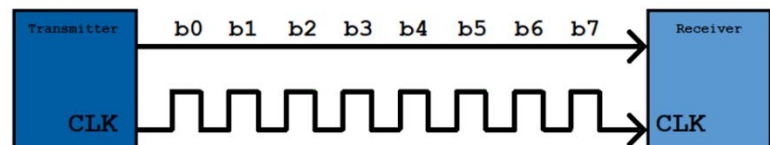
## Understanding Parallel and Serial Interfaces

There are two types of interface modes for LCD's, serial and parallel. Some LCD's offer both interface modes while some are exclusively one type. Each interface type has their own advantages and disadvantages. You may be wondering which is the best interface for your project or what each of them consist of before deciding on your next LCD. This is a brief guide summarizing the main points of each interface mode.

The main difference between the serial and parallel interfaces is how they transmit data. In serial interface the data is sent or received one bit at a time over a series of clock pulses. In parallel mode the interface sends and receives 4 bits, 8 bits, or 16 bits of data at a time over multiple transmission lines. These two interface modes will be explained in further detail below.



8-bit Parallel Interface



8-bit Serial Interface

## Serial Interface

The serial interface is a bi-directional data bus that transmits a series of 8-bits in parity, each with a set clock pulse width, and one at a time. For this reason, serial interface transmission can often be slower (but cheaper) than parallel transmission. Serial interface LCD's controllers require fewer connection pins than the parallel interface. This makes connecting to an external processor (such as a microcontroller) easier.

Serial interfaces consist of 3 types each with their own pins:

- 1.) I2C (Inter-Integrated Circuit): Serial Data In and Serial Clock
- 2.) 3/4-wire SPI (Serial Peripheral Interface): Consists of Serial Data Out, Serial Data In, Serial Clock and an additional Chip Select pin for the 4-wire SPI
- 3.) Serial synchronous control and data lines: Serial Data In, Register Select, Reset, and Serial Clock

Below is a Serial Interface connection example:

No.	Symbol	Description	Notes
1	SCL	Serial Clock	Output from master
2	CS	Chip Select, Low is active	Control Line
3	SDI/SDA	Serial Data In	Data lines
4	SDO	Serial Data Out	
5	A0	Register Select. 0: instruction, 1: data register	
6	RES	External Reset, Low is active	

#### Serial Interface Pros:

- Less Data Pins
- Cheaper
- Easy Setup

## Parallel Interface

The parallel interface transmits 8-bits, or one byte, of data over multiple data bus lines over one clock pulse. This makes parallel transmission faster than serial but is typically more expensive and requires more data pins to be connected. The parallel interface consists of 8 data pins and 3 control pins. The control pins are typically labeled: Register Select (RS), Enable (E), and Read/Write (R/W). Additional common parallel interface pins may include: Contrast adjust (VO), Chip Select (CS) and

Parallel interface consists of 2 standard types:

- 1.) 8080 type: parallel 4-bit/8-bit data input with a write and a read line
- 2.) 6800 type: parallel 4/8-bit data input with write, read and enable lines

Below is a parallel interface connection example:

No.	Symbol	Description	Notes
1	VSS	Power supply ground (pin to GND)	
2	VDD	Power supply (+3V)	Typically (3-5V)
3	VO	Contrast adjust	
4	RS	Register select signal. 0: instruction; 1: data	
5	R/W	Read/Write data. 0: write; 1: read	
6	E	Enable signal	
7	D0	Data bus	8-bit parallel data lines
8	D1	Data bus	
9	D2	Data bus	
10	D3	Data bus	
11	D4	Data bus	
12	D5	Data bus	
13	D6	Data bus	
14	D7	Data but	

#### Parallel Interface Pros:

- Faster Data Transmission
- High Performance