How to:
AIP Override

Let's get the required nasty bits out of the way.
Because the circuit described below can be used to disable an installed "emissions device," this information is provided for educational purposes only. The people that contributed to this work and those who have participated in development of this device make no representations regarding the suitability for use in any project for any purpose, nor can they be held responsible for any liabilities associated with this circuit's installation, application or implementation on any project.
There. That should do it.

For those of you following along in the latest phase, which started on Page 12 of the AIP Simulation Circuit thread (http://www.tundrasolutions.com/forums/tundra/194209-aip-simulation-circuit-12/), you already know the story. For those who want the history, that would be the place to find out how this came to be.

Some background (why we don't like this Air Injection System)
We all have Secondary Air Injection Pumps in the right front fender area of our Tundras: pumps with a reputation of suddenly failing because of "water intrusion," which some warranty underwriters have decided is a perfect reason to deny you the coverage you've been paying them for. The kicker is that even though this Secondary Air Injection system is clearly employed as an emissions device, it appears, based on input from forum members, not to be universally covered under the Tundra's emissions warranty. Toyota has decided coverage for this system should be under the Powertrain warranty. To my knowledge, the manufacturer has neither addressed nor disclosed the cause or source of the water intrusion, but one member's suggestion that these pumps probably got their water while sitting on a loading dock out in the weather, prior to installation, does have merit.

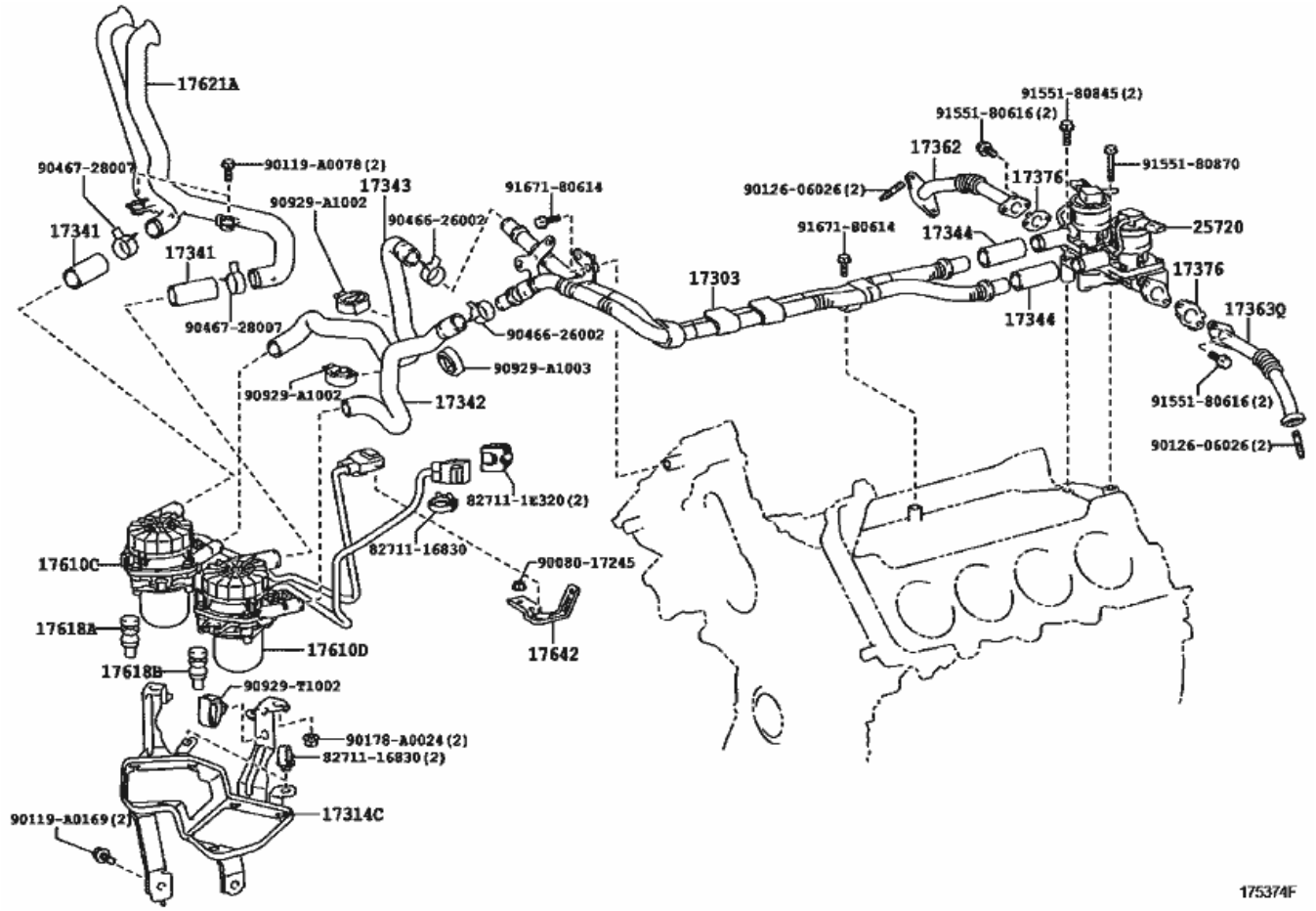
To add insult to the injury, Toyota charges thousands of dollars for these pumps (http://www.tundraheadquarters.com/blog/2010/04/26/tundra-sequoia-air-injection-induction-pump/), even though they're the same air pumps used on the 2000-2003 Chevy Blazer and S10, and can be had for (relatively) cheap. See the CHEVY AIR SMOG PUMP ebay pages at the end of this file for part numbers, info, etc. You'll be amused.

According to Toyota, here's why we have the pumps (from the FSM):
To ensure the proper warm-up performance of the TWC (three way catalytic converter) when starting a cold engine, an air injection system is used.
- This system consists of an electric air pump, an air injection control driver, two air injection control valves (vacuum type), an air injection control valve (electronic type), and two VSVs.
- The ECM estimates the amount of air injected to the TWC (Three-Way catalytic Converter) based on signals from the mass air flow meter in order to regulate the air injection time.
- The air injection operates under the following operation conditions.

Engine Coolant Temp. 41 to 104°F (5 to 40°C)
Intake Air Temp. 41°F (5°C) or more

Opinions differ on several Tundra forums about the general utility and necessity of these pumps, and whether they're worth all the trouble and expense for 30 seconds of diluted exhaust. If you've stayed current on the AIP problem threads, you already know what those opinions are, so except for that little bit of editorial in the previous sentence, I'll not repeat them here.

Here's a look at the complexity of the hardware portion of Tundra's Secondary Air Injection.



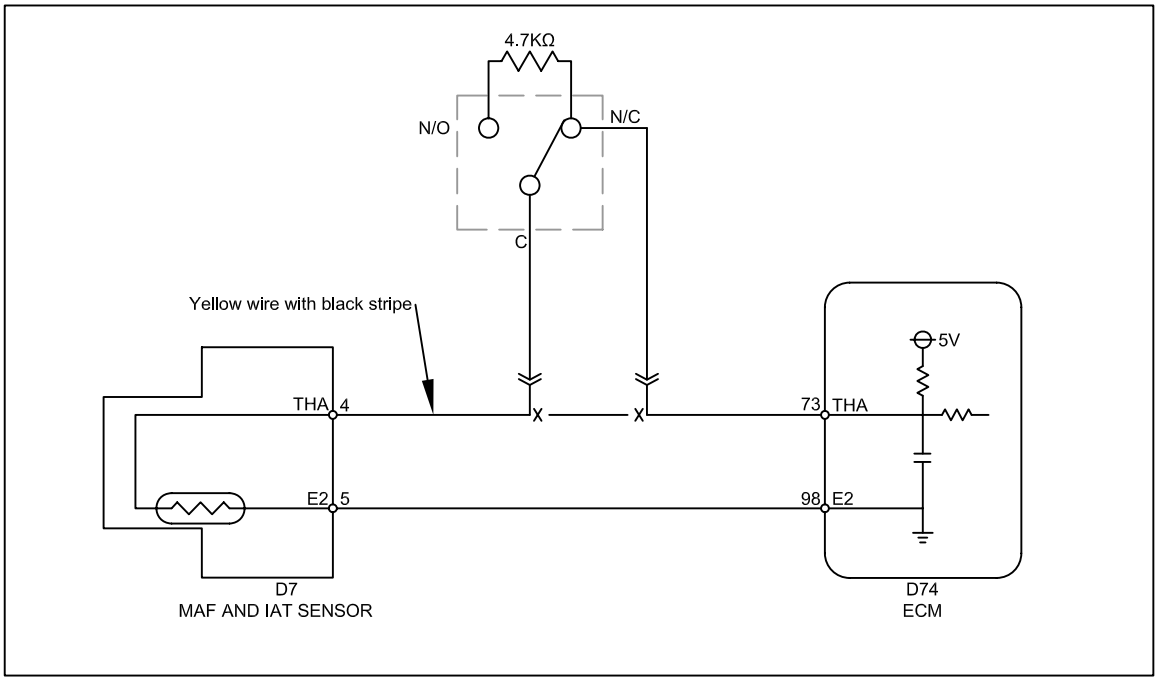
But we don't have to care anymore, because we're gonna play with the software part.

Important discovery!!
These pumps don't run if the ECM sees Intake Air temp less than 41°F at cold start, so the circuit described here has one purpose: to trick the ECM into believing the Intake Air temp is less than that, but only during startup. Soon as the engine starts, the circuitry reverts everything to normal.

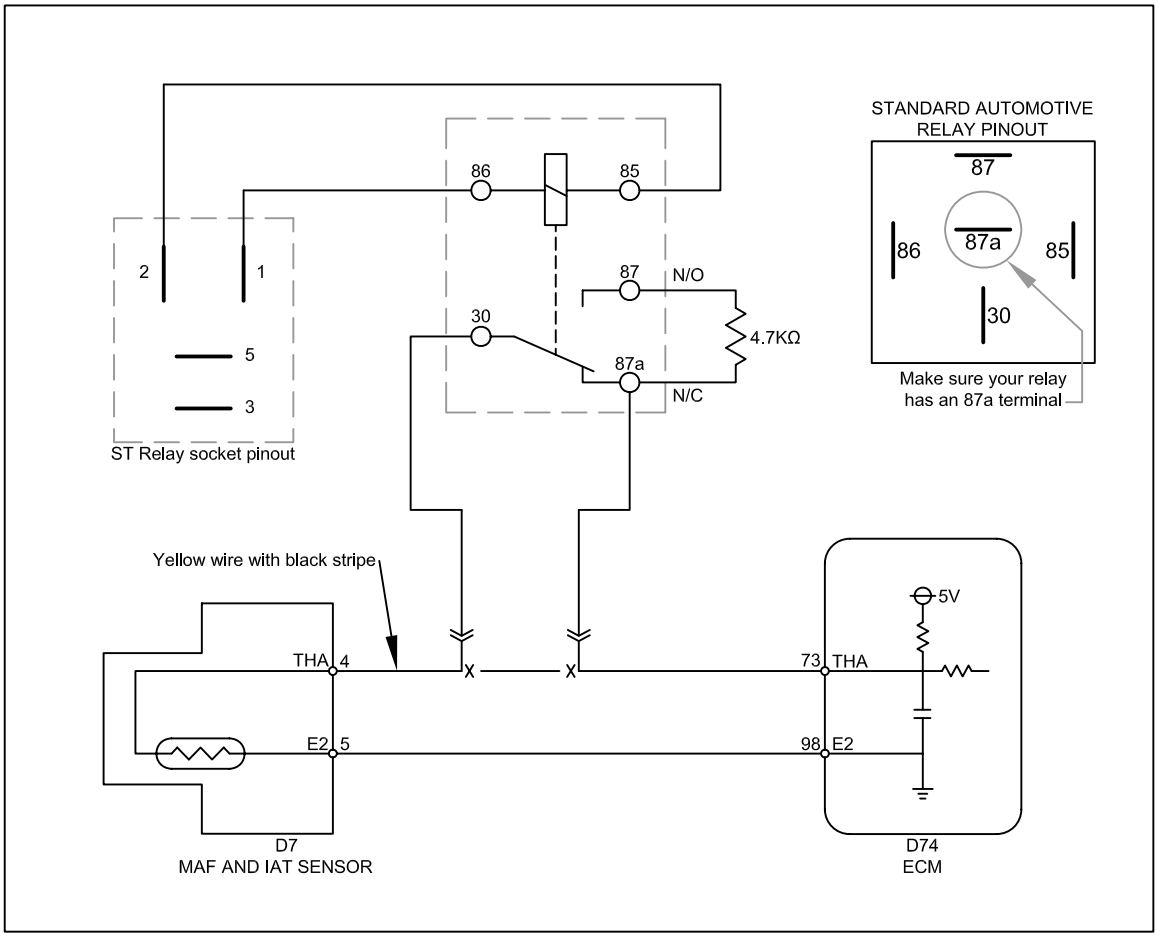
Two different implementations of this circuit were tested. See figure on next page for the diagrams of both.

1. Manual. This was the first attempt: a simple toggle switch.
2. Automatic. A relay was used to do the switching.

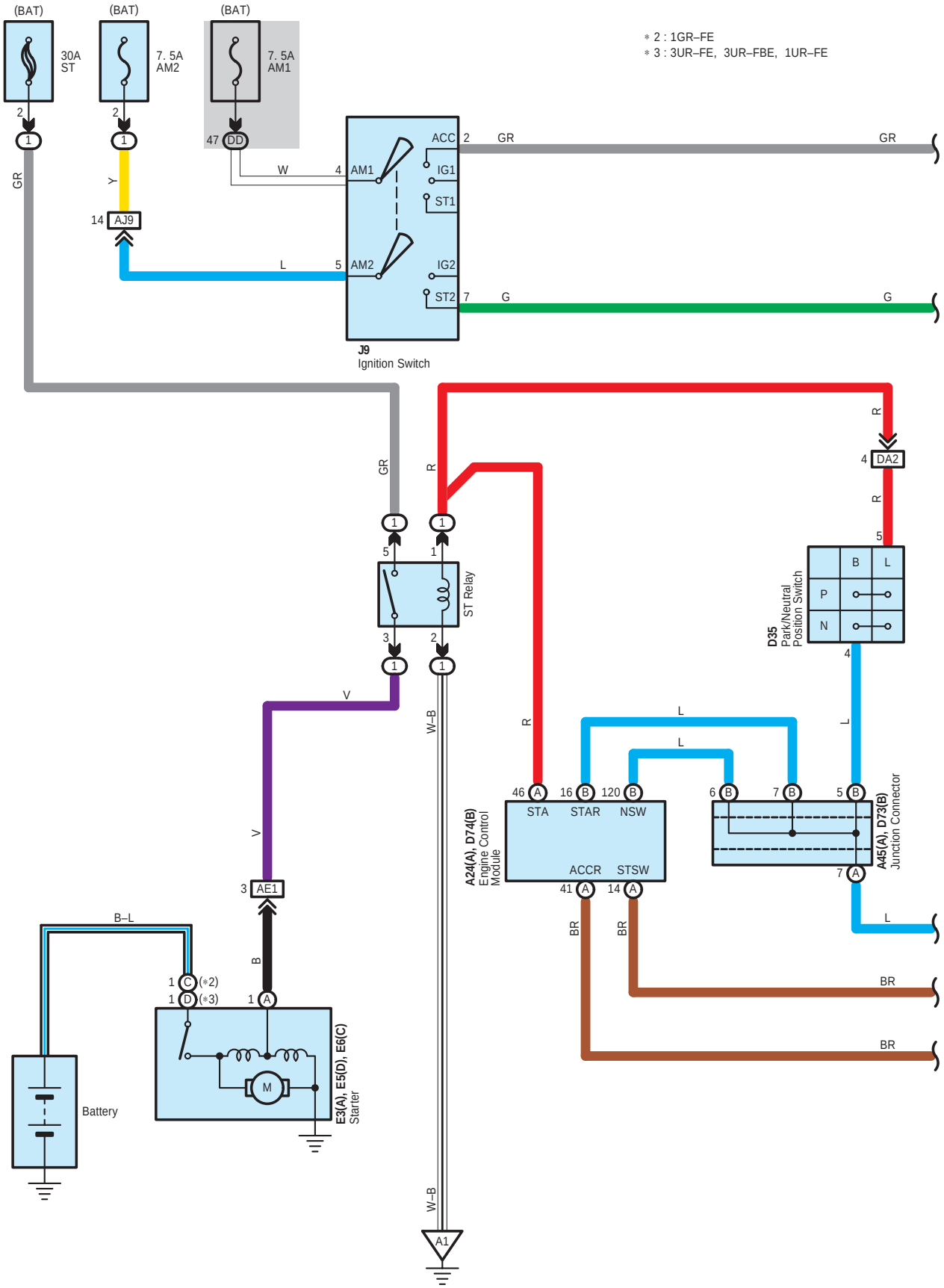
Refer to the diagrams on the next couple pages.
Here's how the override works. When you turn your ignition key to start your engine, the ECM sends a START signal to the ST Relay. The override relay's coil, being in parallel, is energized as well. This inserts a 4.7KΩ resistor into the Intake Air Sensor circuit, which causes the ECM to receive an artificial Intake Air temperature signal below the pump activation threshold. When the engine has started, the ST Relay is de-energized. This also drops out the Override relay, which disconnects the resistor, and reconnects the Intake Air temperature sensor directly to the ECM.



Manual AIP BYPASS using SPDT toggle switch



Automatic AIP BYPASS using ST Relay


(BAT)
30A
ST
(BAT)
7. 5A
AM2
(BAT)
7. 5A
AM1
* 2 : 1GR–FE
* 3 : 3UR–FE, 3UR–FBE, 1UR–FE
ACC
IG1
ST1
IG2
ST2
AM1
AM2
J9
Ignition Switch
AJ9
DD
DA2
ST Relay
D35
Park/Neutral
Position Switch
A24(A), D74(B)
Engine Control
Module
A45(A), D73(B)
Junction Connector
STA
STAR
NSW
ACCR
STSW
AE1
Battery
E3(A), E5(D), E6(C)
Starter
A1
GR
R
Y
L
V
W–B
B–L
B
BR

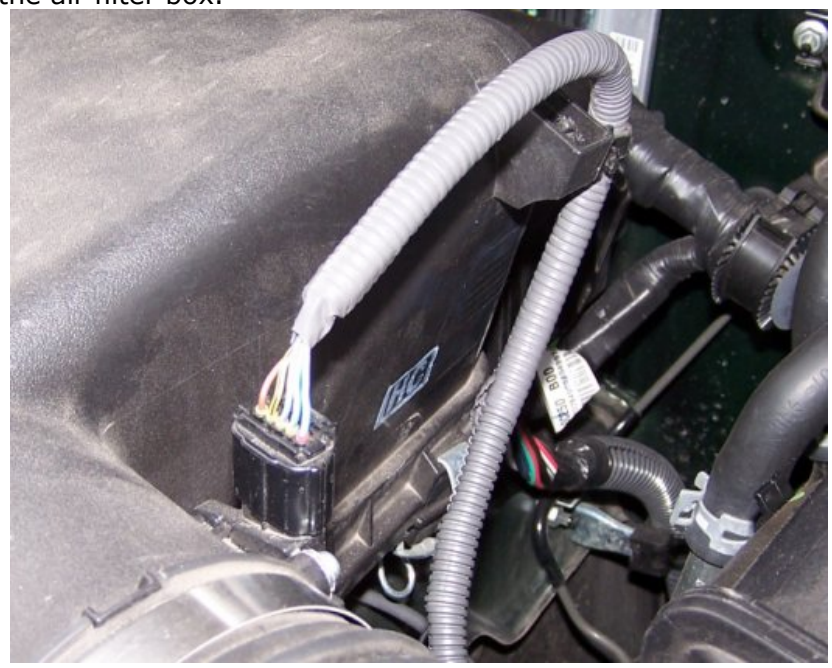
If you decide to do this (for educational purposes), you must be willing to cut a wire. It's the yellow wire with black stripe you can see when you look at the connector plugged into the MAF/IAT sensor at the output of the air filter box.

I'll document how I did the automatic version, because everything is in the engine compartment and no hole has to be made for wires to pass into the cab for a switch, as with the manual version. Also, it's most likely going to be the preferred method.

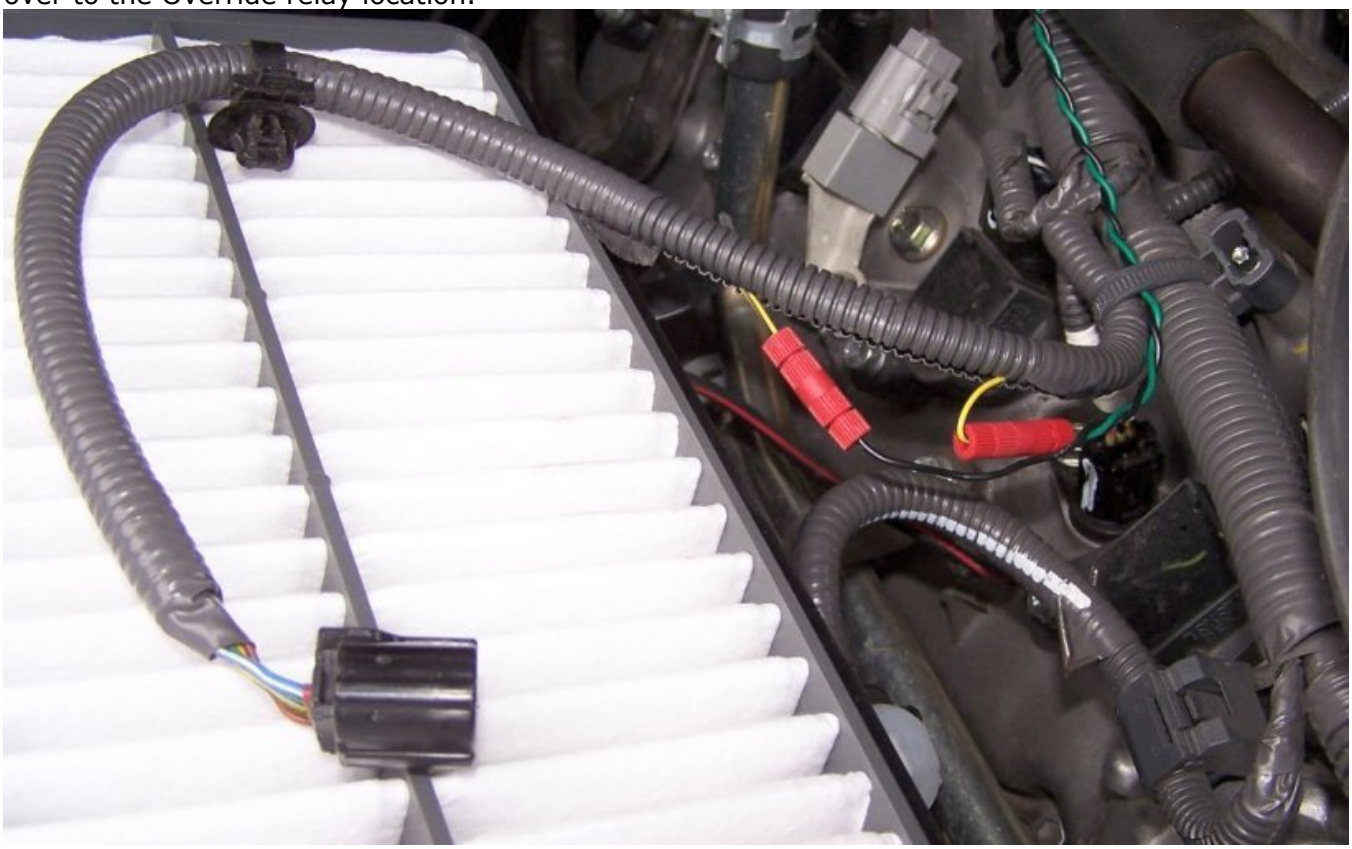
Firstly, get thee to Radio shack for a 4.7KΩ resistor. They're usually sold in a 5-pack, but they're cheap. You'll also want a standard automotive relay with mounting tab, like the one on the left. Make sure it has a Terminal 87a like the one on the right. Some relays won't have it - don't buy those ones. Also **don't buy the type of relay with a diode across the coil** - those are quite common, but not necessary, and will needlessly complicate this project. Because this is a low current project, I used 22 ga wire. Engine compartments are notorious for being "electronically noisy," so I twisted my wires.

Look around and find a good place to mount the relay. Since this was only temporary for testing, I used a convenient firewall insulation retainer stud inboard the master cylinder vacuum booster.

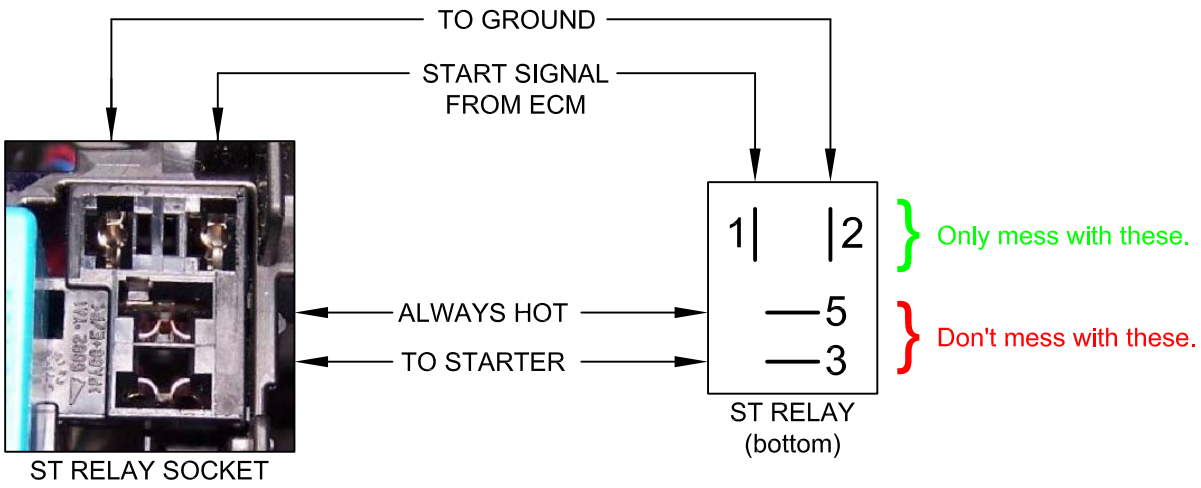
Disconnect the MAF/IAT sensor connector, and using a suitable tool, release the cable support from the air filter box. Unlatch the top of the air filter box, loosen the air hose coupling band, and remove the top of the air filter box.

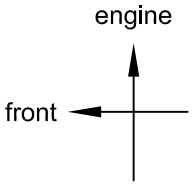


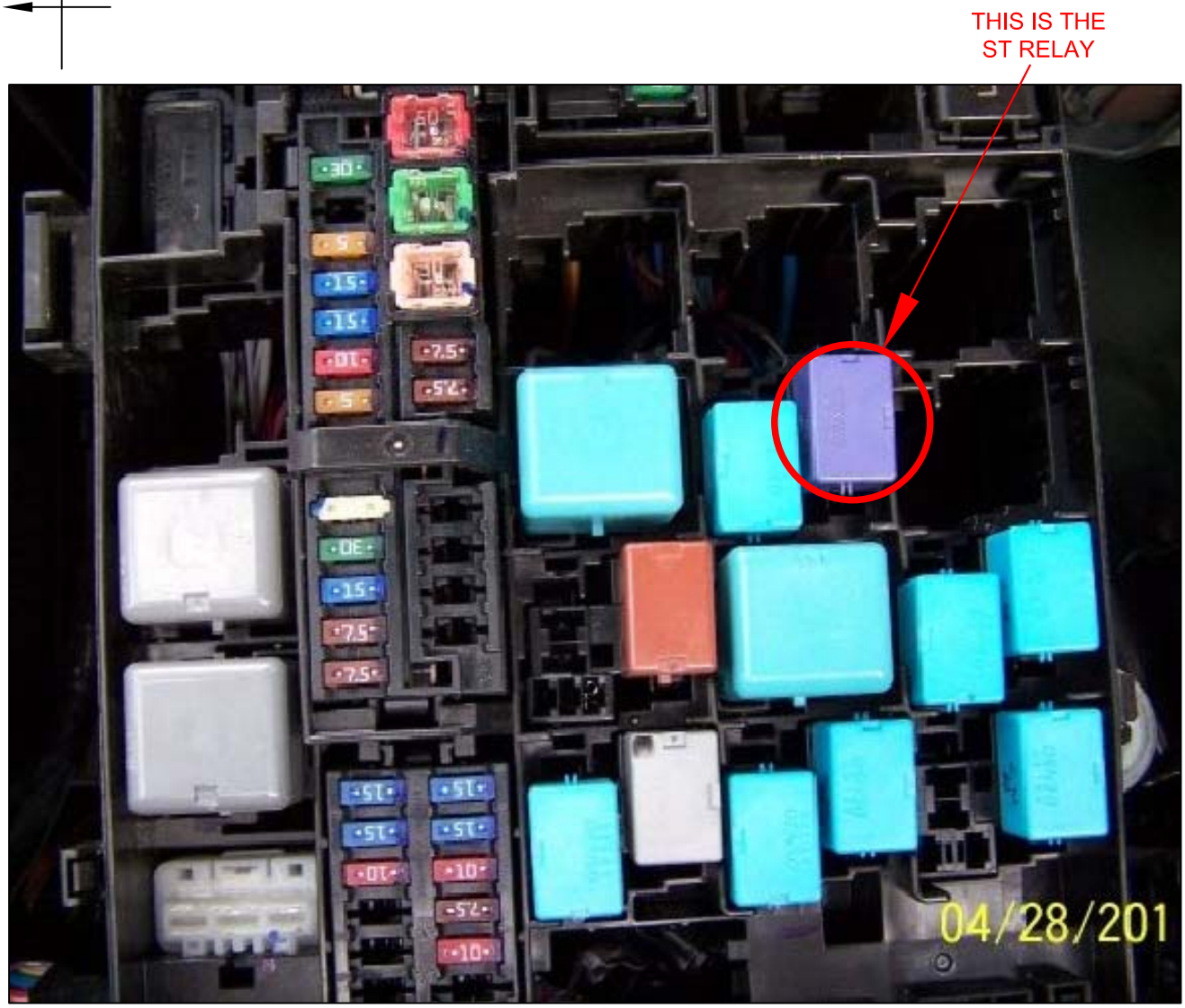
Remove some of the wrapping and open the cable conduit enough to give access to a few inches of the yellow/black wire, and splice in your wires. I used red Posi-lock connectors for ease of wire changes during testing. They're easy to use, and will fit inside the conduit. Then run those wires over to the Override relay location.



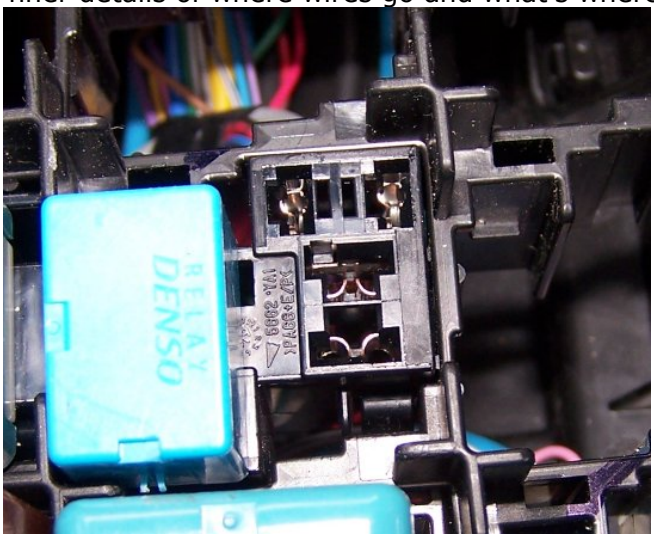
Now go find the ST Relay. Mine is purple


TO GROUND
START SIGNAL
FROM ECM
1
2
Only mess with these.
ALWAYS HOT
5
TO STARTER
3
Don't mess with these.
ST RELAY
(bottom)
ST RELAY SOCKET

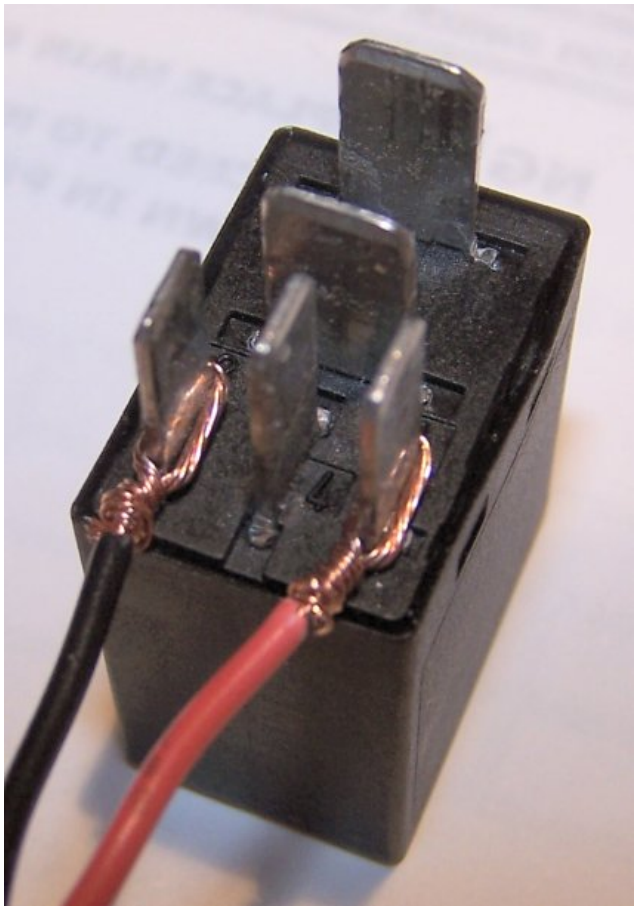

engine
front


THIS IS THE
ST RELAY
04/28/201

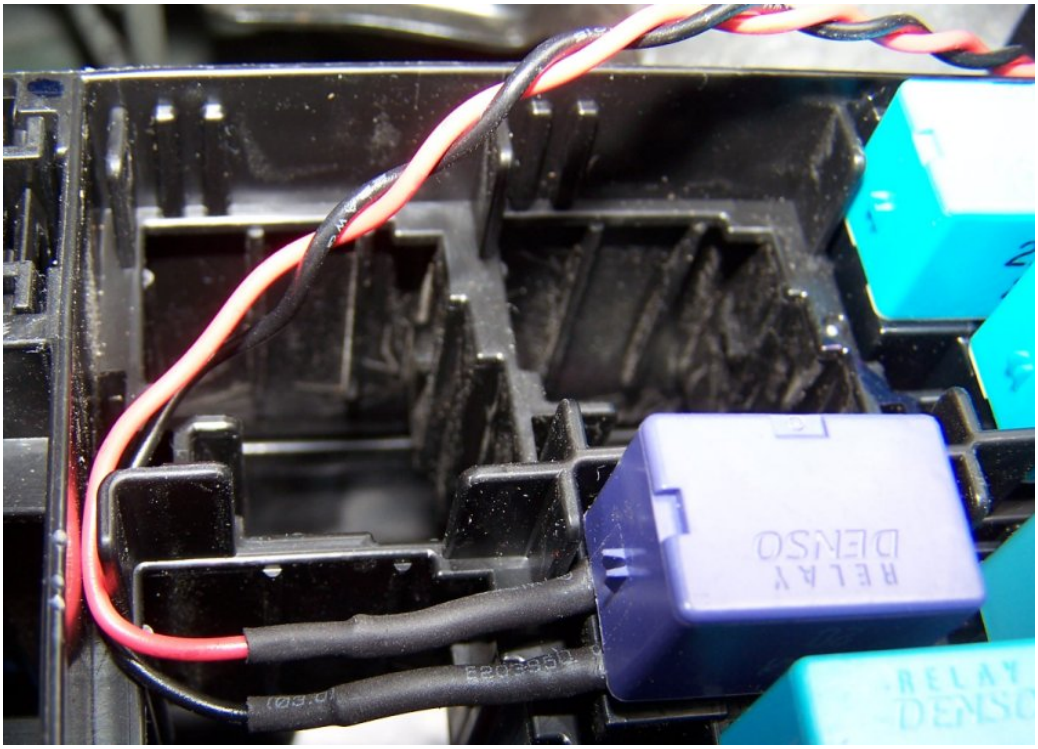
Here's how I did it. Because I was testing, I only made things temporary. You'll no doubt want a more permanent install, but the process will be similar. Once you carefully remove the ST Relay, here's what you see. Refer to AUTOMATIC AIP BYPASS illustration and the ST Relay location illustrations above for the finer details of where wires go and what's where in this socket.



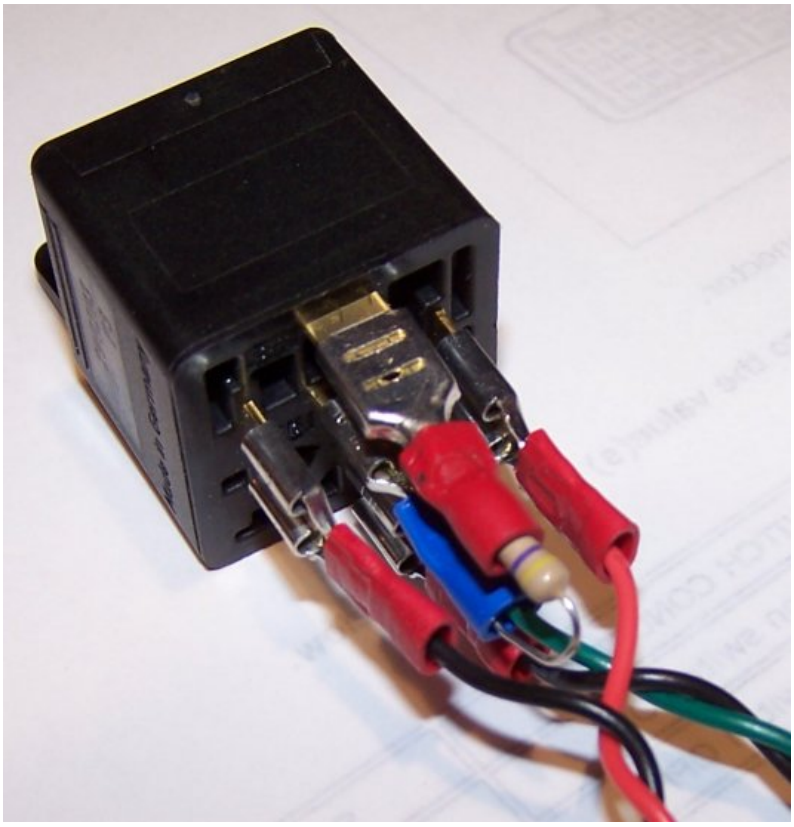
Because I couldn't figure out how to get behind the relay socket to make the connections to the St Relay, I had to do the next best thing. I stripped about an inch of insulation from the wires that will connect the ST Relay to the Override relay. I wrapped them tightly around the ST Relay coil terminals like in the example. This is just a spare relay I had laying around that I wired for photo purposes, because I already had heat shrink on the ST Relay. The real ST Relay does not have the middle terminal between the red and black wires.



Then used two layers of heat shrink on the wires to hold things nice and snug and put the relay back in its socket:



OK. Now we have all the Override relay ends of the wires laying about, so let's connect them to the Override relay.



In the photo above, the green and black twisted pair are the wires I used to splice into the wire at the IAT sensor. The black wire in that pair is crimped to a connector and attached to Terminal 30 (C or common) of the relay. The green wire and one end of the resistor are crimped together to a connector and attached to Terminal 87a (N/C or normally closed) of the Override relay. It does not matter which of these wires goes to which terminal, so long as one wire goes to Terminal 30 of the Override relay, and the other wire together with one end of the resistor goes to Terminal 87a of the Override relay.

The other end of the resistor is crimped to a connector and attached to terminal 87 (N/O or normally open) of the Override relay.

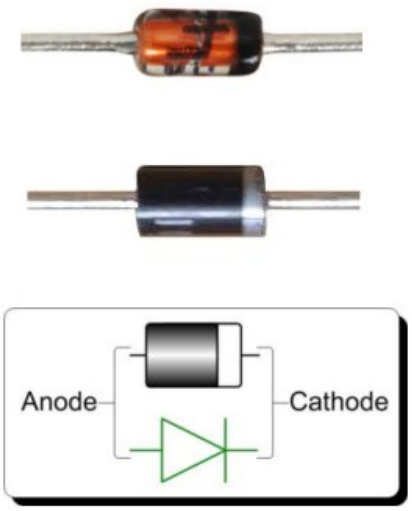
In the photo above, the red and black twisted pair are from the ST Relay coil terminals 1 (positive) & 2 (ground). The red wire is crimped to a connector and attached to Terminal 86 of the Override relay. The black wire in that pair is crimped to a connector and attached to Terminal 85 of the Override relay. The relay I'm using, and the type of relay I recommend, does not have a diode across the coil.

Option 1. If your relay does not have a diode across the coil, then it doesn't matter which of these wires goes to which Override relay terminal, so long as one wire connects to Terminal 86 of the Override relay and the other wire connects to Terminal 85 of the Override relay.

Option 2. See the illustration below. If your relay has a diode across the coil, you must carefully extract the relay from the case and see which end of the diode has the marker or band on it. That will be the positive terminal, and the wire from ST Relay terminal 1 will connect to that side. The wire from ST Relay terminal 2 will go to the other coil terminal on the Override relay. Some relays are set up with Terminal 85 as positive, some are set up with Terminal 86 positive. That's why we must see the diode to know how to proceed.

Option 3. As long as you're inside the relay case, you could just cut the diode out and go back up to Option 1.

In this illustration, the marked, or banded end is on the right. That's the cathode end, which, for the relay to work properly, is the POSITIVE end.



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That's it. Double-check your work. Button it up, put back all the bits you removed to give access, and hide your work however you see fit. And oh yeah - if you've been running with your pumps disconnected, you can plug them back in. Then tomorrow, when you fire up the beast, notice how the Air Injection Pumps don't turn on.

Anyway, This was a fun (and educational) project, with what I believe are some real benefits. This circuit just works, even if you choose to use a manually switched version. It generated no fault codes during testing. The Check Engine Light never came on during testing, so you can plug your pumps back in. Then your Check Engine Light will have meaning again..

Enjoy the fix.
Steve

The following three pages are from a January 2011 ebay sale of CHEVY AIR SMOG PUMPS. this particular sale was brought to our attention by another forum member. The form factor of these pumps is identical to the Tundra's. The cost is definitely not. The plug may be different, but splicing on your dead pump's wires and connector shouldn't be all that difficult.

00 01 02 03 AIR SMOG PUMP CHEVY BLAZER S10 SONOMA S-10

ONLY SELLER OFFERING PUMP & HOUSING,SCREWS & ISOLATORS

Item condition: **New**

Compatibility: This information is not available.

Time left: **19d 22h** (Feb 10, 2011 09:49:00 PST)

Quantity: 1 3 available

Price: **US $115.00** **Buy It Now**

Add to Watch list

Returns: 7 day money back | Read details

Shipping:

Calculate | See all details

Enlarge

Seller info

texstartrader (1850 ★)
100% Positive feedback

Ask a question
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Other item info

Item number: 150547237674
Item location: Texas, United States
Ships to: Worldwide
Payments: PayPal
See payment information
History: 2 sold

Share: | Print | Report item

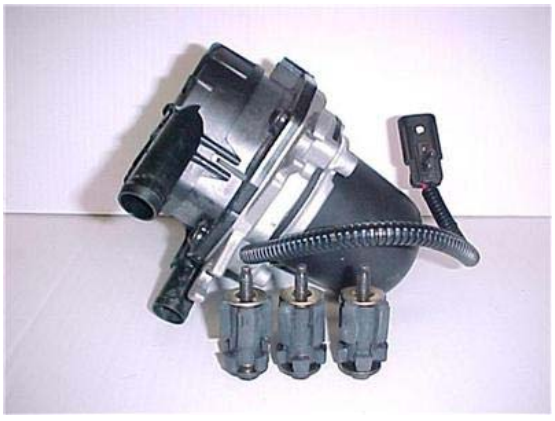
Description | Shipping and payment | Buying tips

Seller assumes all responsibility for this listing.

Item Specifics

Condition:	New: A brand-new, unused, unopened, undamaged item in its original packaging (where packaging is ... Read more	**Manufacturer Part Number:**	12568324
Part Brand:	GM ACDELCO	**Other Part Number:**	215-425

00 01 02 03 AIR SMOG PUMP CHEVY BLAZER S10 SONOMA S-10



THIS IS A BRAND NEW ACDELCO SECONDARY AIR INJECTION / SMOG PUMP

Includes the pump and upper housing as shown.

You receive the whole unit as pictured

PLUS NEW MOUNTING BOLTS AND RUBBER INSULATORS

GM # 12568324

ACDELCO # 215-425

SAME PUMP UNIT AS

GM # 17803251

ACDELCO # 219-505

MADE IN USA

This pump comes with 3 new original factory correct Bolts that hold the pump to the bracket. Most of the time these are rusted and need to be replaced. Also comes with the 3 Rubber Insulated Pump Mounts the bolts go through.Most of the time these are deteriorated and need to replaced.

The cost of these 3 Bolts and 3 Rubber Insulators is over 30.00

These pumps were purchased before they were individually boxed by ACDELCO

Each pump is tested before shipping

Please read information at bottom of page about improved intake hose kit for this pump.Redesigned to prevent water damage to pump.

This pump is correct equipment on the following vehicles

2003 CHEVROLET S10 PICKUP L4 2.2L 134cid GAS FI N Engine VIN = 4
2003 CHEVROLET S10 PICKUP L4 2.2L 134cid GAS FI N Engine VIN = H
2003 GMC SONOMA L4 2.2L 134cid GAS FI N Engine VIN = H
2002 CHEVROLET S10 PICKUP L4 2.2L 134cid FLEX FI N Engine VIN = 5

2002 GMC SONOMA L4 2.2L 134cid FLEX FI N Engine VIN = 5
2001 CHEVROLET BLAZER TRAILBLAZER V6 4.3L 262cid GAS FI N Engine VIN = W
2001 CHEVROLET BLAZER V6 4.3L 262cid GAS FI N Engine VIN = W
2001 CHEVROLET S10 PICKUP L4 2.2L 134cid FLEX FI N Engine VIN = 5
2001 CHEVROLET S10 PICKUP V6 4.3L 262cid GAS FI N Engine VIN = W
2001 GMC JIMMY ENVOY V6 4.3L 262cid GAS FI N Engine VIN = W
2001 GMC JIMMY V6 4.3L 262cid GAS FI N Engine VIN = W
2001 GMC SONOMA L4 2.2L 134cid FLEX FI N Engine VIN = 5
2001 GMC SONOMA V6 4.3L 262cid GAS FI N Engine VIN = W
2001 OLDSMOBILE BRAVADA V6 4.3L 262cid GAS FI N Engine VIN = W
2000 CHEVROLET S10 PICKUP L4 2.2L 134cid FLEX FI N Engine VIN = 5
2000 GMC SONOMA L4 2.2L 134cid FLEX FI N Engine VIN = 5

You can return this pump for a full refund if you are not satisfied

Pumps are shipped in a 12"x10"x10" box(see picture) with extra packing paper to insure you receive yours with no damage.
I also cover each connection with rubber hose to provide extra protection for your pump.

UPS SHIPPING IS FOR US 48 ONLY

SHIPPING OUTSIDE US WILL BE HIGHER

SHIPS SAME BUSINESS DAY IF PAYMENT IS RECEIVED BEFORE 9:00 AM CENTRAL TIME

FAST SHIPPING CHECK MY FEEDBACK

If you are not sure this pump is correct for your vehicle, send the year,make,model & engine of the vehicle before your purchase.

email for other questions

There is a GM replacement inlet hose assembly kit to prevent your new pump from being damaged by ingesting water. Comes with new redesigned inlet hose with clamp, solenoid valve with both vacuum lines, new wiring and plug. Installation instructions included. Cost is 49.50 + 2.00 more for shipping and I can box it up with the new pump you purchased. Please let me send you an invoice to add the additional