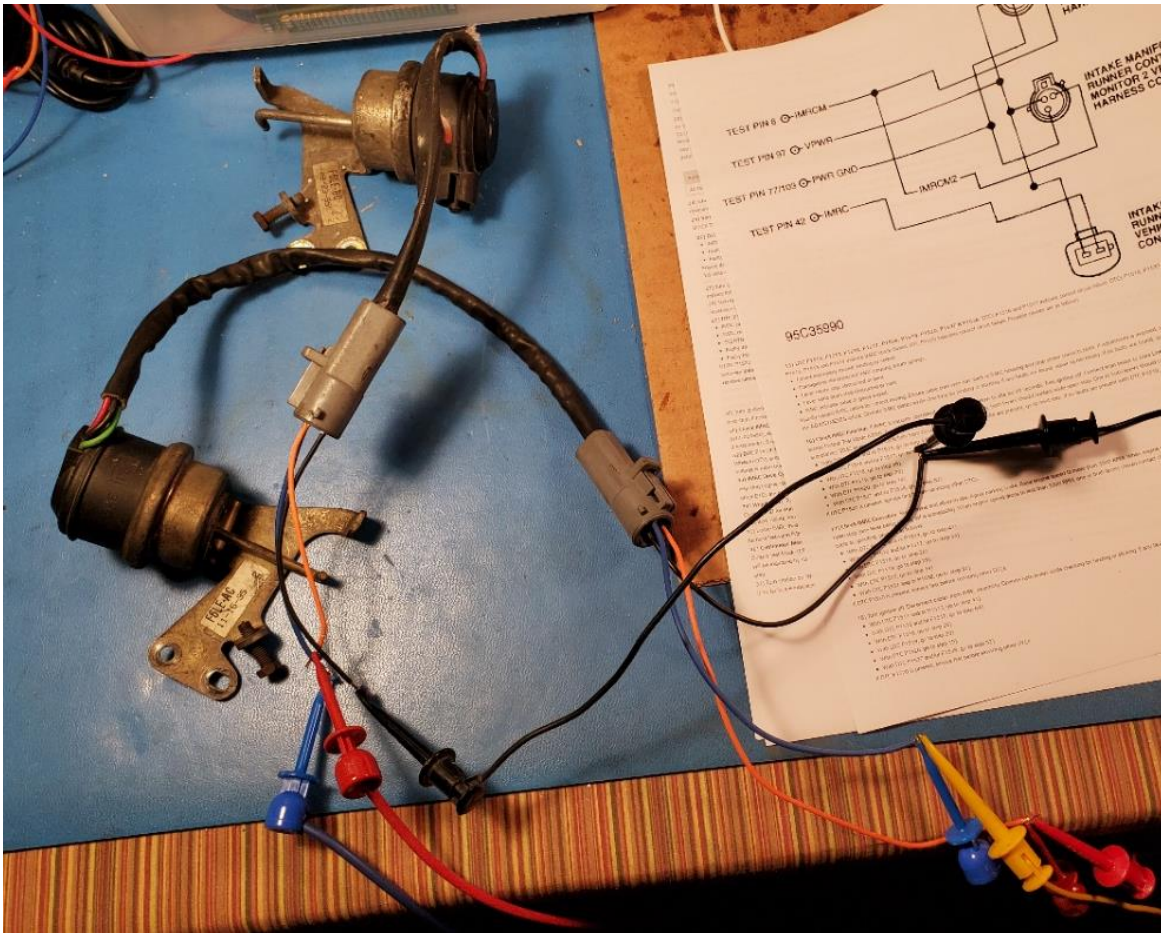
1996 Lincoln Mark 8
IMRC Delete Relay Analysis
Rev. 1.2



The IMRC system in the 1996 Lincoln Mark 8 is made of single year parts that are getting harder and harder to find. This document describes how the system works and how to use a simple automotive relay to prevent a check engine light if the IMRC system is deleted. Other Ford vehicles such as the Windstar also use this style system, so this information may apply to them as well.

I was asked by a prospective customer if my Mark 8/Cobra IMRC Delete Relay (https://accutach.com/imrc-delete-relay) would work in a 96 Mk8 with the IMRCs deleted. This prompted me to start this exercise. May thanks to Carlos (racebronco2) who loaned a set of actuator/sensors to me for testing. Search eBay for racebronco2 if you need a replacement actuator/sensor.

If you do anything I recommend doing in this document, you are doing so at your own risk. I am not responsible for any damage that may occur as a result.

The IMRC system closes a set of valves under the intake manifold at low RPMs to increase the air charge velocity at low RPMs. This will increase the low end torque of the engine. At RPMs above about 3000, the PCM commands the IMRC valves to open, which lets a lot more air flow into the engine, giving you more high end torque.

The system uses a pair of vacuum actuators to pull the IMRC valves closed at low RPMs. At RPMs below about 3000, the PCM energizes a solenoid that supplies vacuum to the actuators. When the RPMs go over about 3000, the PCM de-energizes the solenoid that releases the vacuum in the actuators and a spring then pulls the IMRC valves open. When the RPMs fall below about 3000, the solenoid re-energizes, allowing vacuum into the actuator, closing the IMRC valves again. There are sensors in the actuators that tell the PCM what the state of the actuators is at any given moment. The right side actuator is part # F6LE-AC and the left is F6LE-BC.

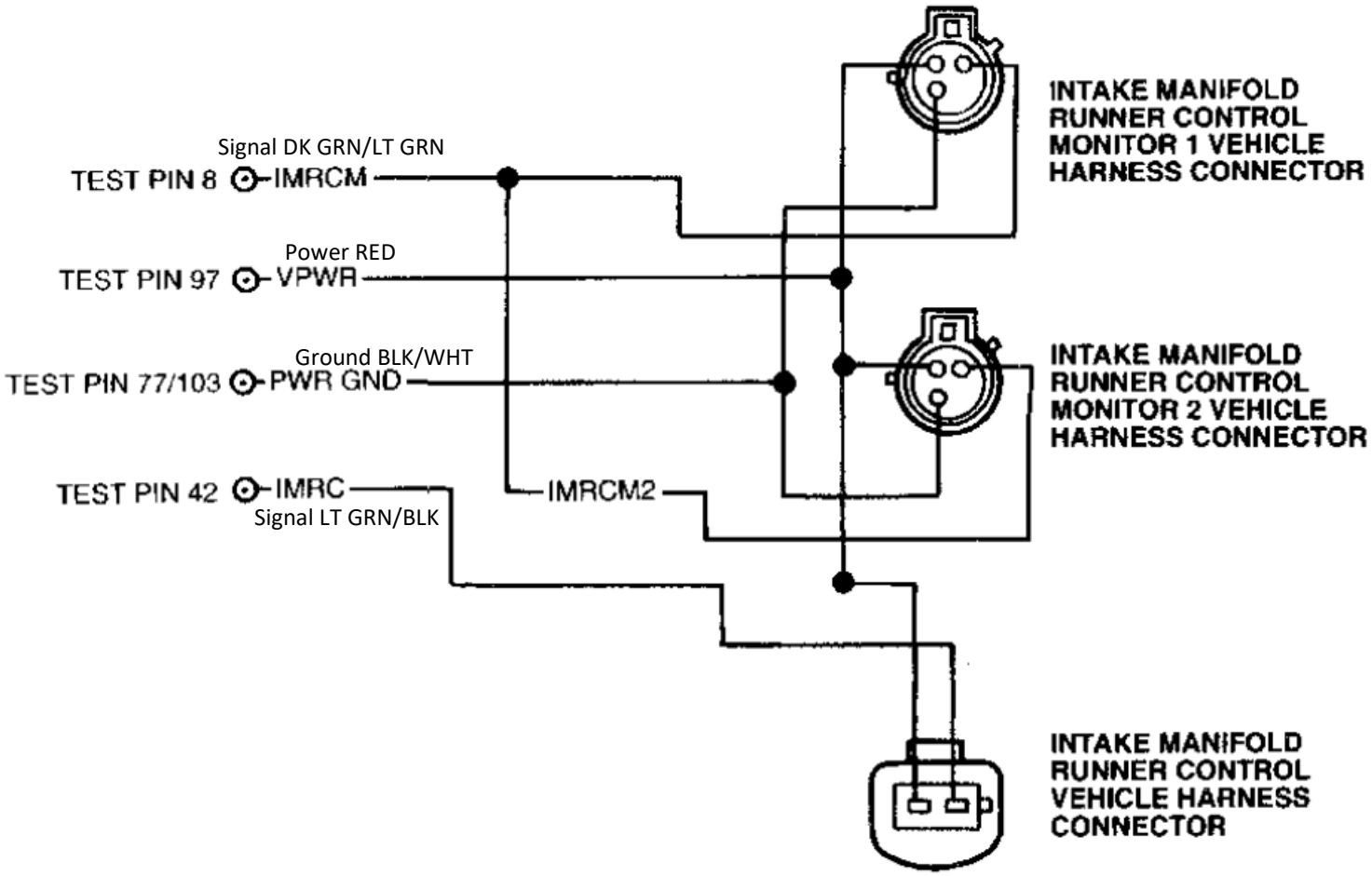
The sensors are Hall effect sensors. The sensor is attached to the body of the actuator. It senses when the steel plunger gets close to it as the vacuum pulls the diaphragm and plunger/rod into the actuator body. Each sensor is powered by battery voltage and has a ground as well. Each signal pin has a signal generated by the Hall effect sensor. The signal pin has very close to 0V when the plunger is extended (no vacuum) and about half a volt below battery voltage when the plunger is retracted (by vacuum).

Since the Hall effect sensors are wired in parallel, if both rods are extended (no vacuum), the voltage the sensors both put out is close to 0V on the signal pin. If both rods are retracted (by vacuum), the voltage the sensors both put out is about half a volt below battery voltage.

It gets interesting when one rod is retracted when the other rod is extended, which is a failure condition. One Hall effect sensor is trying to generate near battery voltage, while the other is trying to pull the signal down to ground. In that situation, the resulting signal is about to 1-2V.

The PCM reads the voltage on that signal pin and, if the voltage is not what is expected, it sets a DTC (Diagnostic Trouble Code). After a few times a DTC is set, it generates a CEL (Check Engine Light).

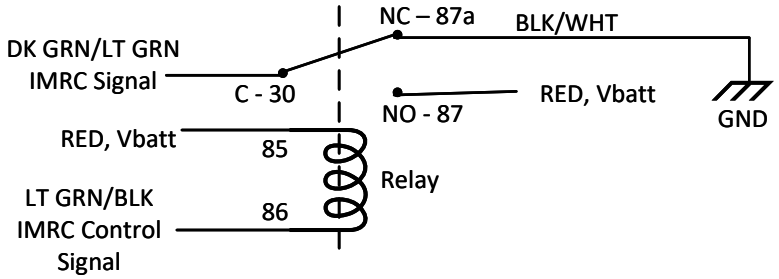
Here is the wiring diagram for the IMRC system:



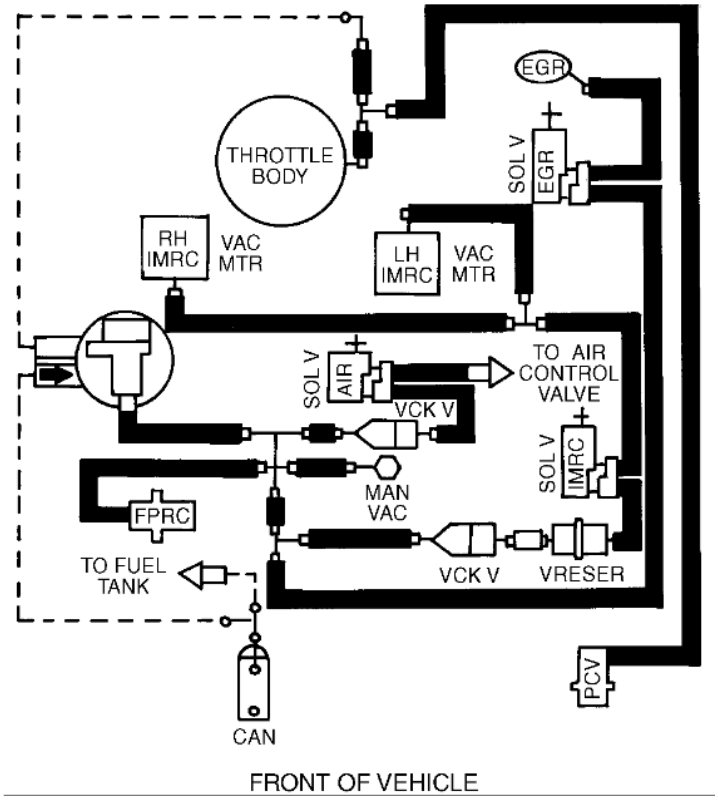
Carlos reports that the diaphragms are what typically fails on these actuators. The sensors never fail. Also, the PCM always reports that the right side has failed regardless of which side actually has failed. This is consistent with the fact that the sensors put out 1V when one side fails. The PCM has no way of knowing which side has failed so it arbitrarily reports a right side failure. If you get a right side failure DTC, you should check both actuators for a leak with a vacuum tester to see which side has actually failed regardless of the DTC. He also reports that the actuator/sensors can be swapped from the left side bracket to the right side bracket if you are having trouble finding a replacement for the side you need.

The next page will show how to replace the solenoid and the sensors with a relay to prevent the PCM from reporting error conditions if the IMRCs have been deleted in a 96 Mk8 or other Ford vehicles that use this vacuum type of IMRC system.

In order to prevent error codes caused by deleting the IMRC system, a replacement circuit must be made. Fortunately, a simple standard automotive SPDT relay can be used. It needs to supply battery voltage on the IMRC monitor wire when the PCM expects it and ground on the monitor wire when the PCM expects it. You will need to cut the wires going to the IMRC solenoid and both sensors and splice those wires to the relay. If you are leaving the valves in the intake IMRC plates, you should use wire them to hold them open all the time. Here is the circuit:



For completeness, here is the 96 Mk8 Vacuum Diagram:



A user has confirmed that this modification works to delete the IMRCs from a 96 Lincoln Mark 8 and will prevent any IMRC-related DTCs or CELs from being set.