Using the GPIO inputs and outputs

The Q-SYS I/O-8 Flex features General Purpose Input/Output (GPIO) connections that allow the Q-SYS network to interface with miscellaneous outside devices, such as LED indicators, switches, relays, and potentiometers, and with custom or third-party controls. The GPIO allotment on the I/O-8 Flex totals eight inputs and eight outputs. Use Q-SYS Designer to select the type of input or output and configure it. Each GPIO input and output is independent of the others.

Flanking each row of eight GPIO inputs and outputs is a +12 V DC terminal (up to 100 mA available on each, protected by a self-resetting fuse) and a ground or reference terminal. This can be used for potentiometers (input), relay coils and LEDs (output), and other uses.

GPIO configurations

These are the various ways that GPIO inputs and outputs can be configured.

<table>
<thead>
<tr>
<th>Type</th>
<th>Conceptual schematic</th>
<th>Control pins</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Input (TTL 3.3 V)</td>
<td><img src="image1" alt="Digital Input Diagram" /></td>
<td>None</td>
<td>Internal pull-up resistor to +12 V. When contacts are closed, GPIO In = 0 V; when open, GPIO In = +12 V.</td>
</tr>
<tr>
<td>Contact Closure Input</td>
<td><img src="image2" alt="Contact Closure Diagram" /></td>
<td>None</td>
<td>Calibrate the minimum and maximum positions of the pot.</td>
</tr>
</tbody>
</table>
| Potentiometer (10 kΩ, 12 V)| ![Potentiometer Diagram](image3) | + Calibrate Maximum
  + Calibrate Minimum
  + Maximum Position
  + Minimum Position | Calibrate the minimum and maximum positions of the pot. |
Type | Conceptual schematic | Control pins | Notes |
--- | --- | --- | --- |
**Input** | Potentiometer (2-wire)—In this setting, the external potentiometer is connected merely as a rheostat—a variable resistor. The internal pullup resistor is enabled, so the variable resistor delivers a variable voltage to the GPIO input; the GPIO circuitry interprets the voltage as a proportion between minimum and maximum. This configuration also requires calibration of the pot’s minimum and maximum positions. | • Calibrate Maximum  
• Calibrate Minimum  
• Maximum Position  
• Minimum Position | Calibrate the minimum and maximum positions of the pot. |  |
| Analog Input (0–24 V, low Z)—In this setting the GPIO reads the positive analog voltage presented to its input terminal. | | | | |
| Raw—Combines features of both analog and digital inputs. | Pullup enable | See the tech note pertaining to the Raw input. | | |

**Output** | Digital Output (TTL 3.3 V)—The output feeds a 3.3 V TTL digital input or its equivalent. The two states are logic high (1) and logic low (0). | | | |
| Open Collector (100 mA)—In this setting each output can sink up to 100 mA of current, making it suitable to actuate the low side of a relay (shown), LED, or other device. A relay, for example, can be used to switch higher levels of voltage or current. CAUTION: The GPIO output is not fused. Current greater than 100 mA can damage it. | For 12 V relays or other loads, use the +12 V source provided. For higher-voltage relays or loads, use an external DC supply (up to 24 V). | | |
| Raw—Similar to the Digital Output setting, except it offers an “invert” option. | Invert | See the tech note pertaining to the Raw output. | | |

**Application Examples**

**Shure MC396 Microphone Button/Light**
Purpose: To convey switch actuations to the Core and turn the mic's status light either red or green (the LED cannot be turned off), as directed by the Core’s GPIO output.
The mic receives phantom power from the I/O-8 Flex. The I/O-8 Flex can accommodate as many as eight MC396 mics.
Set the GPIO input and output both to Digital.

Mic DIP switch settings:
1  Down  
2  Either (does not matter)  
3  Up  

```
red
black
bare
```

**Clockaudio CH32 Touch Sensitive Switch**
Purpose: To convey switch actuations to the Core and turn the LED ring of the Clockaudio CH32 touch sensitive switch either red or green.
As many as three CH32 switches can share the same +12 V and GND pins. A I/O-8 Flex can power no more than three CH32 switches; a suitable external 12 V power supply, though, may allow four switches.
Set GPIO input to Contact Closure. Set both GPIO outputs to Digital.

```
I/O-8 FLEX
```

```
pin 2  GPIO Output (Red LED)  
pin 3  Ground  
pin 4  +12 V  
pin 5  GPIO Input (Button)  
pin 6  GPIO Output (Green LED)  
```