FM629 Digital I/O Board

This Digital I/O Board contains one keypad for input and two 7-segment LED displays for output. Each component (keypad, displays) is separately mounted on the board and can be used individually.

The three 10-pin connectors at the bottom of the board correspond to the components immediately above, and are compatible in layout with the port connectors on the STK500 development kit board. A 10-pin ribbon-cable can be used to connect this board with the STK500 kit.

Component descriptions

**Keypad:**
The keypad used on this board is a 12-key numeric keypad including star (*) and hash (#) buttons. Buttons are arranged in a 3 x 4-way matrix. This keypad can be found as catalogue item SP-0770 on the Jaycar website.

**7-segment LED displays:**
The 7-segment LED displays used on this board are small red displays with common cathode. These displays can be found as catalogue item ZD-1855 on the Jaycar website.
12 Key Numeric Keypad
This telephone style keypad has many uses. It has 0-9, *, # - 3 x 4 way matrix.

Specifications:
Contact rating: 20mA, 24VDC
Contact resistance: 200Ω max
Life: 1,000,000 cycles per key
Contact: Conductive rubber
Size (Key Face): 44(W) x 54(H) x 5(D)mm
Colour: White keys on black

Small Displays - Red
FND500 / LTS543R / S505RWB COMMON CATHODE
FND507/LTS542R/S50 RWB COMMON ANODE
Connector Layouts

All connectors along the bottom of the I/O Board are 10-pin connectors with pin 1 starting at top-right. All three connectors follow this layout:

<table>
<thead>
<tr>
<th>pin9</th>
<th>pin7</th>
<th>pin5</th>
<th>pin3</th>
<th>pin1</th>
</tr>
</thead>
<tbody>
<tr>
<td>pin10</td>
<td>pin8</td>
<td>pin6</td>
<td>pin4</td>
<td>pin2</td>
</tr>
</tbody>
</table>

Note that when connecting to the STK500 boards, pins 9 and 10 are driven by the STK500 board as ground (GND, pin 9) and 5V (VTG, pin 10).

**Keypad Connector:**
The keypad connector uses only pins 1-7. Pins 8, 9 & 10 are not connected at all, to any component on this I/O board. The pins are connected to the keypad pins as described in the diagram below, through current limiting resistors.

<table>
<thead>
<tr>
<th>Pin</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose</td>
<td>Col1</td>
<td>Col2</td>
<td>Col3</td>
<td>Row1</td>
<td>Row2</td>
<td>Row3</td>
<td>Row4</td>
</tr>
</tbody>
</table>

**LED display Connectors:**
The LED displays use pins 1-9. Pin 10 is not connected to any component on this I/O Board. Pin 9 is connected to one of the common cathode pins on the display and serves as ground for the LEDs. Pins 1-8 are connected to the displays’ eight LED segments as described in the diagram below, through current limiting resistors.

<table>
<thead>
<tr>
<th>Pin</th>
<th>8</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose</td>
<td>DP</td>
<td>g</td>
<td>f</td>
<td>e</td>
<td>d</td>
<td>c</td>
<td>b</td>
<td>a</td>
</tr>
</tbody>
</table>

**Example AVR programs**

**Keypad:**

; checking Column 1 through PORTA
ldi temp, 0b10111111 ; set a mask with only column1 to 0
out PORTA, temp ; output to PortA
nop ; one nop delay inherent in AVR circuitry
nop ; second nop delay to ensure correct values
in temp, PINA ; now we can check ‘temp’ for which row = 0

**LED display:**

; outputting number ‘zero’ to PORTB
ldi temp, 0b00111111 ; use the mask that displays ‘0’
out PORTB, temp ; output to PORTB