Integrating Logic Output Circuits into your Installation (Radius/Edge, xControl, Jupiter, 761)

This tech tip will explain how to properly integrate the Logic Outputs of the above DSP units into your installation. Typically these outputs would be utilized in a couple of ways – driving LEDs in order to give visual feedback to an end user, or controlling an external relay for switching other equipment, such as a projector screen or rack of other equipment. In order to do this is as seamlessly as possible, it is first necessary to know some basic facts.

First, each of these logic outputs is the open collector of a switching transistor that has its emitter tied to ground. What does this mean to you? These are not dry contacts that are simply open or closed. When the transistor is inactive, 5V is present at the logic output. When the transistor is activated, the 5V is shunted to ground through the transistor's emitter, which results in 0V at the logic output.

Here are the specs for the logic outputs that we'll be referring to in this tech tip:

- The logic output is pulled high (5V) when inactive.
- The logic output goes low (0V) when active.
- The maximum logic output source current is 10mA.
- The maximum external power supply voltage is 24 VDC.
- The maximum external power supply current sinking is 50mA.

How to drive an LED:

With a max output current of 10mA, it is possible to drive an LED directly from the logic output without needing a current-limiting resistor (there is an internal 500 ohm resistor). This of course depends on the forward voltage and forward current of the LED you choose (check the datasheet for your LED). In this case, simply connect as below:
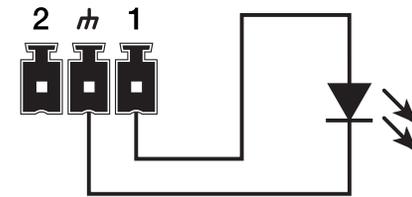
If you have an LED that requires a higher voltage/current demand, an external power supply will be needed. As stated above, the max external power supply voltage is 24 VDC with 50 mA sinking current. Hook it up as below:

External Supply (24 VDC max.)
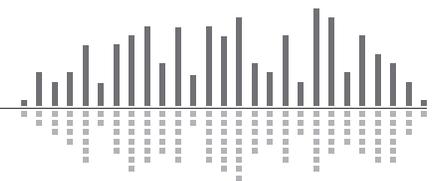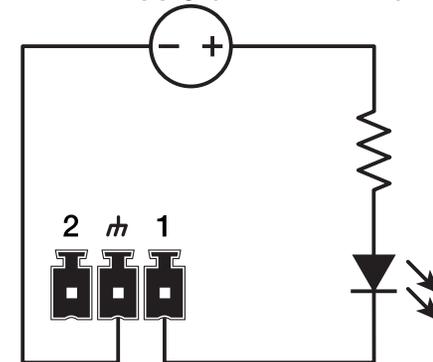
You can calculate the resistor's value by using Ohm's law:

$$R = \frac{(Vs - Vf)}{i}$$

Vs = Supply Voltage

Vf = LED forward voltage drop

I = LED forward current (in Amps)

Round up your value to the nearest standard resistor value.

Note: Various styles of LEDs (from standard through-hole to panel-mounted) in a seemingly endless variety of values are readily available. The best approach would be to identify your needs in terms of LED type, then use the extensive search functions of sites like Digikey.com or Mouser.com to see what is available.

Driving Relays:

There are two types of relays we'll work with to control external devices, the most common being a non-latching mechanical relay. Taking into consideration the 10mA output current of the logic outputs, this type of relay will typically need to have its coil driven by an external power supply. As noted earlier, the external supply should not exceed 24 VDC, while the relay coil current should not exceed 50mA. A relay such as the Omron G5LE-1A4 DC12 should do nicely.

External Supply (24 VDC max.)
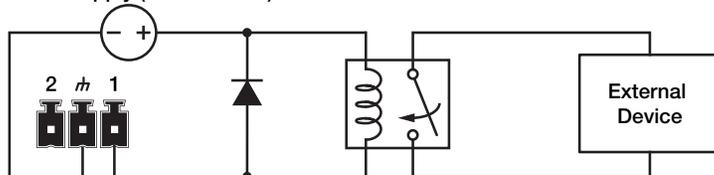
Take note of the flyback diode placed in parallel across the relay coil – This provides a path for discharge current to flow when the coil is switched off. Without this diode, there is the risk of damaging or destroying the internal transistor of the Symetrix device. Think of a flyback diode as the cheapest equipment insurance policy you'll find anywhere. Use a 1N4004 or equivalent.

Another relay option would be to use a Solid State Relay (SSR), which typically has a lower current requirement for activation. Most installers use mechanical relays, but some of the advantages of SSRs are worth noting:

- Low turn-on requirements - There is no inductive coil to drive in an SSR. Instead there is an internal LED that toggles the relay, which typically requires very little current to turn on. If you choose one that requires less than 10mA to activate, there is no need for the external power supply that you might need to power a mechanical relay coil.

- No mechanical wear-and-tear, arcing or contact bouncing.

Solid State Relay
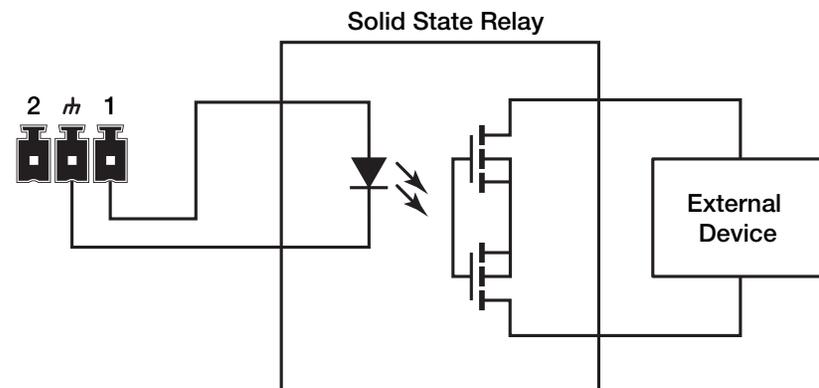
For a general use SSR, try a Panasonic AQV252G (max load voltage 60 VDC/VAC, max current of 2.5 A).
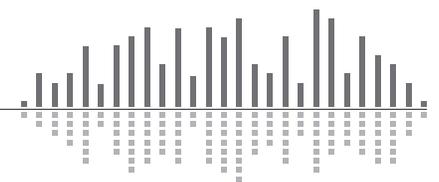
Triggering the Logic Outputs in SymNet Composer (Radius, Edge and xControl):

As a basic example, we'll set up a logic output to be toggled on and off by an external device such as a Crestron or AMX controller.
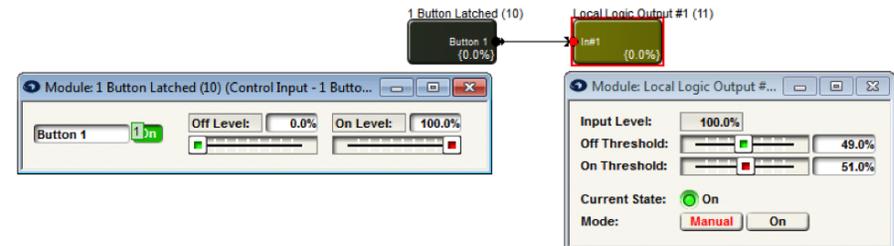
1. In Composer's Design View, drag in a single Latched Button from the Toolkit.
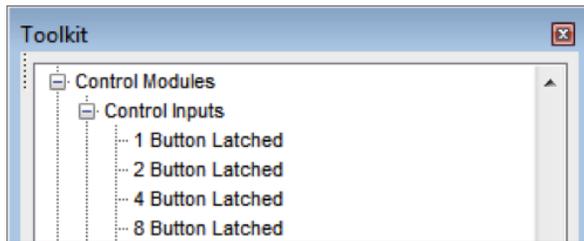
2. Drag in a "Local Logic Output #1" Module from the Toolkit. To use an xControl's logic outputs, select the "Remote Logic Output" module instead.
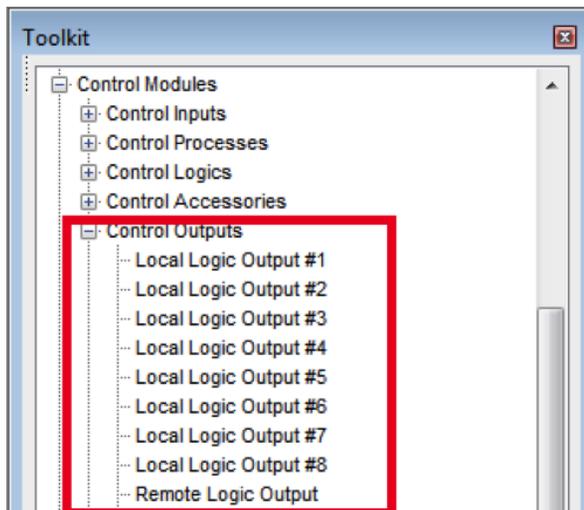
3. Wire the output of the latched button module to the input of the logic output module.

4. Right-click the "On" Button in the latched button module and click "Set Up to Remote Control".

5. Select "Generic Controller Number Assignment" from the drop-down menu. Either keep the "Auto-assign controller number" checkbox selected, or un-check to type in your own controller number. Click OK, then push the site file to hardware.

6. You will now be able to control the button with your external controller.
    *   To enable the button, send the following command to the DSP:
        *   CS <CONTROLLER NUMBER> 65535 <CR>
    *   To disable the button:
        *   CS <CONTROLLER NUMBER> 0 <CR>

Be sure to download the SymNet Composer Control Protocol from our website for full command details.

Triggering Logic Outputs for Jupiter and 761:

Use the "External Controller Wizard" in the software to walk through programming your logic outputs.