

Monitoring, Remote Reset, and Recovery

Have you tried turning it off and back on again?

NetOps Discussion

November 5, 2019

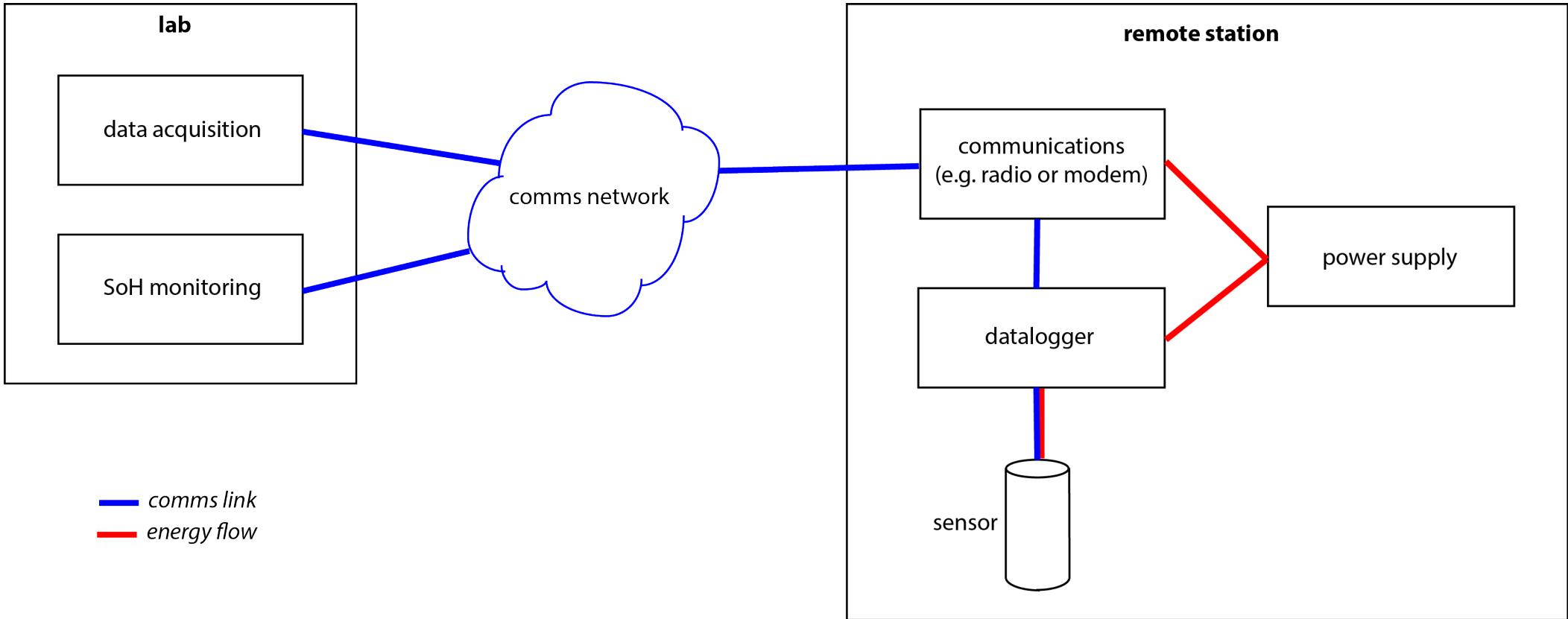
Moderated by Scott Dalton, Alaska Earthquake Center

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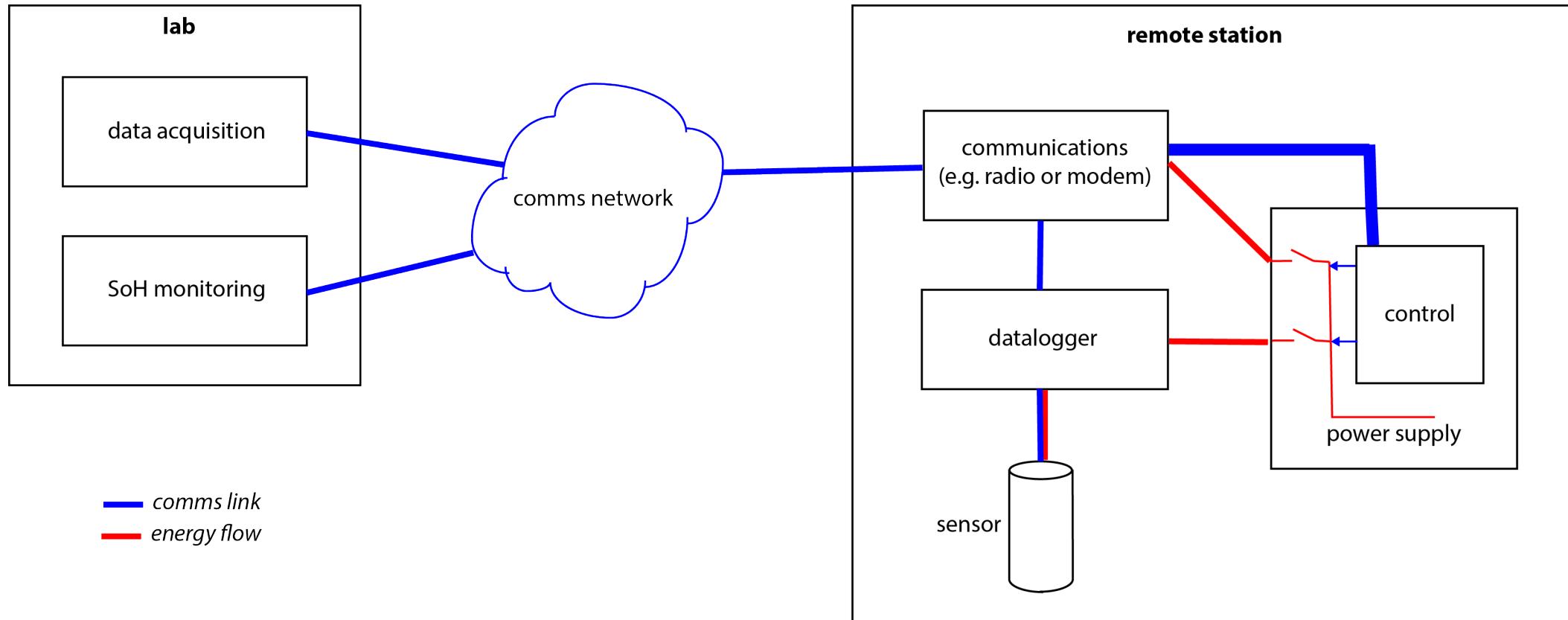
How do you reset (reboot) unresponsive devices at a remote station?



A Simple Case

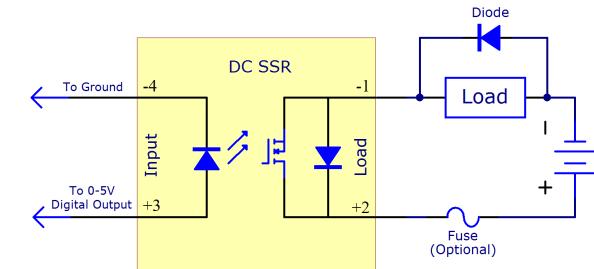
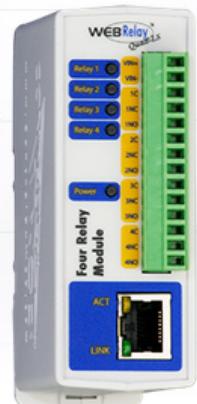


Remote Control of the Power System



Remote Control of the Power System

- PDU
 - Used in data centers
 - Usually rack mounted
 - Robust solution for sites where power consumption is not a concern
 - DC units available, or convert to DC downstream
- Web Relay
 - Remote control relays on DC power lines
 - Suited for small scale, low power
 - Less expensive, more portable
- Custom
 - GPIO control of SSR
 - Simple, easy, & cheap if you have the GPIOs available and are only switching one or two lines
 - Does not scale

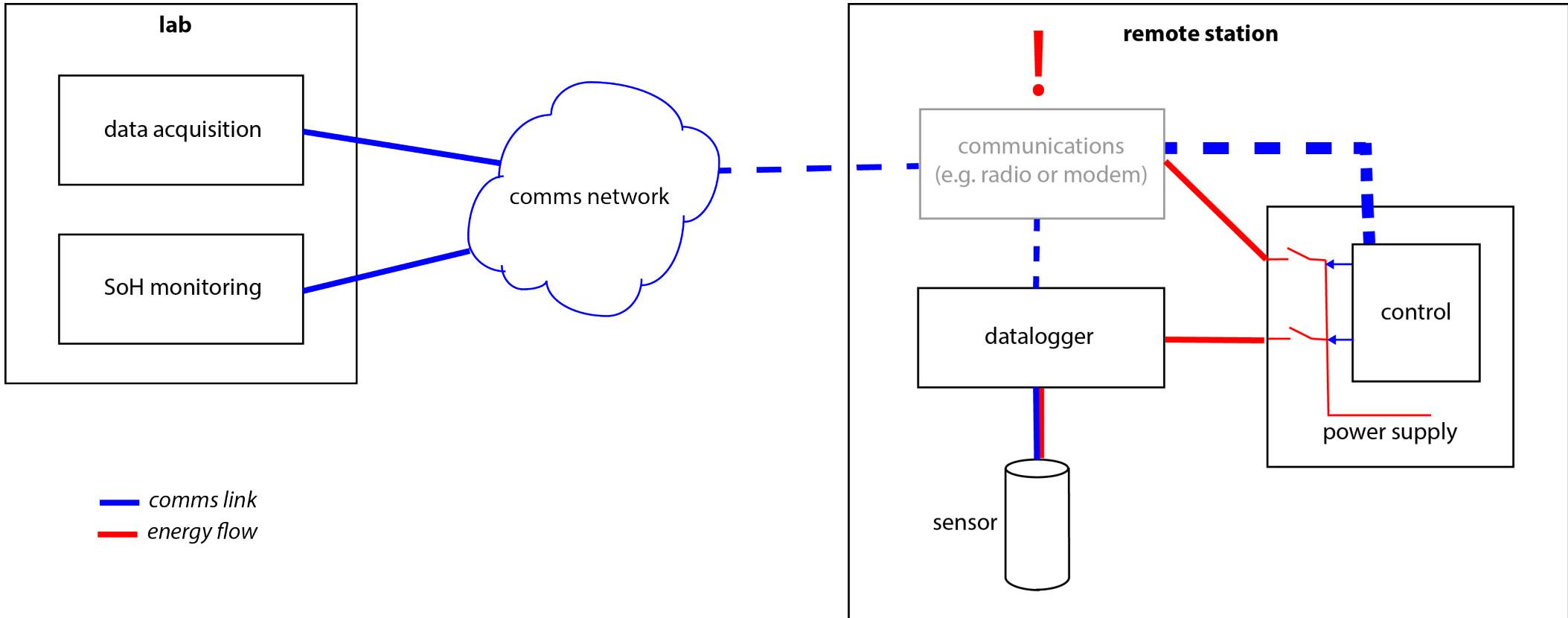


decreasing cost & power consumption

Remote Control of the Power System

...is great, but it's not enough

Comms Outage Removes Your Control



Reboot on Timeout

...or “network watchdog”

Configuring the power system to reboot a device when communication has been cut off.

How are network operators approaching this?

- CVO
 - migrating from the ControlByWeb X-310 to the X-410
 - GPS receivers can't be pinged once they choke so a local ping followed by automated reset works well
 - We haven't been able to demo the capability or isolate an instance with our 900MHz radios that sometimes hang
 - There's a lot of debate about whether to ping the local radio or a remote device before deciding to reset
 - interested in hearing about low-power Ethernet switches since the relays take up yet another Ethernet port

more from CVO

Serial Stream Watchdog

<https://www.industrologic.com/uwdtdesc.htm>

- **Power supply requirements-**

Power supply voltage: 11 to 14 volts AC, 10 to 16 volts DC, regulated or unregulated

Power supply current: 8 ma at 12VDC with relay and LED's not activated

Relay current: approximately 40 ma

LED current: approximately 20 ma

Power supply connector: 5.5 mm outside diameter, 2.1 mm inside diameter

Operating environment:

Temperature: 0-50 degrees Celsius (32-122 Fahrenheit)

Humidity: 30 to 80 percent, non-condensing

- **RS-232 signals-**

All nine signals passed through from DB9F to DB9M

Pin 2 or 3 connected through 10K series resistor

Circuit can be triggered by any baud rate

- **Trigger input-**

10K pull-up resistor to +5 volts, .1uf to ground

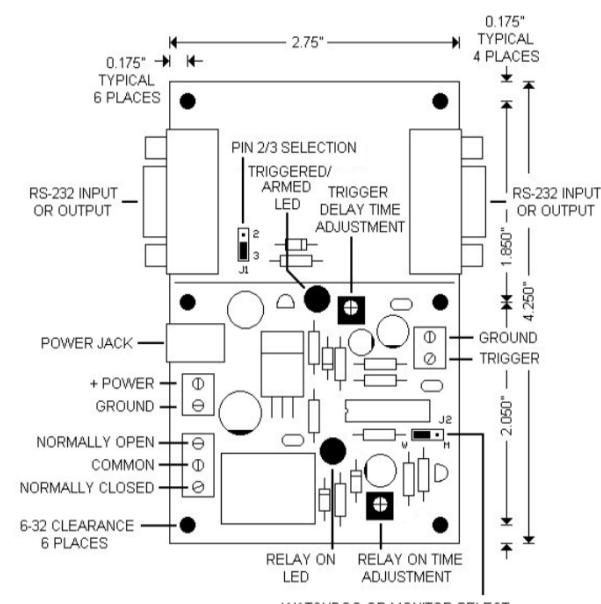
Active low, trigger pulse must sink 0.5 ma to ground

- **Form "C" Relay Contacts-**

Maximum voltage: 30 volts, AC or DC

Maximum current: 10 amps

Manufacturer's type: Omron G5LE-14 series or equivalent



AVO has slides

Some devices have inherent watchdog capability

For example, the **RV50** cell modem

Network Watchdog

Network Watchdog Timer	<p>Network Watchdog Timer</p> <p>If there is no WAN connection for the time configured in this field, the gateway reboots.</p> <p>Options are:</p> <ul style="list-style-type: none">• Disable—When this field and the Accelerated Interface Scan field are set to Disable, the gateway never reboots as a result of lack of network connectivity.• 5 Minutes• 10 Minutes• 15 Minutes (Default)• 30 Minutes• 45 Minutes• 1 Hour
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RV50s also have a free I/O

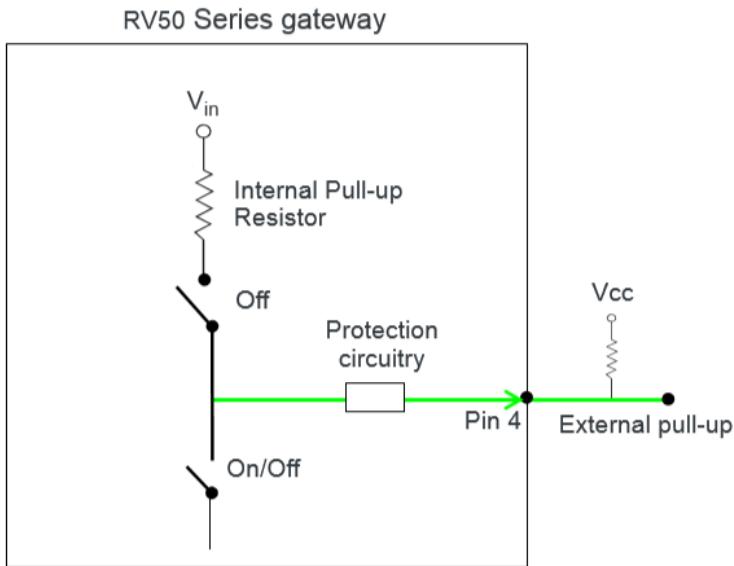


Figure 3-15: Digital Output/Open Drain

Table 3-9: Digital Output / Open Drain

Pull-up	State	Minimum	Typical	Maximum	Units	Comments
Off	Off	Open Circuit	—	—	—	—
	Active Low	—	—	0.5	V	5 mA, ≤ 5 V

Relay Selection

Digi-Key ELECTRONICS

United States ▾ English ▾ USD

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Product Index > Relays > Solid State Relays

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Manufacturer	Packaging	Series	Part Status	Mounting Type	Circuit	Output Type	Voltage - Input
Altech Corporation	Box	1	Active	Chassis Mount	DPDT (2 Form C)	AC	0 ~ 10VDC
Amprobe	Bulk	1-110/125A	Discontinued at Digi-Key	Chassis Mount, DIN Rail	DPST-NC (2 Form B)	AC, DC	0 ~ 5VDC
Broadcom Limited	Cut Tape (CT)	1-DC	Last Time Buy	DIN Rail	DPST-NO (2 Form A)	AC, DC (RF)	0 ~ 7VDC
Carlo Gavazzi Inc.	Digi-Reel®	1-DCL	Not For New Designs	Panel Mount	DPST-NO (2 Form A) x 2	AC, Proportional Control	1.1VDC
CEL	Strip	2	Obsolete	Socketable	SPDT (1 Form C)	AC, Zero Cross	1.13VDC
Comus International	Tape & Box (TB)	21	Preliminary	Surface Mount	SPST-NC (1 Form B)	DC	1.14VDC
Coto Technology	Tape & Reel (TR)	21RS		Through Hole	SPST-NC (1 Form B) x 2		1.15VDC
E-T-A	Tray	23			SPST-NO (1 Form A)		1.16VDC
Finder Relays, Inc.	Tube				SPST-NO (1 Form A) x 2		1.17VDC
IDEK							

Voltage - Load	Load Current	On-State Resistance (Max)	Termination Style	Package / Case	Supplier Device Package
0V ~ 5V	3mA	3.3 mOhms	Gull Wing	Hockey Puck	DIP
0V ~ 15V	10mA	4 mOhms	PC Pin	Hockey Puck with Heat Sink	Hockey Puck
0V ~ 20V	20mA	5 mOhms	Plug In	i4-Pac™-4, Isolated	i4-PAC™
0V ~ 22V	25mA	5.6 mOhms	Plug In, 8 Pin (Octal)	ISO Micro	ISO Micro
0V ~ 24V	30mA	5.8 mOhms	Plug In, Quick Connect - 0.187" (4.7mm)	ISOPLUS264™	ISOPLUS264™
0V ~ 25V	40mA	6 mOhms	Quick Connect - 0.110"/0.250"	Module	Module
0V ~ 30V	45mA	7 mOhms	Quick Connect - 0.187" (4.7mm)	SSR with Integrated Heat Sink	S-VSON4
0V ~ 38V	50mA	8 mOhms	Quick Connect - 0.187"/0.250"	TO-5 Variant, 8 Leads, Lens Top Metal Can	S-VSON4T
			Quick Connect - 0.250" (6.3mm)	4-DIP (0.300", 7.62mm)	Thin-Pak

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Relay Nomenclature

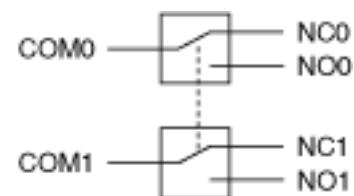
Relays are classified by their number of poles and number of throws. The pole of a relay is the terminal common to every path. Each position where the pole can connect is called a throw. A relay can be made of n poles and m throws. For example, a single-pole single-throw (SPST) relay has one pole and one throw, as illustrated in the following figure.



A single-pole double-throw (SPDT) relay has one pole and two throws. Based on the default position of the pole, one throw is considered normally open (NO) while the other is normally closed (NC). The following figure illustrates a SPDT relay.



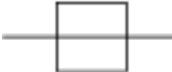
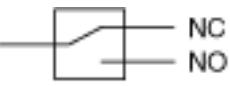
A double-pole double-throw (DPDT) relay has two poles, each with two simultaneously controlled throws, as illustrated in the following figure.



Source: National Instruments

http://zone.ni.com/reference/en-XX/help/375472H-01/switch/relay_forms/

Relay Nomenclature - Forms

Form	Symbol	Description
Form A		SPST relays with a default state of normally open.
Form B		SPST relays with a default state of normally closed.
Form C		SPDT relays that break the connection with one throw before making contact with the other (break-before-make).

RV50s also have a free I/O

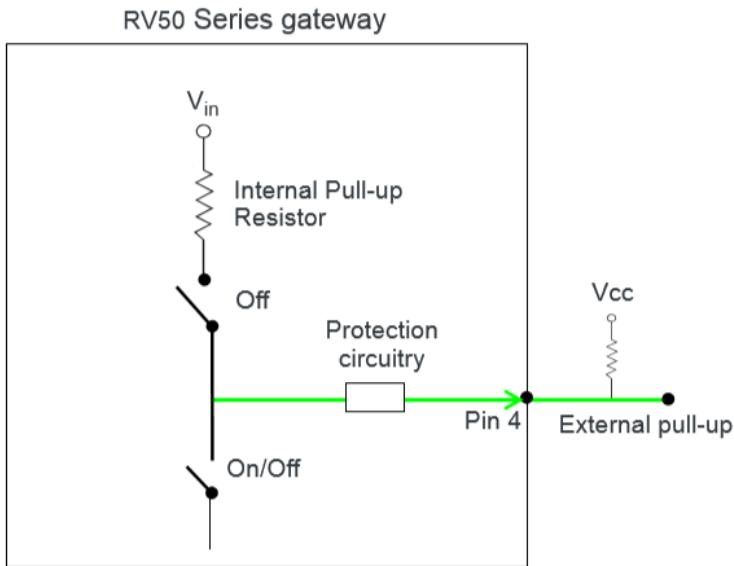


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Using RV50 Digital Output to Drive a Solid State Relay

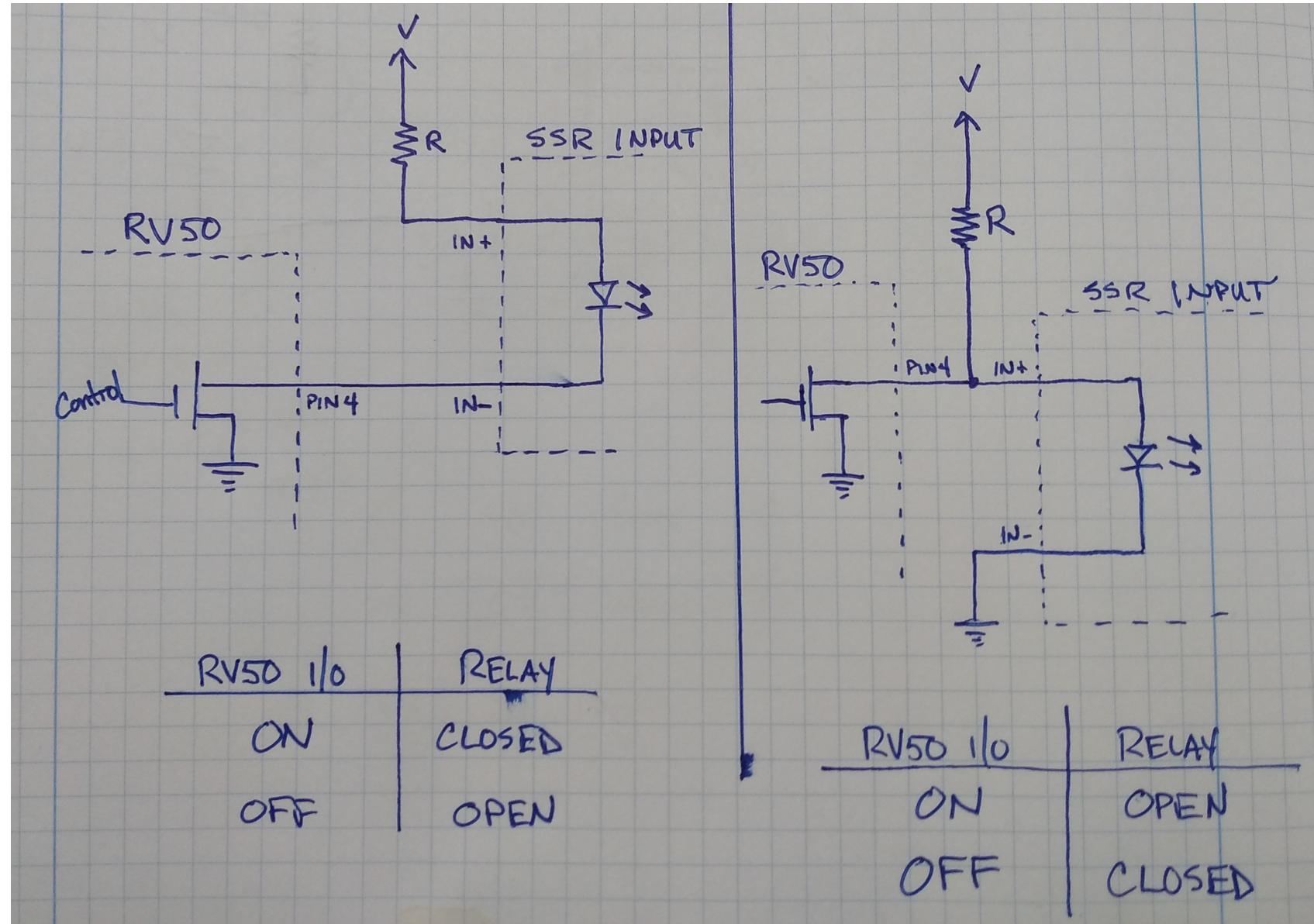
V = station power (12 V)

Select R based on the input requirements of the SSR, just as you would to illuminate an LED.

Configure RV50 IO as an open drain output.

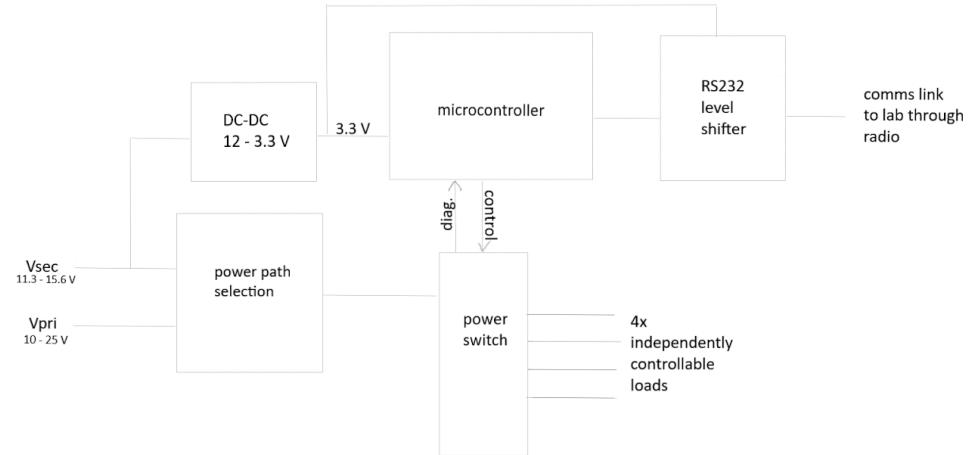
RV50 output ON will pull pin 4 to ground

RV50 output OFF will pull pin 4 to V through the pull-up resistor



AEC's Load Control Circuit (LCC)

LCC block diagram



- Built around TI MSP430 low power microcontroller
- Very low power consumption (mW range)
- Serial communication
- Does not require extra ethernet connection or switch
- Remote control and watchdog on 4 DC power lines

