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## **BRP ELF Installation '90-'05**



### ***Congratulations!***

Congratulations on your purchase of the BR Performance (BRP) ELF (Emissions Legal Fueling). This ECU works with the factory ECU so as to maintain full OBDI and OBDII compatibility and great daily drivability. It also provides exceptionally smooth fuel delivery and power levels that used to be only possible with a stand-alone ECU. An experienced mechanic should be able to install the ELF in about 30-60min.

Do not hesitate to call us if you have any questions or concerns.

### ***Tools:***

No special tools or equipment will be needed to install your BRP ELF. Following is a list of tools that may be necessary:

- ◇ Screwdrivers: Phillips, Flathead (small).
- ◇ Wiring Tools: Wire stripper/cutter, Crimper (although we suggest the use of a soldering iron & solder for electrical connections when possible).
- ◇ Other: Utility knife. Electrical tape. Extra zip-ties to help tidy up the wires and hoses.

# ELF Installation

The ELF consists of the following connections:

- 1 red Power wire
- 1 black Ground wire
- 4 blue Injector wires
- 1 orange O2 wire
- 1 vacuum hose connection

To Install the ELF:

- 1) Connect the wires from the ELF wiring harness to the wires going to the factory ECU according to the table on the right that corresponds to your model year Miata. On page 3 there is also a complete pinout of the factory ECU so you can see exactly where on the ECU to locate these wires. You can either solder the wires or use the included vampire taps. We recommend soldering the wires, though vampire taps can also work well if installed properly.  
**Important Note #1:** You are not cutting the factory wires, rather you are simply tapping into them. If soldering the wires, remove about 1/4" of the insulation from the factory wire where you wish to attach the ELF wire.  
**Important Note #2:** The order of the injector wires is NOT important. You can connect the blue wires from the ELF to the injector wires in any order ('90-'93 can use any two of the blue ELF wires).
- 2) Connect the ELF wiring harness to the ELF.
- 3) Attach the vacuum hose to the vacuum hose fitting on the ELF.
- 4) Locate a rubber grommet in the firewall under the dash and cut a hole in it to route the vacuum hose into the engine bay. Be careful not to cut into any other lines or hoses.
- 5) Route the vacuum hose through the rubber grommet.
- 6) Attach the other end of the vacuum hose to an available barb on the intake manifold, that is, where boost is seen. If there are no available barbs put a tee into an existing hose to the intake manifold and attach the vacuum hose from the ELF to the tee.
- 7) Turn the ignition key to the "ON" position and observe the red light on the front of the ELF. It should illuminate. If it does not illuminate this means there is no power to the ELF and you need to recheck the Power and Ground wire connections.
- 8) Secure the ELF to the side of the ECU with the included Velcro strip.
- 9) Secure the vacuum hose and wiring with zip ties.

## '90-'93 1.6L Engine

**Power:** White with Red stripe (W/R) 1B  
**Ground:** Black (B) 2B  
**Injector:** Yellow (Y) 2U  
**Injector:** Yellow with Black stripe (Y/B) 2V  
**Injector:** Leave ELF wire disconnected  
**Injector:** Leave ELF wire disconnected  
**O2:** Red with Blue stripe (R/L) 2N

## '94-'95 1.8L Engine

**Power:** White with Red stripe (W/R) 1B  
**Ground:** Black (B) 2B  
**Injector:** Yellow (Y) 2U  
**Injector:** Yellow with Black stripe (Y/B) 2V  
**Injector:** Green with White stripe (G/W) 2Y  
**Injector:** Green (G) 2Z  
**O2:** Red with Blue stripe (R/L) 2N

## '96-'97 1.8L Engine

**Power:** White with Red stripe (W/R) 4B  
**Ground:** Black (B) 4D  
**Injector:** Yellow (Y) 4U  
**Injector:** Yellow with Black stripe (Y/B) 4V  
**Injector:** Green with White stripe (G/W) 4W  
**Injector:** Green (G) 4X  
**O2:** Red with Green stripe (R/L) 3C

## '99-'00 1.8L Engine

**Power:** White with Red stripe (W/R) 1B  
**Ground:** Black with Blue stripe (B/L) 3C  
**Injector:** Yellow with Black stripe (Y/B) 3W  
**Injector:** Violet with Green stripe (V/G) 3X  
**Injector:** Yellow with Red stripe (Y/R) 3Y  
**Injector:** Yellow with Green stripe (Y/G) 3Z  
**O2:** Blue (L) 2C

## '01-'05 1.8L Engine

**Power:** White with Red stripe (W/R) 4AF  
**Ground:** Black with Blue stripe (B/L) 4A  
**Injector:** Yellow with Black stripe (Y/B) 2A  
**Injector:** Violet with Green stripe (V/G) 2D  
**Injector:** Yellow with Red stripe (Y/R) 2G  
**Injector:** Yellow with Green stripe (Y/G) 2J  
**O2:** Blue (L) 4W

All Diagrams are viewed facing the ECU from the wire side with the harness tabs on top.

Code	Color
B	Black
BR	Brown
G	Green
GY	Gray
L	Blue
LB	Light Blue
LG	Light Green
O	Orange
P	Pink
R	Red
V	Violet
W	White
Y	Yellow

### '90-'93 1.6L engine

INJ												O2										PWR												
2Y	2W	2U	2S	2Q	2O	2M	2K	2I	2G	2E	2C	2A	1U	1S	1Q	1O	1M	1K	1I	1G	1E	1C	1A	1V	1T	1R	1P	1N	1L	1J	1H	1F	1D	1B
*	L/O	Y	*	L/W	R	R/B	LG/R	B/W	Y/L	W	B/LG	B	R/B	L/O	LG/B	G	*	LG/Y	*	BR/Y	Y/B	V	L/R	BR/W	*	B/G	L/Y	R	*	L/B	BR	W/Y	W/G	W/R
LG	Y/R	Y/B	*	*	R/G	R/L	LG/W	*	R/W	*	B/LG	B	1V	1T	1R	1P	1N	1L	1J	1H	1F	1D	1B											
2Z	2X	2V	2T	2R	2P	2N	2L	2J	2H	2F	2D	2B																						
INJ												O2										GND												

### '94-'95 1.8L engine

INJ												O2										PWR												
2Y	2W	2U	2S	2Q	2O	2M	2K	2I	2G	2E	2C	2A	1U	1S	1Q	1O	1M	1K	1I	1G	1E	1C	1A	1V	1T	1R	1P	1N	1L	1J	1H	1F	1D	1B
G/W	L/O	Y	L/W	L/W	R/W	R/B	LG/W	B/W	Y/L	W	B/LG	B	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
G	Y/R	Y/B	LG	Y/G	R/B	R/L	L/R	LG/R	LG/Y	B/R	B/L	B	1V	1T	1R	1P	1N	1L	1J	1H	1F	1D	1B											
2Z	2X	2V	2T	2R	2P	2N	2L	2J	2H	2F	2D	2B																						
INJ												O2										GND												

### '96-'97 1.8L engine

INJ												O2										PWR									
4Y	4W	4U	4S	4Q	4O	4M	4K	4I	4G	4E	4C	4A	3O	3M	3K	3I	3G	3E	3C	3A	1U	1S	1Q	1O	1M	1K	1I	1G	1E	1C	1A
L/W	G/W	Y	*	L/O	Y	*	*	L/R	Y/L	Y/B	B	B/LG	B/L	R/W	R/B	LG/W	L/W	*	R/G	*	LG	*	G/B	B/LG	G/R	LG/B	LG/Y	L/B	Y/B	V	B/G
*	G	Y/B	Y/R	BR	Y/W	BR/Y	B/W	Y/G	Y/W	W	B	W/R	L/Y	B/Y	R	LG/R	BR/B	R/B	R/L	R/W	*	G/L	G	L/O	*	BR/W	R/W	R/B	*	W/B	L/W
4Z	4X	4V	4T	4R	4P	4N	4L	4J	4H	4F	4D	4B	3P	3N	3L	3J	3H	3F	3D	3B	1V	1T	1R	1P	1N	1L	1J	1H	1F	1D	1B
INJ												O2										GND									

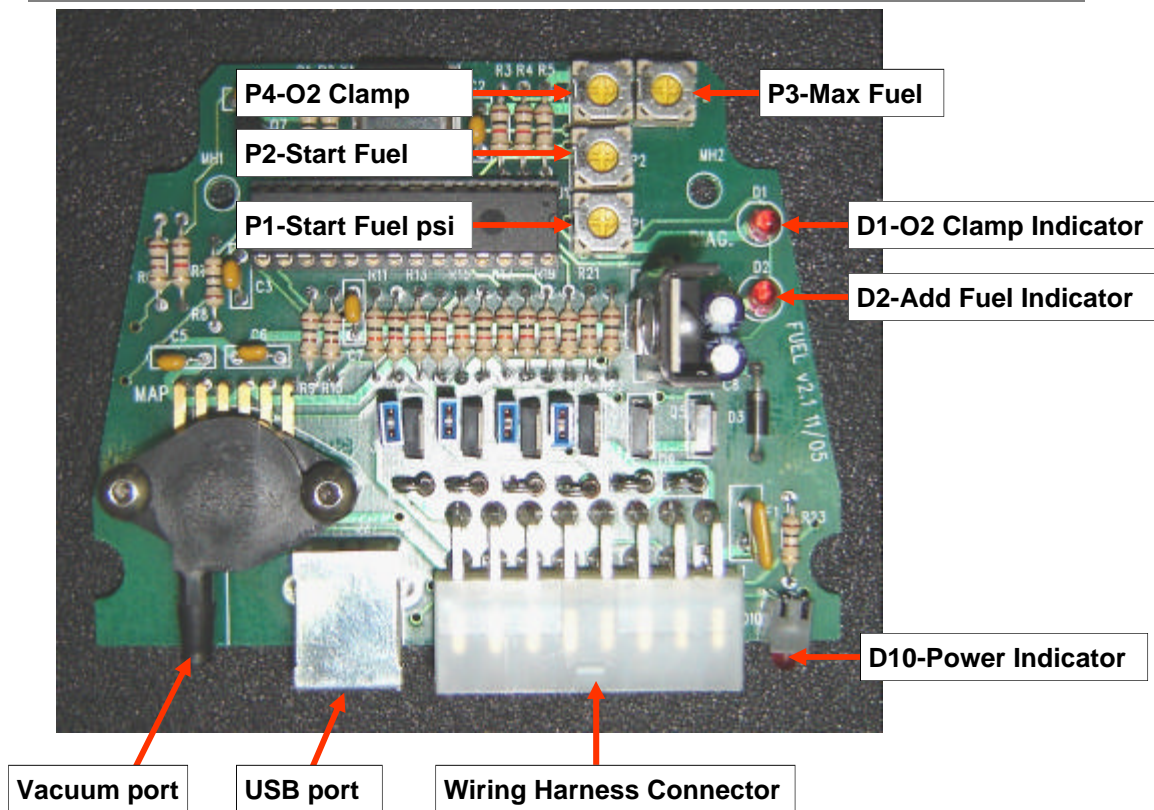
### '99-'00 1.8L engine

INJ												O2										PWR									
3Y	3W	3U	3S	3Q	3O	3M	3K	3I	3G	3E	3C	3A	2O	2M	2K	2I	2G	2E	2C	2A	1U	1S	1Q	1O	1M	1K	1I	1G	1E	1C	1A
Y/R	Y/B	L/O	GY	W/L	V/R	O	BR/B	BR/W	BR/Y	G/B	B/L	B/Y	P/B	V	G/O	LG/R	*	R/L	L	R/G	V/Y	L/B	BR/R	GY/R	*	*	L/W	BR	W/L	*	L/R
Y/G	V/G	R/Y	GY/B	*	*	LG	BR/R	R	BR	B/R	*	B/Y	P	W/G	LG/B	GY/R	GY/L	W	W/B	P/L	V	GY	R/G	LG/B	*	BR/Y	*	G/R	G	G/W	W/R
3Z	3X	3V	3T	3R	3P	3N	3L	3J	3H	3F	3D	3B	2P	2N	2L	2J	2H	2F	2D	2B	1V	1T	1R	1P	1N	1L	1J	1H	1F	1D	1B
INJ												O2										GND									

### '01-'05 1.8L engine

PWR												O2										INJ									
4AF	4AC	4Z	4X	4U	4R	4O	4L	4J	4H	4D	4A	3X	3U	3S	3P	3M	3J	3D	3A	2P	2M	2J	2G	2D	2A						
W/R	Y/G	P/B	4X	*	V/Y	B/R	LG/R	4J	4H	Y	B/L	*	BR/R	3S	W/B	GY/R	B/O	3H	GY/B	B	O	R/W	Y/G	Y/R	V/G	Y/B					
L/R	BR/B	R	P	G/B	*	R/L	W	O	V	BR/Y	G	V/W	GY/L	R/B	G/W	*	*	*	L/O	B/R	V/R	B/W	L/B	P/B	LG	R/Y					
*	L/Y	R/G		L	GY	4P	P/L	*	W/G	LG/B	BR	*	*	G/R	3Q	G/O	*	B/Y	BR/W	GY	W/L	*	2K	P	W/G	L/W					
4AH	4AE	4AB		4W	4T	4N	4K	4I	4F	4C		3Z	3W	3T	3O	3L	3I	3F	3C		2R	2O	2I	2F	2C						
PWR												O2										INJ									

## Tuning the ELF



The ELF comes with the tunable pots (P1, P2, P3 and P4) already preset with what we have found to be the best settings on the dyno. These pots have the following functions:

**P1** - Sets the psi at which the ELF begins to add fuel. The range on this pot is from 0 to 1 psi. Setting the pot at a lower setting will give a richer fuel mixture at low engine rpm.

**P2** - Sets the amount of fuel for the ELF to begin adding. The range on this pot is from 0 to 2 milliseconds (ms). This means how much longer the fuel injector is held open over stock. This pot has a similar effect as P1 except it also acts as a sort of “accelerator pump”. A higher pot setting means a larger amount of fuel is added. Set the pot just high enough to remove any detection of lean tip-in. Lean tip-in is a condition in which the a/f ratio goes lean when the throttle is suddenly opened.

**P3** - This is the most important pot for setting the engine for maximum performance. This pot sets the maximum amount of fuel that will be added by the ELF at high engine rpm. It also determines the rate at which fuel is added at increasing boost. The range on this pot is from 2.1 to 6.5 ms. A higher pot setting will give a richer fuel mixture at full power and high rpm. This pot is best set on a dyno with a wideband a/f meter. The best a/f mixture on supercharged setups is about 12-12.5:1.

**P4** - Sets the psi at which the O2 clamp is activated. The range on this pot is from 0 to -1 psi (i.e. vacuum). The O2 clamp sends a signal to the factory ECU that the fuel mixture is stoich when it is activated. This prevents the stock ECU from trying to pull out fuel during part throttle to full throttle transitions, when the ELF is trying to add fuel. The drawback in using the O2 clamp is fuel consumption will be increased and sometimes the full mixture will be too rich. We have found it is best to leave the O2 wire (orange) disconnected on the '99+ Miata for smoothest running. For the '90-'97 Miata, it is best to have the O2 clamp wire hooked up and functioning normally because without it they run lean at full throttle up to about 3500rpm.

## Tuning the ELF



Close-Up of Pot Settings

Above is a close-up of the pot P1 in the same orientation as on the larger picture of the ELF on the previous page. All of the pots are oriented the same way. The numbered dashes indicate the pot settings as describe previously. Higher pot settings correspond to a higher numerical setting. The pot as shown above is currently set to 5.

Here are the pot settings we have found work optimally on our MP62 supercharged setups:

### '90-'97:

P1 - 5  
P2 - 5  
P3 - 6 (approximate, best if tuned on a dyno for 12-12.5:1 a/f ratio)  
P4 - 5

### '99-'00:

P1 - 5  
P2 - 2  
P3 - 8 (approximate, best if tuned on a dyno for 12-12.5:1 a/f ratio)  
P4 - leave orange wire disconnected to disable the O2 clamp

### '01-'05:

P1 - 10  
P2 - 0  
P3 - 8 (approximate, best if tuned on a dyno for 12-12.5:1 a/f ratio)  
P4 - leave orange wire disconnected to disable the O2 clamp