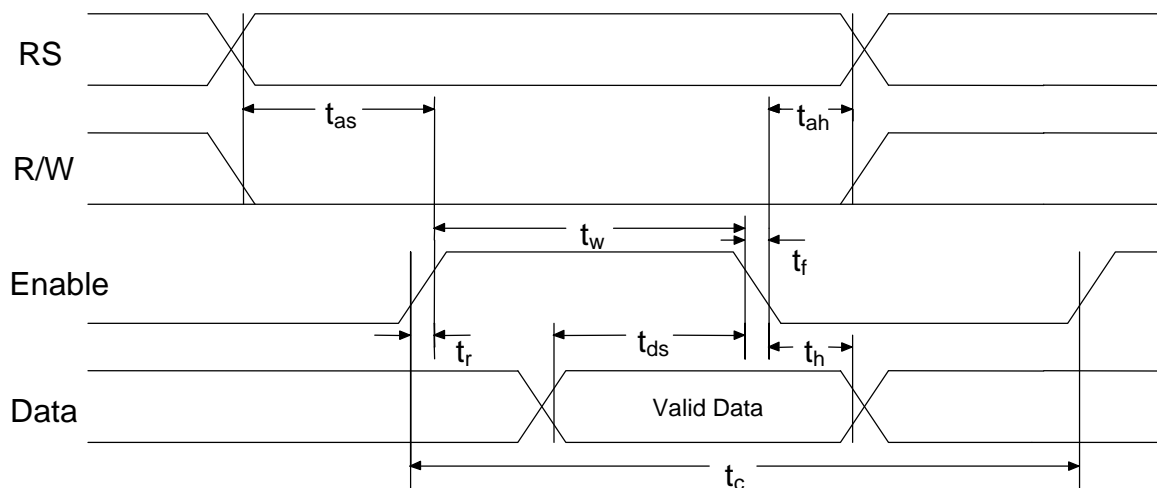


| Instruction | RS | RW | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Description | Clocks |
|----------------------|----|----|------------|--------------------------|-------------------------|----|-----|---------------------------------|-----------------------------------|--------------------|--|--------|
| NOP | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No Operation | 0 |
| Clear Display | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | Clears display & sets address counter to zero. | 165 |
| Cursor Home | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | Sets address counter to zero, returns shifted display to original position. DDRAM contents remains unchanged. | 3 |
| Entry Mode Set | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | I/D | S | Sets cursor move direction, and specifies automatic shift. | 3 |
| Display Control | 0 | 0 | 0 | 0 | 0 | 0 | 1 | D | C | B | Turns display (D), cursor on/off (C) or cursor blinking(B). | 3 |
| Cursor/display shift | 0 | 0 | 0 | 0 | 0 | 1 | S/C | R/L | 0 | 0 | Moves cursor and shift display. DDRAM contents remains unchanged. | 3 |
| Function Set | 0 | 0 | 0 | 0 | 1 | DL | N | M | G | 0 | Sets interface data width(DL), number of display lines (N,M) and voltage generator control (G). | 3 |
| Set CGRAM Addr | 0 | 0 | 0 | 1 | Character Generator RAM | | | | | Sets CGRAM Address | 3 | |
| Set DDRAM Addr | 0 | 0 | 1 | Display Data RAM Address | | | | | Sets DDRAM Address | 3 | | |
| Busy Flag & Addr | 0 | 1 | BF | Address Counter | | | | | Reads Busy Flag & Address Counter | 0 | | |
| Read Data | 1 | 0 | Read Data | | | | | Reads data from CGRAM or DDRAM | 3 | | | |
| Write Data | 1 | 1 | Write Data | | | | | Writes data from CGRAM or DDRAM | 3 | | | |

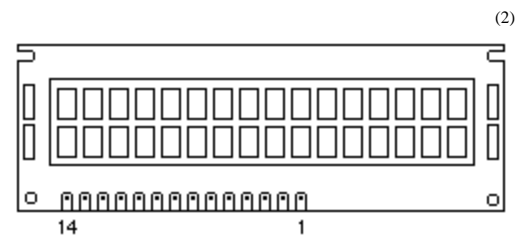
Write Cycle



| Parameter | Symbol | Min ⁽¹⁾ | Typ ⁽¹⁾ | Max ⁽¹⁾ | Unit |
|---------------------------|------------|--------------------|--------------------|--------------------|------|
| Enable Cycle Time | t_c | 500 | - | - | ns |
| Enable Pulse Width (High) | t_w | 230 | - | - | ns |
| Enable Rise/Fall Time | t_r, t_f | - | - | 20 | ns |
| Address Setup Time | t_{as} | 40 | - | - | ns |
| Address Hold Time | t_{ah} | 10 | - | - | ns |
| Data Setup Time | t_{ds} | 80 | - | - | ns |
| Data Hold Time | t_h | 10 | - | - | ns |

Note ¹ The above specifications are a indication only. Timing will vary from manufacturer to manufacturer.

Note ² A 2 line by 16 Character LCD Module is Pictured. Data will work on most 1 line x 16 character, 1 line x 20 character, 2 line x 16 character, 2 line x 20 character, 4 lines x 20 character, 2 lines x 40 character etc. modules compatible with the HD44780 LCD Module.



| Pin No | Name | I/O | Description |
|--------|------|--------|------------------|
| 1 | Vss | Power | GND |
| 2 | Vdd | Power | +5v |
| 3 | Vo | Analog | Contrast Control |
| 4 | RS | Input | Register Select |
| 5 | R/W | Input | Read/Write |
| 6 | E | Input | Enable (Strobe) |
| 7 | D0 | I/O | Data LSB |
| 8 | D1 | I/O | Data |
| 9 | D2 | I/O | Data |
| 10 | D3 | I/O | Data |
| 11 | D4 | I/O | Data |
| 12 | D5 | I/O | Data |
| 13 | D6 | I/O | Data |
| 14 | D7 | I/O | Data MSB |