Using General Purpose EMS Pins for Contacts or Indicators

NOTE: This is extracted and adapted from forum posts I made when someone had difficulty using general purpose EMS pins for on/off indications or contacts. The forum posts are at this link:

https://forum.flydynon.com/threads/need-to-turn-off-pull-up-voltage-on-pin-22-in-ems.14435/

This is applicable to the enhanced type C general purpose inputs (pins 8, 22, 23, and 31) that do not have configurable internal pull ups.

General purpose contacts don't work on simply the absence or presence of voltage. When in the OFF state, the input can't just be open. It has to be connected to ground. The general purpose contacts on the Skyview don't act like a typical voltage sensor. They don't really care about voltage at all, because they aren't really looking for voltage to tell them something is turned on. They're really looking for ground to tell them something is turned off. The general purpose contact pins have a constant bias voltage of around four volts applied from within the EMS. So, when you remove the voltage being supplied from your switch or other device in the ON state, the pin must be grounded in order for the EFIS to read zero, and give you an OFF indication. That's why you see OFF when you manually ground the pin. It appears the sensor in your ECU/ECM is simply disconnecting voltage and creating an open circuit when it's turned off, rather than switching from voltage to ground, which is what the Skyview is looking for. If there isn't a way to reconfigure the ECU/ECM to supply ground when it's turned off, you probably need to install a circuit that can apply ground in the OFF state. That can be done with a pull down resistor, or with a common automotive SPDT relay. The pull down resistor is a more elegant solution, but a relay may offer an easier installation path for those without electronics skills.

Using a Pull Up Resistor

Dynon already recommends a 10k inline resistor when using the general purpose pins for contacts. The pull down resistor will be placed in parallel, between the inline resistor and the EMS, as shown here:
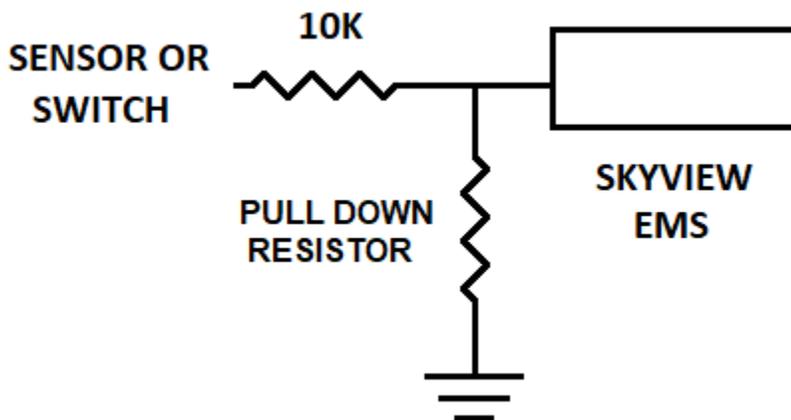

A pull down resistor is normally 10k, but should be increased to 20k or higher if multiple general purpose pins are being used as contacts, or if you have a 28 volt electrical system. Multiple or higher voltage inputs on these pins are cumulative, and may overpower the bias voltage on those pins. That can cause some or all widgets on the EMS to blank out. If you experience this problem, try increasing the resistance value of your pull down resistor(s) until the problem goes away.

A very smart man named Vern (vlittle on the Dynon forum) made a post if that same thread linked above showing how he uses a plug-in D-sub connector to build his resistor circuit. That has distinct advantages if you like to tinker, or if you envision future changes or additions to your on/off circuits. Instead of digging into the wiring harness again, you simply unplug the D-sub connector, reconfigure or modify the resistor connections, and plug it back in. Hard to beat that kind of convenience. He even provides pictures in another thread.

Using an Automotive SPDT Relay

The SPDT is probably the most common of automotive relays, and this should be the relay configuration you need.
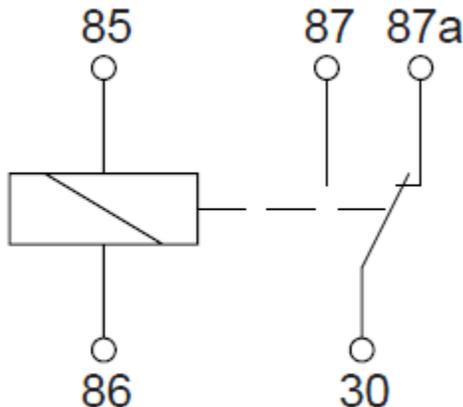
The typical (not necessarily guaranteed) pinout is:

85 - ground
86 - sensor input trigger voltage to key the relay (from your switch/sensor)
87 - switched input (either 12 volts system power, or the trigger voltage from your switch/sensor)
30 - switched output (to pin 22 on Skyview in this case)
87a - normally open in cars, but this is where you need to connect ground for the Skyview to see when the relay is off

You should note that I've switched the input and output connections. In automotive applications, pin 30 is the input and 87 is the output. But since we need to supply ground in the OFF condition, I made pin 30 the output, and pins 87 and 87a the inputs.

Automotive relays will typically trigger with much less than 12 volts, so a sensor voltage should have no trouble activating the relay if it's 2 to 15 volts. If it is, you can tie pins 86 and 87 together. Then it will trigger both the relay and the Skyview widget.

You can also install the relay in a socket on the wiring harness behind the panel to make relay replacement a plug and play operation, should it ever be needed. Those sockets are also common automotive parts. The image below shows how such a typical socket would be connected:

This is the output to a general purpose pin on the Skyview EMS. It supplies voltage when the sensor or switch is in the ON state, or ground when the sensor or switch is in the OFF state. A 10k ohm resistor should be installed inline if any voltage exceeds 10 volts (NEVER apply more than 15 volts to the Skyview)

This the ground that will be supplied to the EMS through the relay whenever the sensor or switch is in the OFF state. It should be connected to the same ground the Skyview EMS uses, or to one of the ground pins on the EMS D37 connector (3, 5, 13, 16, 17 or 30)

PIN 30
Blue

PIN 87a
RED

PIN 86
White

PIN 85
Black

This is the trigger voltage from your switch or sensor that keys the relay. The relay is designed to operate on 12 volts, but will typically key much lower. If the voltage is between 2 and 15 volts, you can tie this to pin 87 of the relay (yellow wire), to provide the input voltage to the Skyview EMS

This is the ground used to operate the relay. It can be tied to pin 87a.
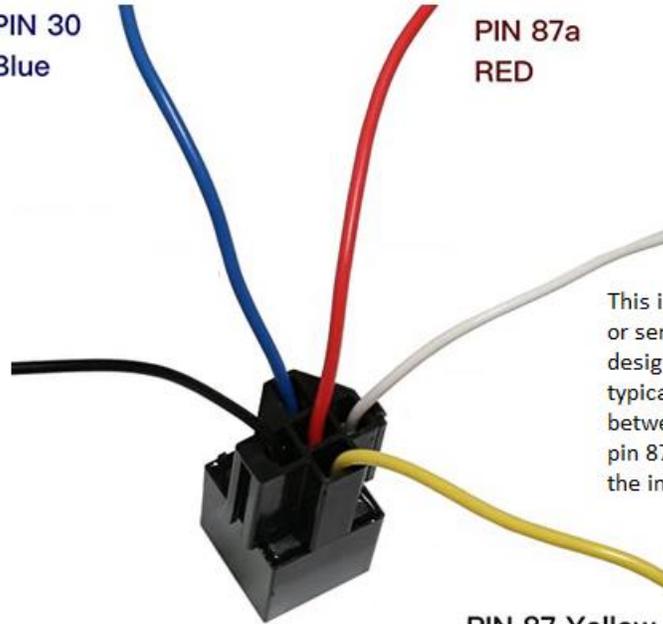
PIN 87 Yellow

This is the input voltage that will be sent through the relay to the Skyview EMS when a sensor or switch is in the ON state. It should be between 2 and 15 volts, but should never exceed 15 volts. Anything over 10 volts should have a 10k ohm inline resistor on pin 30 (see that pin)