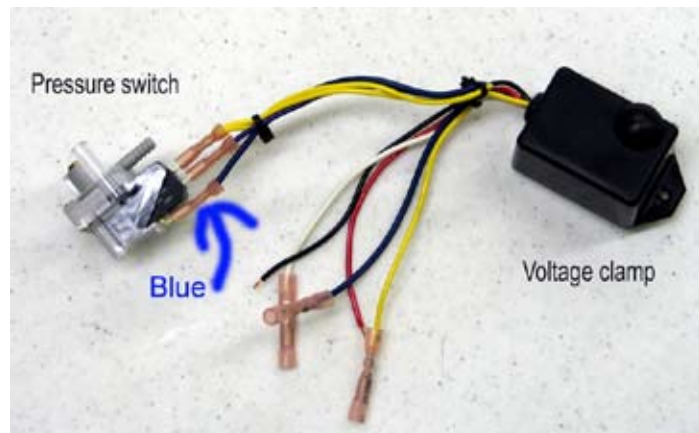




FM O2 pressure switch installation

9-6-07

The engine computer in late model cars can sometimes be way too smart for its own good when combined with an aftermarket boosted application and its own closed loop O2 control. We need to occasionally “pull the wool over its eyes” to keep air/fuel ratios rich enough for safe, smooth operation on throttle tip in. The FM O2 pressure switch intercepts the O2 signal, and when the manifold goes to positive pressure it sends a false value to the ECU telling it that the motor is running lean so that the factory ECU adds fuel. Without this, the O2 sensor would report a rich condition under boost and the ECU would pull fuel causing lean tip in when operating in closed loop (below ~4000rpm on 90-97 Miata and below 5000rpm on 99-05 Miata). This unit can be used on any FI application; Miata-specific installation instructions are on the next few pages. The idea behind the unit is the following: there is a pressure switch and a voltage regulator. When the engine is pulling vacuum, the signal from the O2 sensor will pass through the switch unimpeded. Just before the engine transitions into boost, the switch will click over and the signal will be conditioned to a constant 0.3v output. This voltage signals "lean" to the ECU, and it adds fuel. Remember, the normal range of output from a stock narrowband oxygen sensor is 0-1v- at stoichiometric (idle and cruise) they will normally dither from around .1v to around .9v. **All clamps need to be calibrated once installed.**



1) Disconnect the negative cable on the battery before you start. Find your factory ECU (engine computer)- It is under the passenger's feet in a 90-93, behind the passenger seat in a 94-97, and under the driver's side dash by the steering column on a 99-05 (including MSM). Un-plug the connectors from the ECU and cut away the electrical tape from the wires going to the clip that has the O2 signal wire in it so that the wires can be fanned out.

2) Attach the red wire from the voltage clamp to a +12v source, and the black wire to an ECU ground (diagrams to follow). A vampire clamp and a spade connector are included for this. At the ECU, find the signal wire from the primary O2 sensor and cut it. Watch out for shielding on the O2 sensor wire. (If it is there you should ground it.) Attach the yellow wire from the voltage clamp to the side going to the O2 sensor, and the blue wire to the side going to the ECU. The white wire will not be used.

3) Run a vacuum line to the pressure switch using the supplied T. This line must see vacuum and boost, so the source needs to come from between the throttle body and the head.

4) The pressure switch should be calibrated using the brass screw on top such that with a light application of vacuum to the nipple you hear a clicking noise. If the screw is set too loose the switch will chatter. If the screw is set too tight you will spoof the signal when you are not in boost and your fuel economy will go down the tubes. You want to set the screw as loose as you can and still have it fend off off lean tip-in - some testing may be required to get it in the right spot based on what your car needs. If you try to set the pressure switch by connecting and removing the vacuum hose while the car is idling, it will be set to come on with too much vacuum. It needs to switch when the car is slightly in vacuum (2 +/- in Hg), not when the car is far into vacuum (18+ in Hg).

5) Once everything above is done you can set the voltage output. Start the car and let it idle. Take a multimeter and measure the voltage at the blue wire- it should be dithering from roughly .1v to .9v once the car is warmed up and in closed loop. Once this is confirmed, pop the vacuum tube off the pressure switch and the signal will switch to its conditioned state. Measure this voltage- we are looking for it to be .3v. If it is not, pop the rubber cap off of the voltage clamp and turn the screw until you get .3v. (+/- .05v is fine) Once this is done, verify the work by putting the vacuum tube on and off a couple times while measuring the voltages to confirm that the outputs are correct and stable. When finished you are ready to clean up and drive the car. If you'd like to check the operation of the clamp while you're driving the car, don't do it with the multimeter. That should be done with a scan tool which will return the O2 sensor voltage. If the multimeter is connected while the car is driving, you can get erroneous readings.

All diagrams are looking at the harness plug from the wire side, thumb tab up.

Miata, 1990-1993

Voltage clamp wire color	Factory wire color	Terminal number	Usage
Red	White/Red	1B	+12 volts
Black	Black/Green	2C	Ground
Yellow	Red/Blue (sensor side)	2N	O2 signal from sensor
Blue	Red/Blue (ECU side)	2N	Modified O2 signal to ECU

1U	1S	1Q	1O	1M	1K	1I	1G	1E	1C	1A		
R/B	L/O	LG/B	G	*	LG/Y	*	BR/Y	Y/B	V	L/R		
BR/W (B/L)	*	B/G	(L/Y)	R	*	L/B	BR	W/Y	W/G	W/R		
1V	1T	1R	1P	1N	1L	1J	1H	1F	1D	1B		
2Y	2W	2U	2S	2Q	2O	2M	2K	2I	2G	2E	2C	2A
*	L/O	Y	*	L/W	R	(R/B)	LG/R	B/W	Y/L	W	B/LG	B
(LG)	Y/R	Y/B	*	*	R/G	R/L	LG/W	*	R/W	*	B/LG	B
2Z	2X	2V	2T	2R	2P	2N	2L	2J	2H	2F	2D	2B

Miata, 1994-1995

Voltage clamp wire color	Factory wire color	Terminal number	Usage
Red	White/Red	1B	+12 volts
Black	Black/Green	2C	Ground
Yellow	Red/Blue (sensor side)	2N	O2 signal from sensor
Blue	Red/Blue (ECU side)	2N	Modified O2 signal to ECU

1U	1S	1Q	1O	1M	1K	1I	1G	1E	1C	1A
R/B	L/O	LG/B	G/B	G/R	B/LG	L/W	BR/Y	Y/B	V	L/R
BR/W	Y/R	Y	L/Y	R	B/G	L/B	BR	*	W/G	W/R
1V	1T	1R	1P	1N	1L	1J	1H	1F	1D	1B

2Y	2W	2U	2S	2Q	2O	2M	2K	2I	2G	2E	2C	2A
G/W	L/O	Y	L/W	L/W	R/W	R/B	LG/W	B/W	Y/L	W	B/LG	B
G	Y/R	Y/B	LG	Y/G	R/B	R/L	L/R	LG/R	LG/Y	B/R	B/L	B
2Z	2X	2V	2T	2R	2P	2N	2L	2J	2H	2F	2D	2B

Miata, 1996-1997

Voltage clamp wire color	Factory wire color	Terminal number	Usage
Red	White/Red	4B	+12 volts
Black	Black/Green	4A	Ground
Yellow	Red/Green (sensor side)	3C	O2 signal from sensor
Blue	Red/Green (ECU side)	3C	Modified O2 signal to ECU

1U	1S	1Q	1O	1M	1K	1I	1G	1E	1C	1A
LG	*	G/B	B/LG	G/R	LG/B	LG/Y	L/B	Y/B	V	B/G
*	G/L	G	L/O	*	BR/W	R/W	R/B	*	W/B	L/W
1V	1T	1R	1P	1N	1L	1J	1H	1F	1D	1B

3O	3M	3K	3I	3G	3E	3C	3A
B/L	R/W	R/B	LG/W	L/W	*	R/G	*
L/Y	B/Y	R	LG/R	BR/B	R/B	R/L	R/W
3P	3N	3L	3J	3H	3F	3D	3B

4Y	4W	4U	4S	4Q	4O	4M	4K	4I	4G	4E	4C	4A
L/W	G/W	Y	*	L/O	Y	*	*	L/R	Y/L	Y/B	B	B/LG
*	G	Y/B	Y/R	BR	Y/W	BR/Y	B/W	Y/G	Y/W	W	B	W/R
4Z	4X	4V	4T	4R	4P	4N	4L	4J	4H	4F	4D	4B

Miata, 1999-2000

Voltage clamp wire color	Factory wire color	Terminal number	Usage
Red	White/Red	1B	+12 volts
Black	Black/Red	3F	Ground
Yellow	Blue (sensor side)	2C	O2 signal from sensor
Blue	Blue (ECU side)	2C	Modified O2 signal to ECU

Note: In the Link piggy back ECU enter the following number into the ACCEL zones:
Z16 = 10, Z17 = 15, Z18 = 14, Z19 = 11, Z20 = 4

1U	1S	1Q	1O	1M	1K	1I	1G	1E	1C	1A	20	2M	2K	2I	2G	2E	2C	2A				
V/Y	L/B	BR/R	GY/R	*	* <V/G>	L/W	BR	W/L	*	L/R	P/B	V	G/O	LG/R	*	R/L	L	R/G				
V <X>	GY	R/G	LG/B	* <P/B>	BR/Y	*	G/R	G	G/W	W/R	P	W/G	LG/B	GY/R	GY/L	W	W/B	P/L				
1V	1T	1R	1P	1N	1L	1J	1H	1F	1D	1B	2P	2N	2L	2J	2H	2F	2D	2B				
										3Y	3W	3U	3S	3Q	3O	3M	3K	3I	3G	3E	3C	3A
										Y/R	Y/B	L/O	GY	W/L	V/R	O	BR/B	BR/W	BR/Y	G/B	B/L	B/Y
										Y/G	V/G	R/Y	GY/B	*	*	LG	BR/R	R	BR	B/R	*	B/Y
										3Z	3X	3V	3T	3R	3P	3N	3L	3J	3H	3F	3D	3B

Miata, 2001-2005 & MSM

Voltage clamp wire color	Factory wire color	Terminal number	Usage
Red	White/Red	4AF	+12 volts
Black	Black/Red	3B	Ground
Yellow	Blue (sensor side)	4W	O2 signal from sensor
Blue	Blue (ECU side)	4W	Modified O2 signal to ECU

Note: In the Link piggy back ECU enter the following number into the ACCEL zones:
Z16 = 10, Z17 = 15, Z18 = 14, Z19 = 11, Z20 = 4

2P	2M	2J	2G	2D	2A	3X	3U	3P	3M	3J	3D	3A		
O	R/W	Y/G	Y/R	V/G	Y/B	*	BR/R	W/B	GY/R	B/O	GY/B	B		
2Q	2N	2K	2H	2E	2B	3Y	3V	3S	3Q	3N	3K	3H	3E	3B
V/R	B/W	L/B	P/B	LG	R/Y	V/W	GY/L	R/B	G/W	*	*	*	L/O	B/R
2R	2O		2I	2F	2C	*	*	G/R		G/O	*	B/Y	BR/W	G/Y
W/L	*		P	W/G	L/W									
4AF	4AC	4Z	4U	4R	4O	4L	4D	4A						
W/R	V/G	P/B	*	V/Y	B/R	LG/R	Y	B/L						
4AG	4AD	4AA	4X	4V	4S	4P	4M	4J	4H	4E	4B			
L/R	BR/B	R	P	G/B	*	R/L	W	O	V	BR/Y	G			
4AH	4AE	4AB		4W	4T		4N	4K	4I	4F	4C			
*	L/Y	R/G		L	GY		P/L	*	W/G	LG/B	BR			

Protégé

1. The first wire we are interested in is Pink/Blue and goes to terminal 60 on the ecu connector. Take a look and you will see the wire goes a few inches and disappears into a shielded cover. Slit the insulation over the shield and peel back the shield to give yourself a little more slack to work with. Cut the wire about two or three inches out from the ecu connector (do NOT cut into shield) and strip $\frac{1}{4}$ " of insulation off both ends.
2. Crimp the Blue wire to the ecu end of the cut Pink/Blue wire.
3. Crimp the Yellow wire from the pressure switch onto the sensor end of the Pink/Blue wire that you cut in step 1.
4. Connect the black wire from the clamp to the Black/White wire in terminal 77 using the supplied quick splice.
5. Connect the red wire from the clamp to the White wire in terminal 97 using the supplied quick splice.