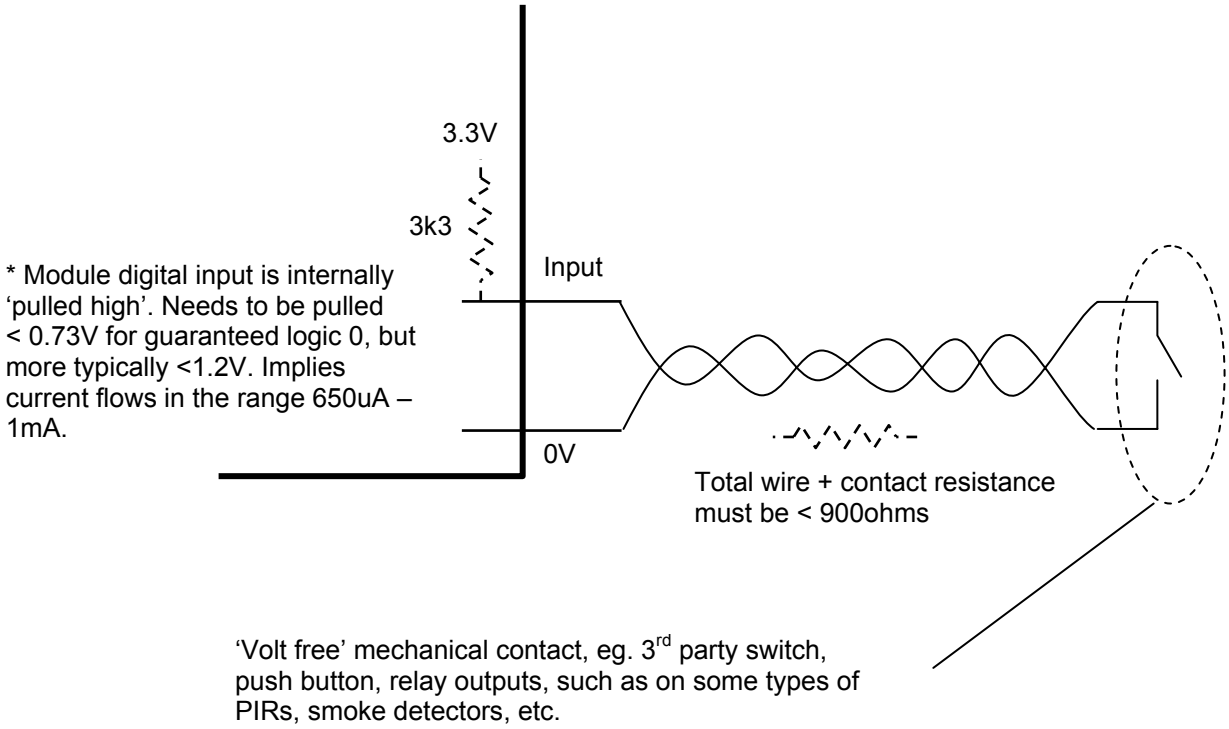
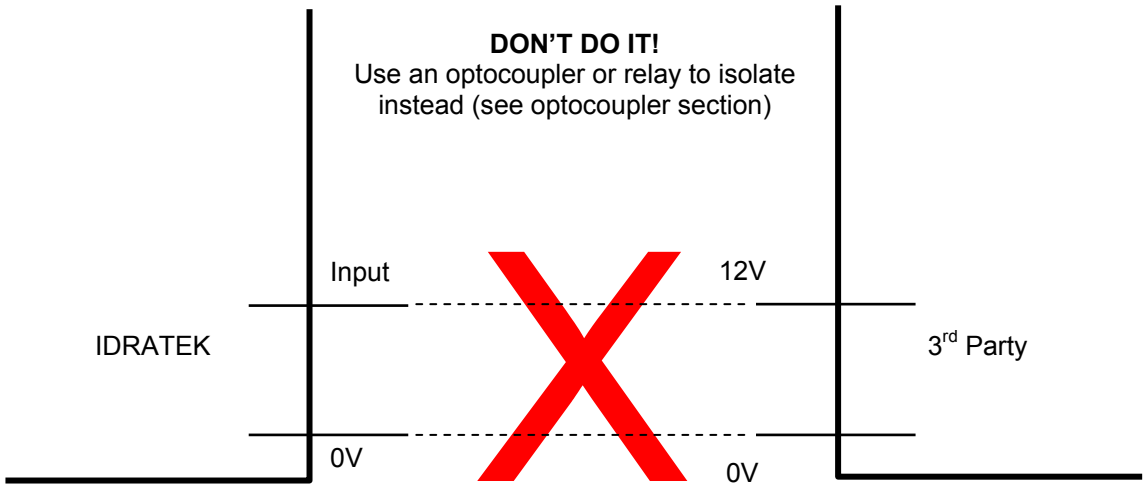
Connecting mechanical switches to digital inputs

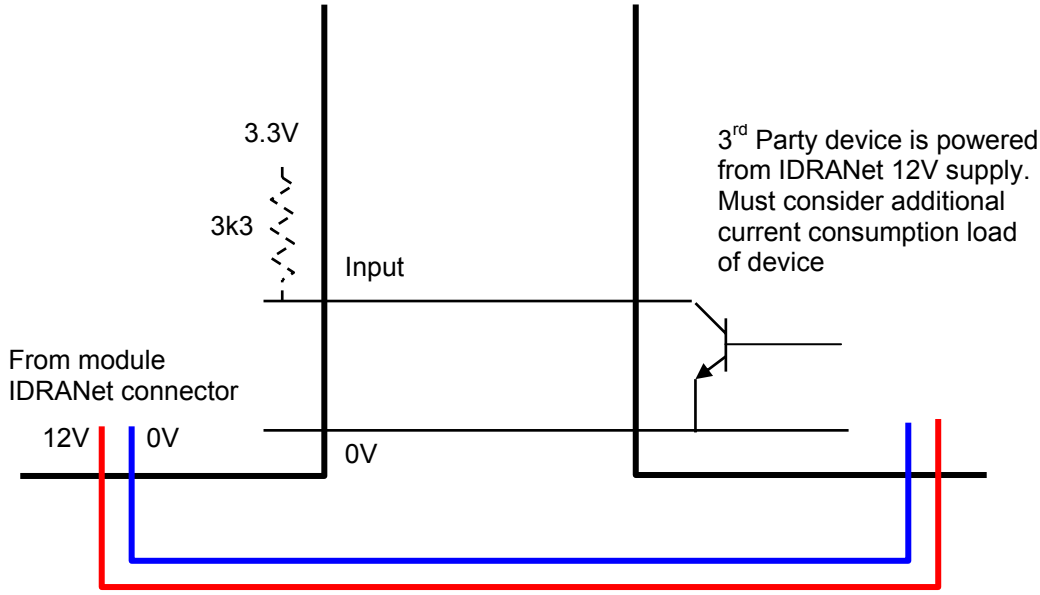


In principle any practical length of wire can be used between the input and the switch as long as the total path resistance criterion is met. However in practice longer wires or running wires close to and especially in parallel with electrical noise sources mean greater chance of picking up electrical noise. To reduce noise pick up on long runs use twisted pair conductors and/or screened cable (with screen tied to IDRANet cable screen or 0V at the module if former not available). If noise still a problem additional external filtering may be applied e.g 1u0 capacitor across input terminal connection points

Non Volt Free outputs

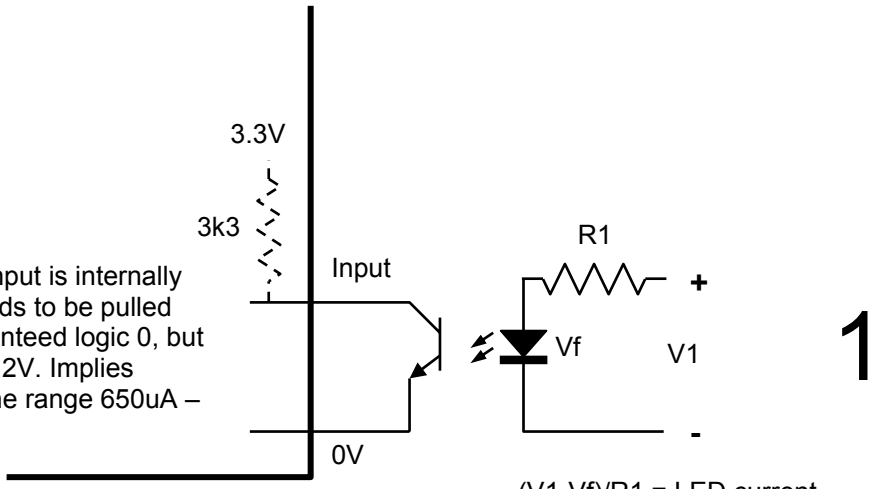


Open Collector non isolated outputs



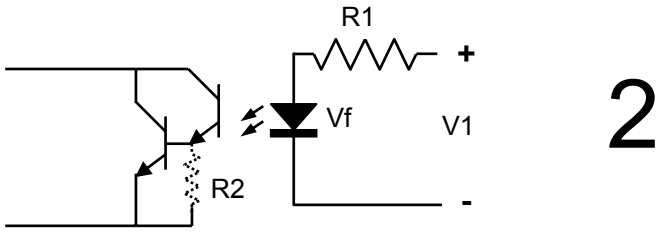
If the 3rd party device has 'Open collector' outputs and it is not clear whether these are isolated (e.g see optocoupler section) then it may imply that the 0V of the 3rd party device will be commoned with that of the IDRATEK system at the digital input 0V connector. If the 3rd party device uses its own power supply then 0V on the device may not be the same as 0V on the IDRATEK module (0V is a relative value). This could therefore result in significant current flow between the supplies of the two different systems via the 0V connection at the digital input. To avoid such a situation it is best to choose a 3rd party device that has isolated outputs or can be powered from the IDRANet system and preferably from the connector on the digital input module itself. If the use of separate supplies is unavoidable then a 100mA fuse should be placed in the 0V line between the 3rd party device and the IDRANet 0V input. Even then you risk introducing noise from the 3rd party supply into the IDRATEK system.

Connecting opto-coupled devices to IDRATEK digital inputs



* Module digital input is internally 'pulled high'. Needs to be pulled < 0.73V for guaranteed logic 0, but more typically <1.2V. Implies current flows in the range 650uA – 1mA.

(V1-Vf)/R1 = LED current
Vf typically 1.2-1.4V for IR LED
E.g. for 10mA LED current and V1 = 12V,
R1 = 10.7/10mA ~ 1 kohms



Darlington pair configuration in 2 gives much higher sensitivity but there is a small risk that the 'on' voltage drop across the output (~0.7-0.8V) may not be low enough for the digital input to register zero for all IDRATEK modules*. Depending on application R2 may be required to improve switch off speed. Typical transistor BC550C and, if used, R2 might be ~10k

The choice of circuit depends on the 'Current Transfer Ratio'. For an enclosed optoisolator device a CTR of 50-100% is not atypical. This means 10mA of LED current can easily allow the required ~1mA through a single stage output transistor. But for an open device such as a retroflective IR sensor the effective CTR will be much lower and of course will also depend on the distance and reflectivity of the target

The transistor output side of diagram 1 is typical of what you might find in some 3rd party devices such as off the shelf PIR units, smoke detectors, and also pulse output devices such as kWhr metering modules. In these devices the LED side is internal to the device. For the former group you may sometimes find that the output is a mechanical relay switch rather than optically isolated transistor because a relay, being a mechanical switch, can usually pass more current, block higher voltages and is not polarised, meaning that the PIR or smoke detector can be connected to a wider variety of systems without the installer having to worry about polarity or too much about voltage/current considerations. Basically you need to read the device specifications or sometimes between the lines to figure out what kind of output is being used, but either should be fine for a digital input so long as any polarisation is taken into account (if the device OUTPUT is marked – and + then – goes to 0V and + goes to digital input – note I've capitalised OUTPUT ☺). Pulse meters will unlikely use mechanical relays because a) relays are more bulky and b) you don't want to use a mechanical device for a signal that is regularly switching state. **Note: Not all module digital inputs incorporate the pulse counting feature – notably the QLD and DFP do not.**