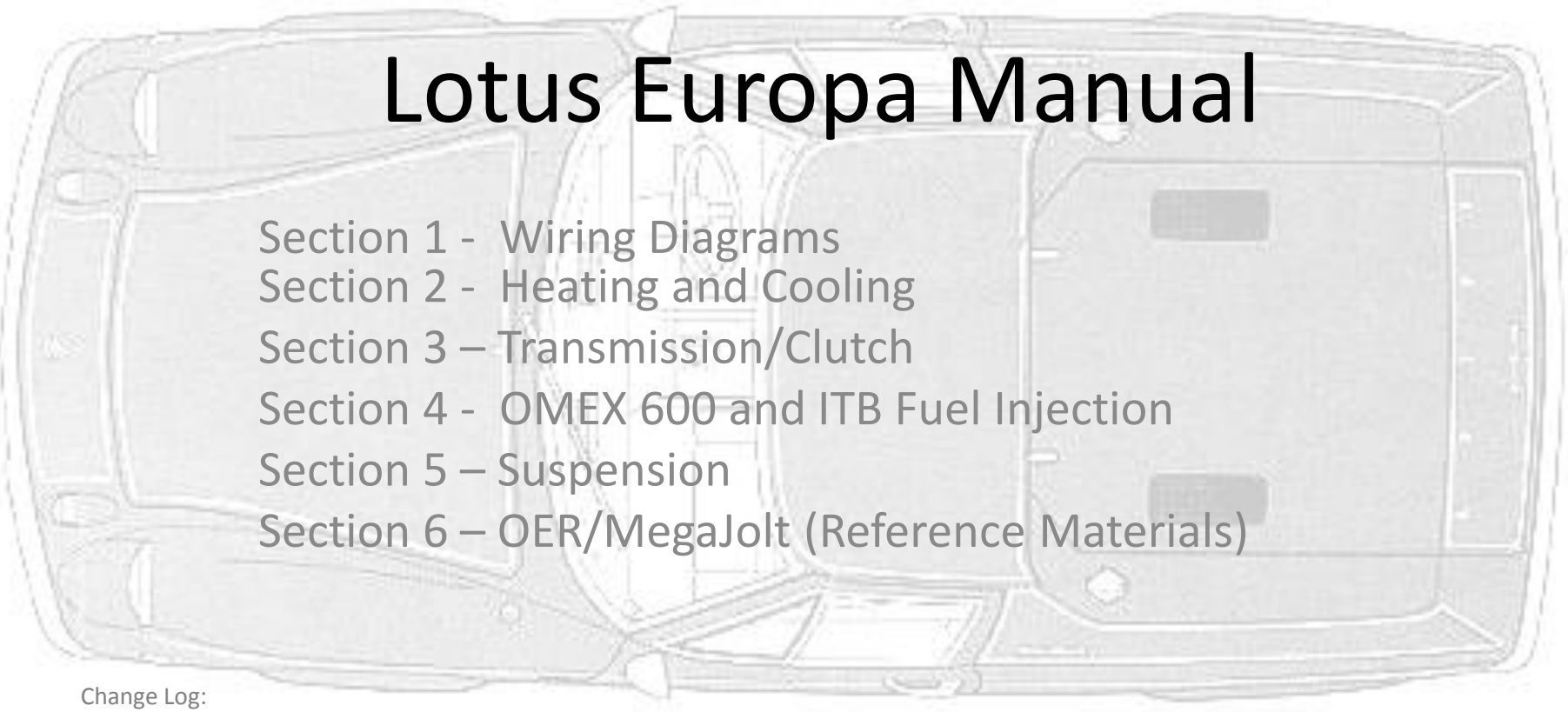
Lotus Europa Manual



Section 1 - Wiring Diagrams
Section 2 - Heating and Cooling
Section 3 – Transmission/Clutch
Section 4 - OMEX 600 and ITB Fuel Injection
Section 5 – Suspension
Section 6 – OER/MegaJolt (Reference Materials)

Change Log:
Updated 1/14/2011 for Tachometer & Shift Light
Updated 2/22/2011 to show actual EDIS to Coil Wiring
Updated 3/02/2011 to add Weber jet data
Updated 3/12/2012 added Radiator temp switch; updated Weber/OER tuning
Updated 6/29/2012 added spark plug data
Updated 4/9/2013 added a new section "3" to document the trans install; reorganized tires and alignment into a separate Section
Updated 5/13/2013 modified alternator regulator specs and wiring; added Weber how-to tuning data
Updated 7/22/2013 added Suzuki Swift charging circuit wiring diagram; updated OER Jet settings and guidance
Updated 11/04/2013 Optional Emergency Flasher; OER jet settings
Updated 7/2/2014 OER settings; spring rates/LM2 tach wiring
Updated 6/26/2015 OMEX ITB installation/OER-MegaJolt removal to backup (Section 6)

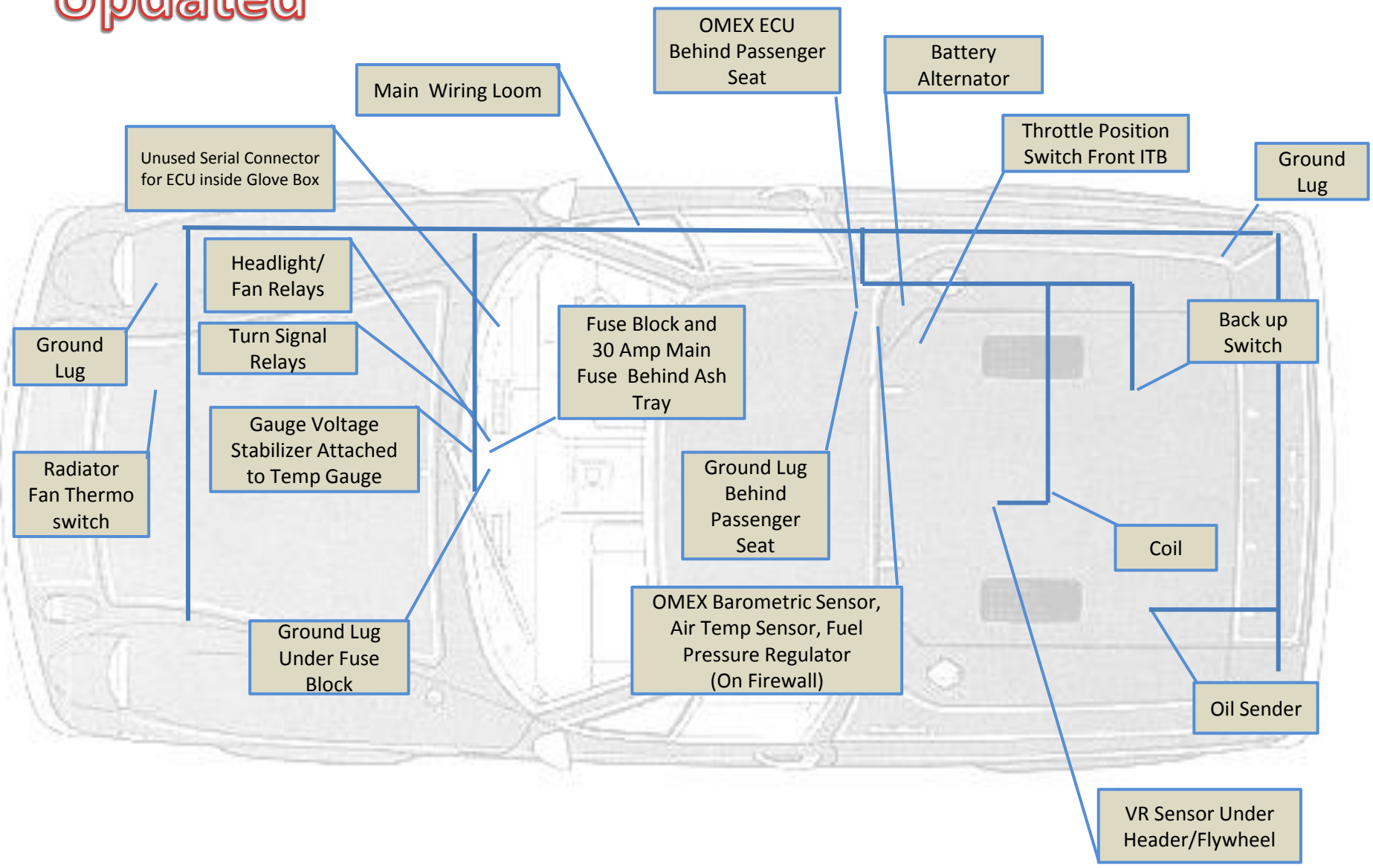
Section 1

Lotus Europa Wiring Diagrams

EZ Wire/ OMEX ITB/ Zetec / Nippon Denso Alternator / Dash Layout

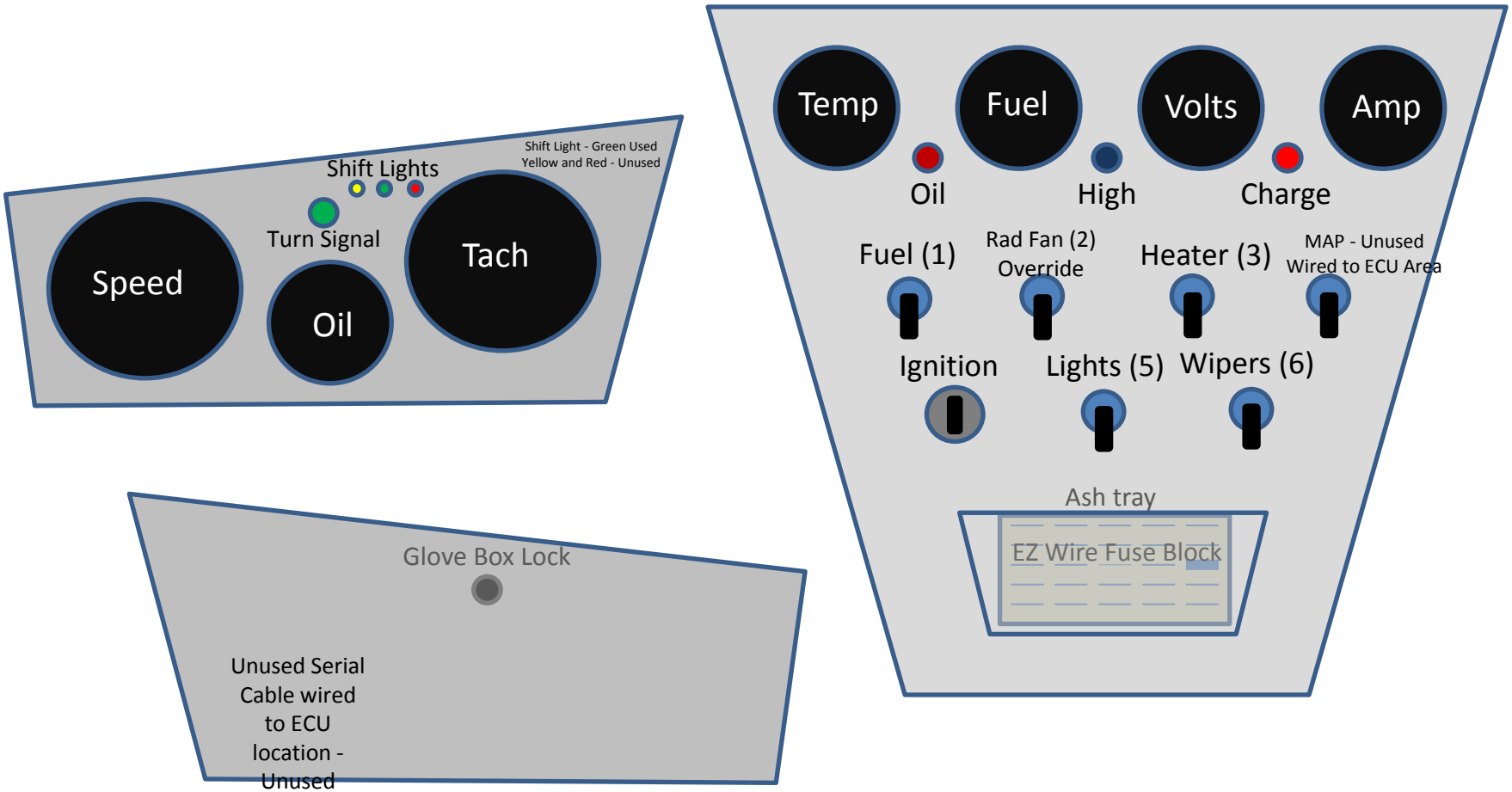
Component Layout

Updated



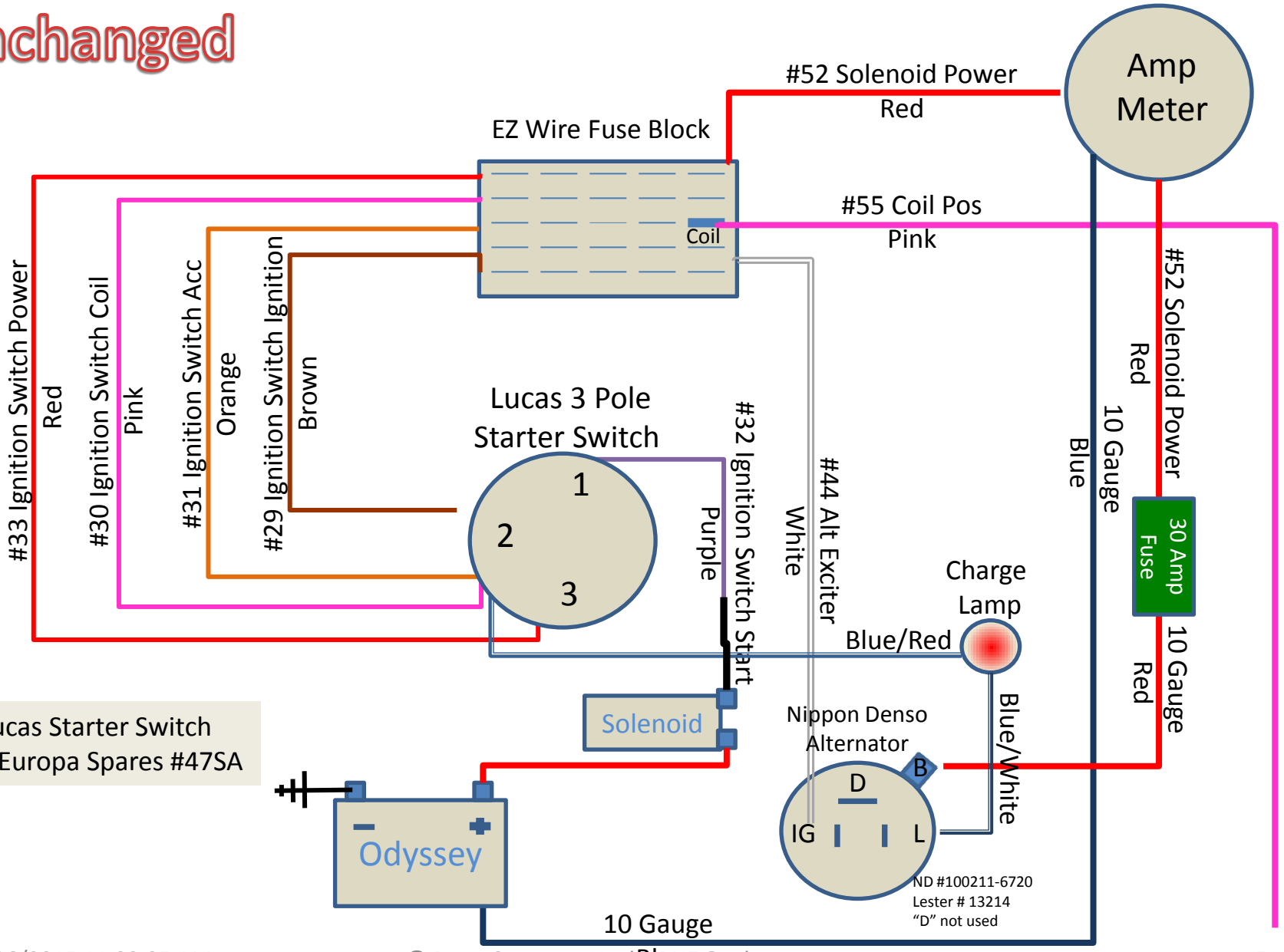
Dash Layout

Updated



Charging and Starter

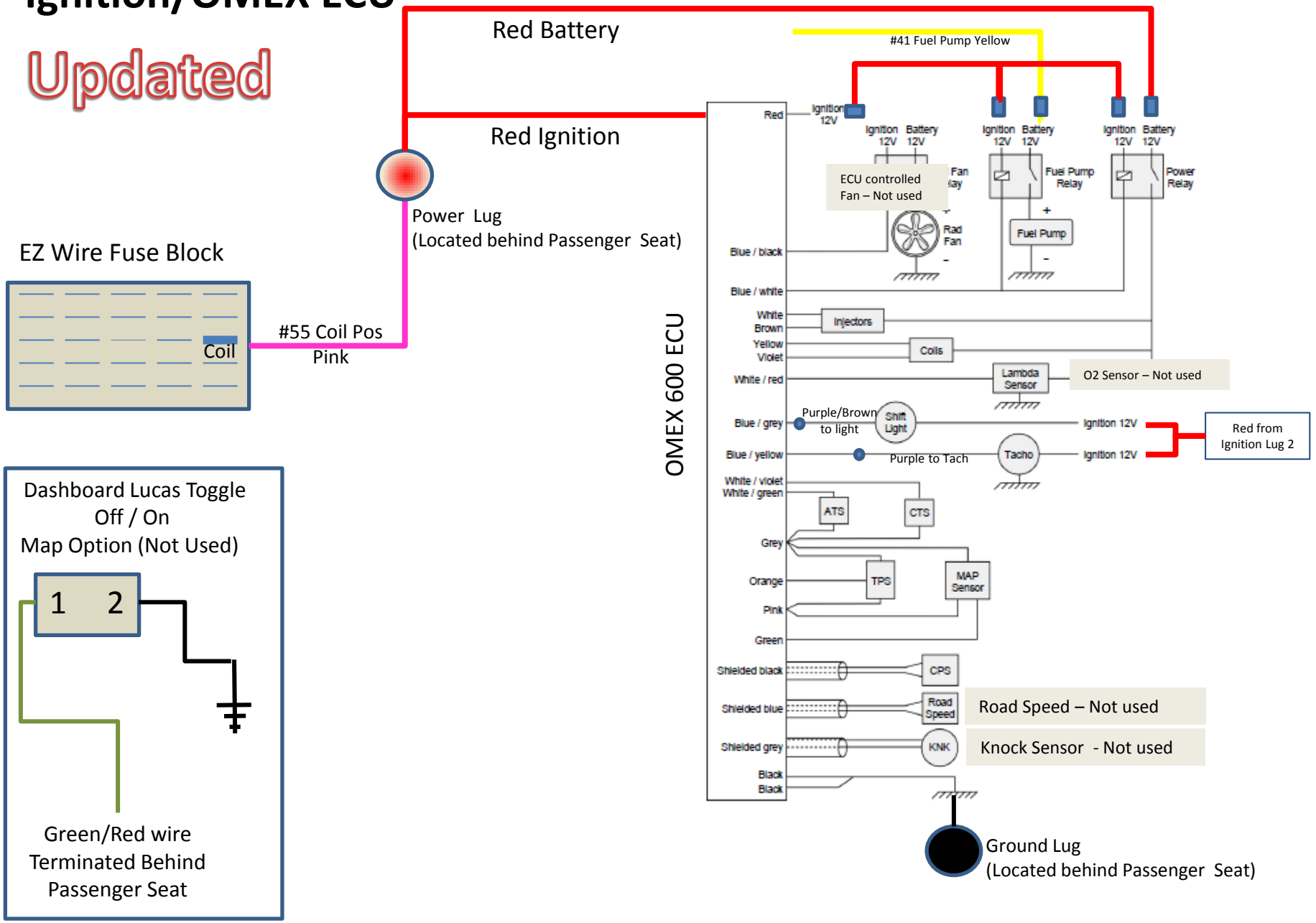
Unchanged



Lucas Starter Switch
Europa Spares #47SA

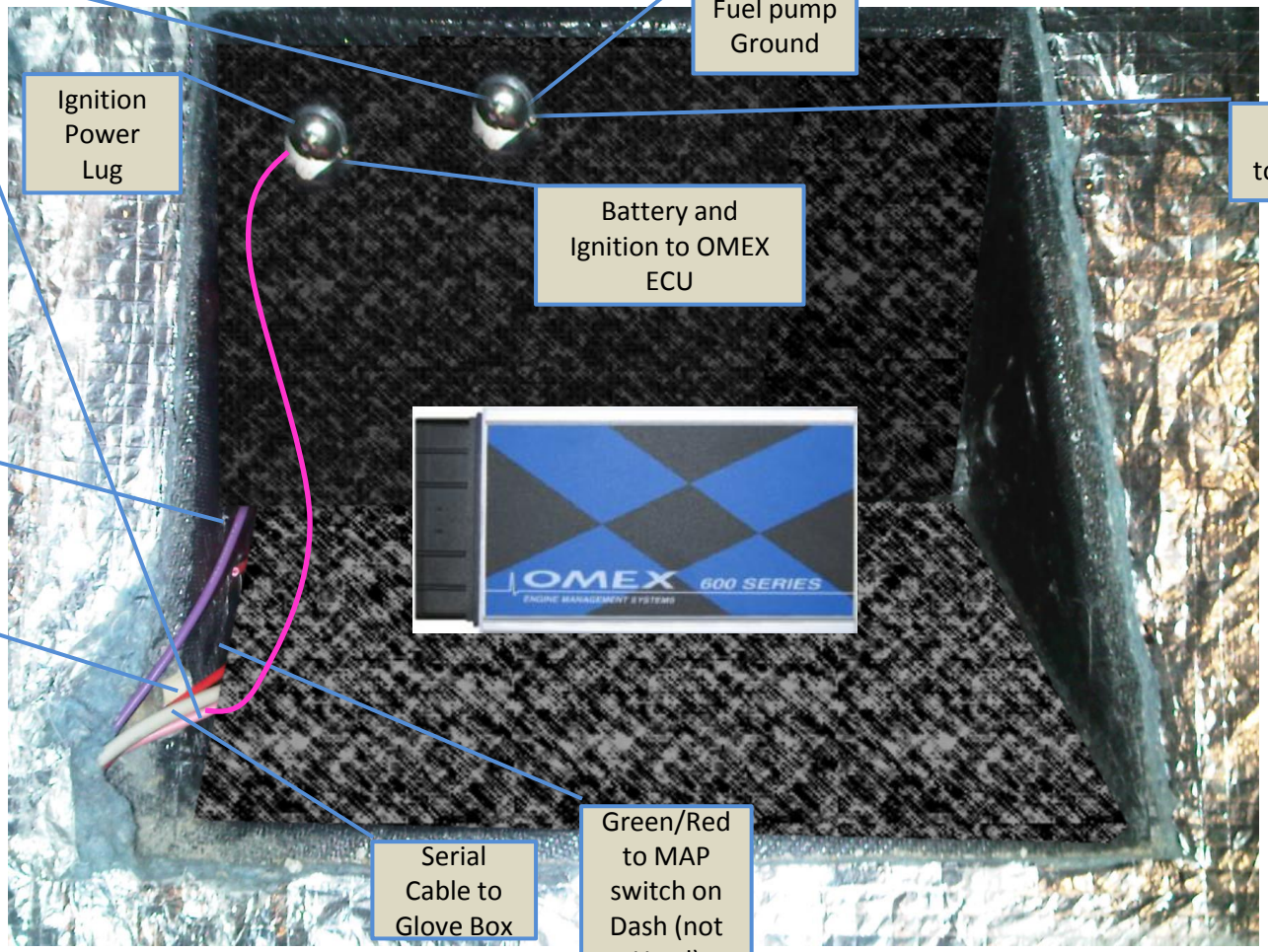
Ignition/OMEX ECU

Updated



OMEX ECU Location Behind Passenger Seat

Updated



Ground

Ignition Power Lug

Pink Power From #55 Coil Pos

Purple Tach Out

Red – Choke power to Cig Lighter accessory

Fuel pump Ground

Ground to Battery

Battery and Ignition to OMEX ECU

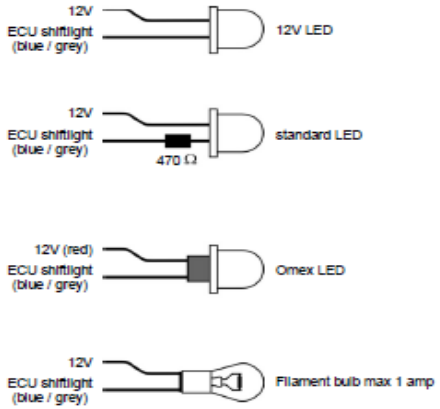
Serial Cable to Glove Box

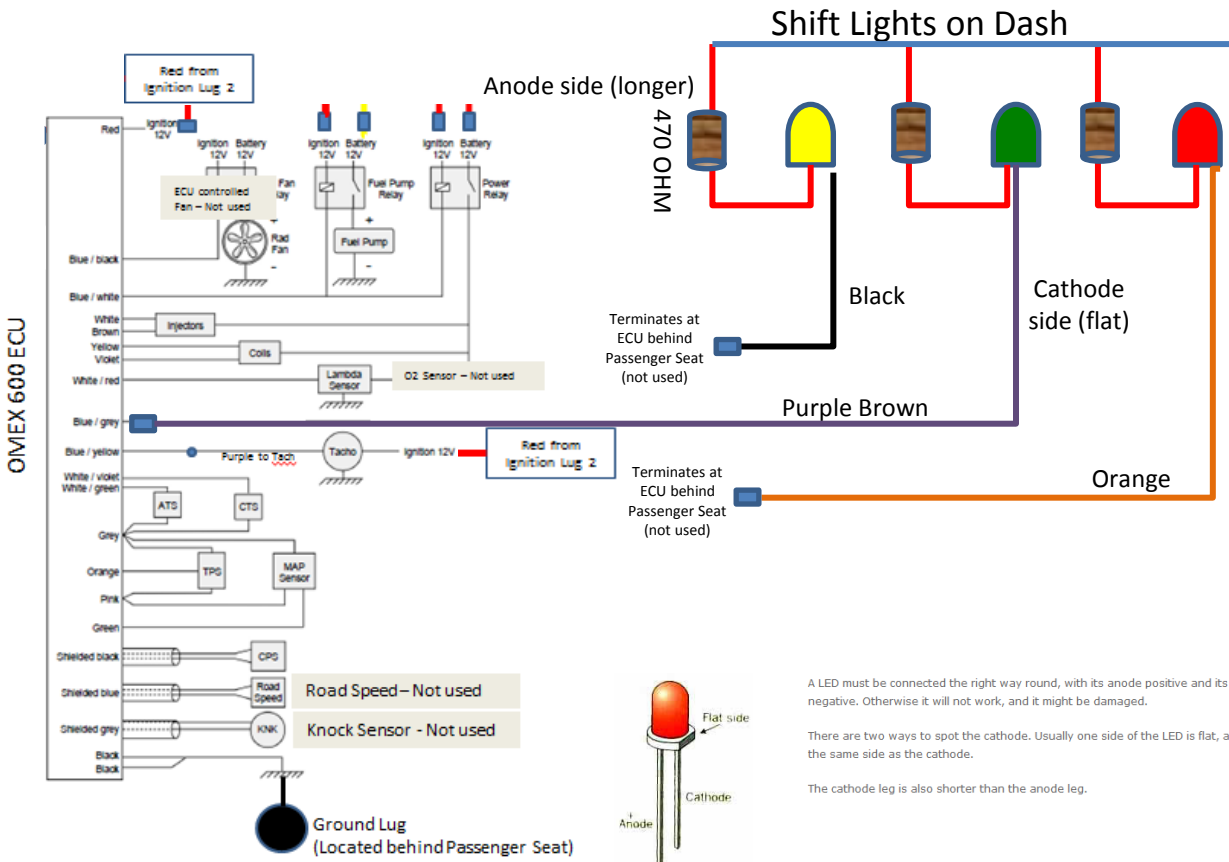
Green/Red to MAP switch on Dash (not Used)

Shift Lights

Updated

The shift light can be either an LED or a filament bulb of up to 1A current draw. If an LED is used it will need to be a 12V specific LED or must have an inline resistor fitted. An LED will glow slightly all of the time then turn on bright at the shift point. Omex can supply shift light LEDs that are fully off normally. If a filament bulb is used it will be fully off then fully on at the shift point.

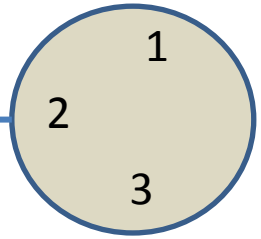




A LED must be connected the right way round, with its anode positive and its cathode negative. Otherwise it will not work, and it might be damaged.

There are two ways to spot the cathode. Usually one side of the LED is flat, and this on the same side as the cathode.

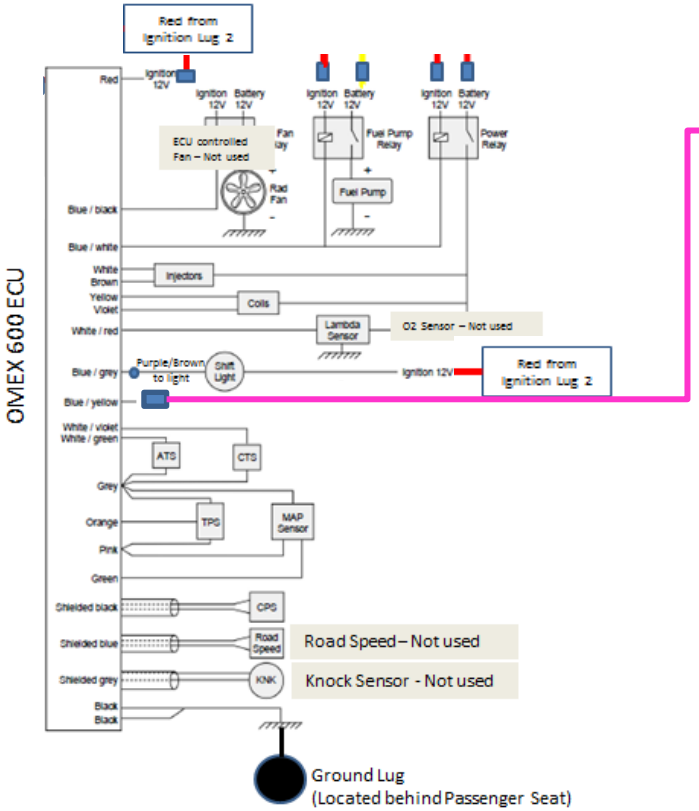
The cathode leg is also shorter than the anode leg.

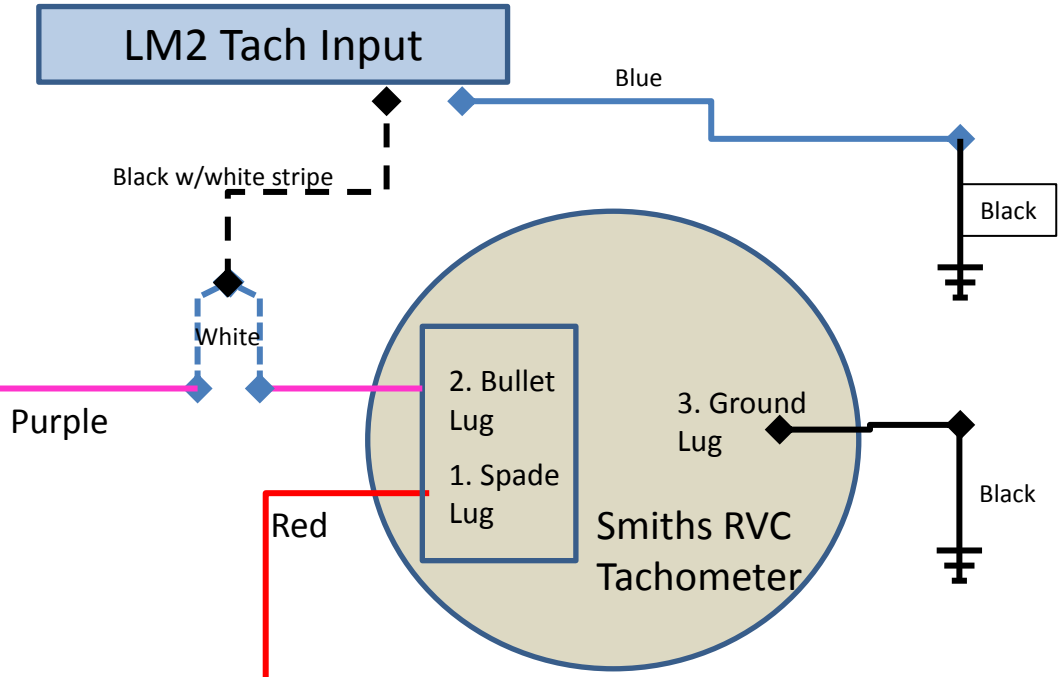


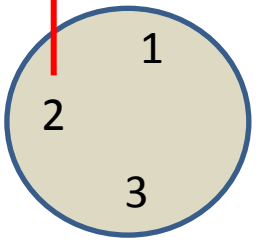
Lucas 3 Pole Starter Switch

Tachometer

Updated





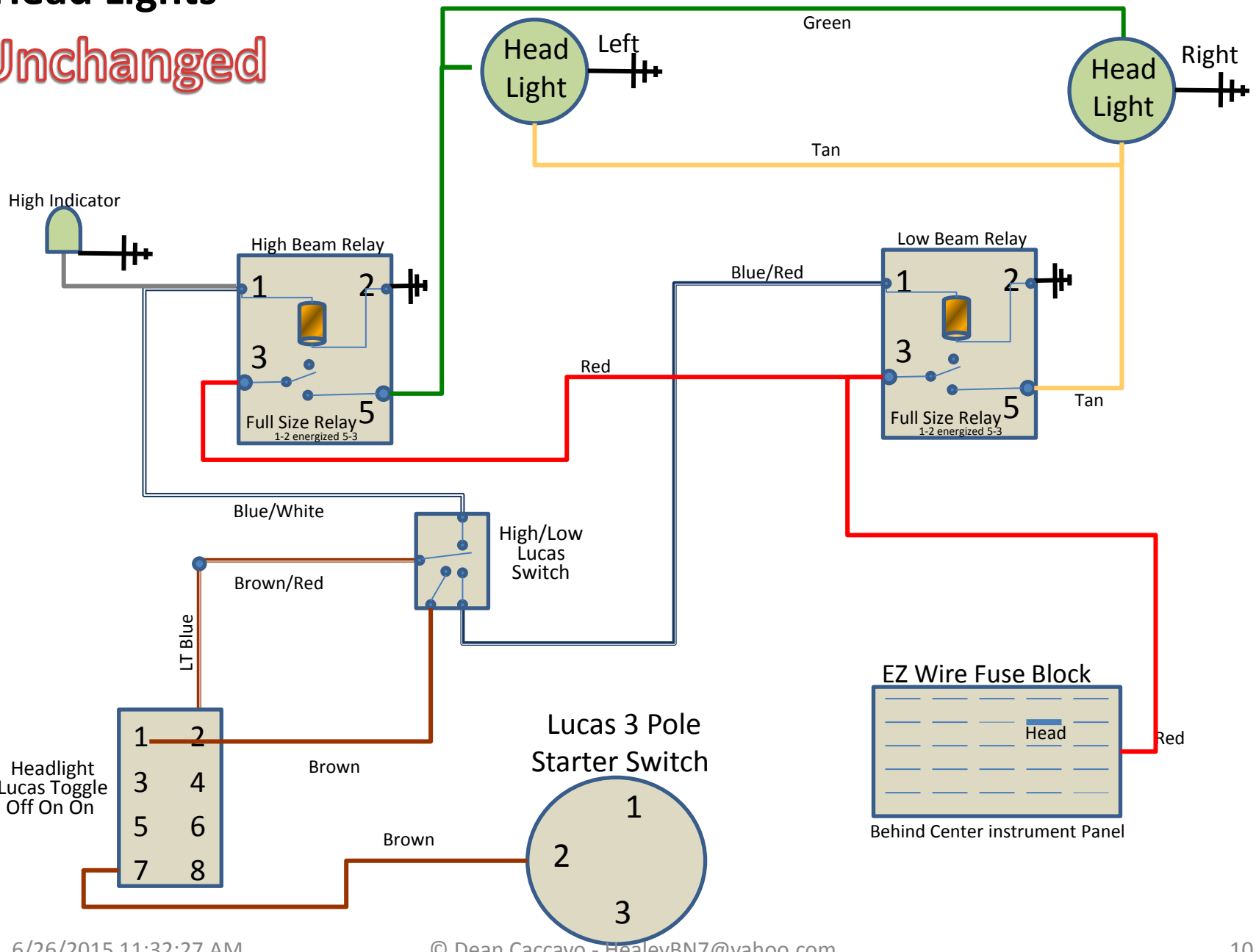


Lucas 3 Pole Starter Switch

terminal 1 is for ignition power
terminal 2 is for trigger lead which will go to terminal on coil marked 'cb' or earth
terminal 3 is earth ; Source http://dosjebroseven.se/tips.htm

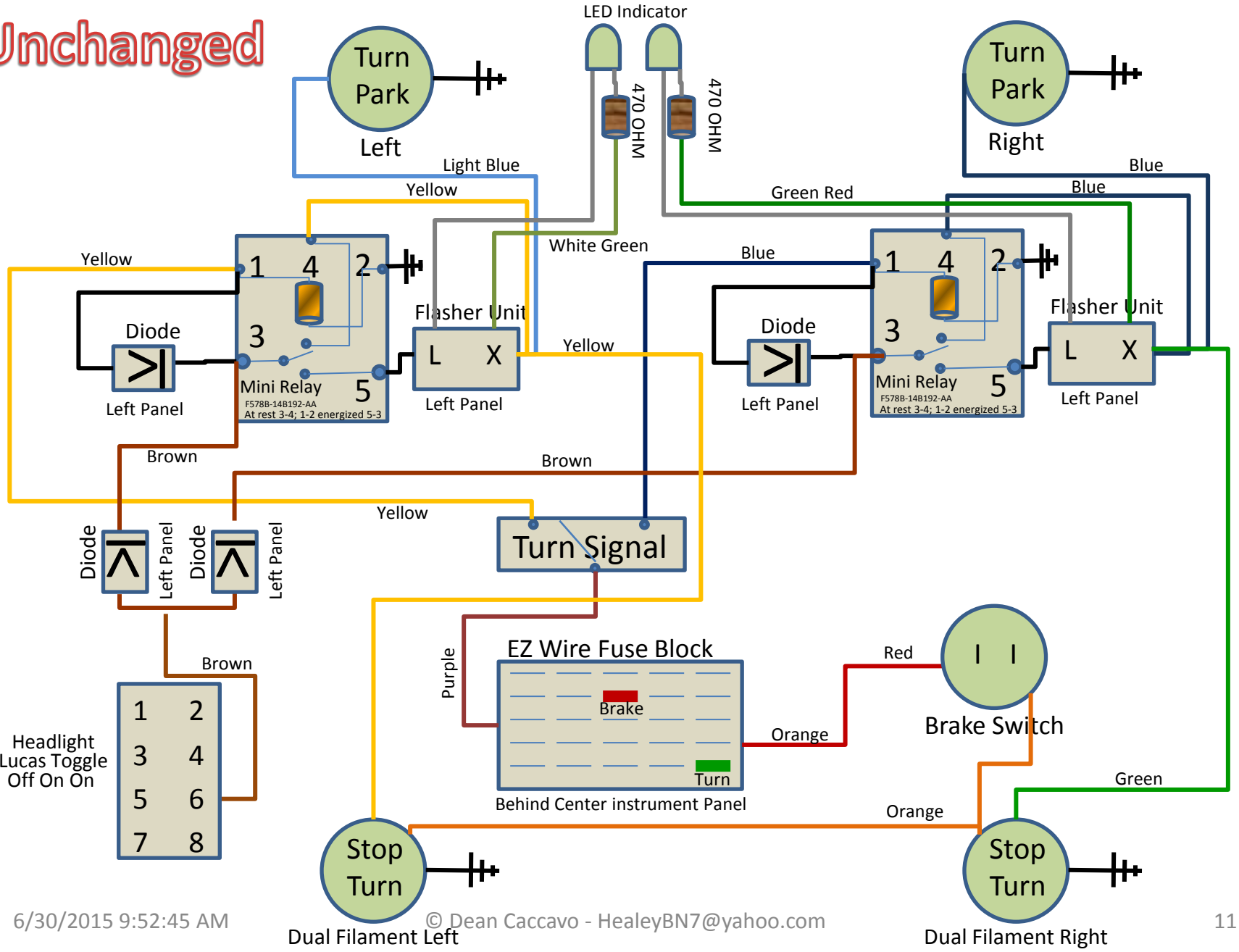
Head Lights

Unchanged



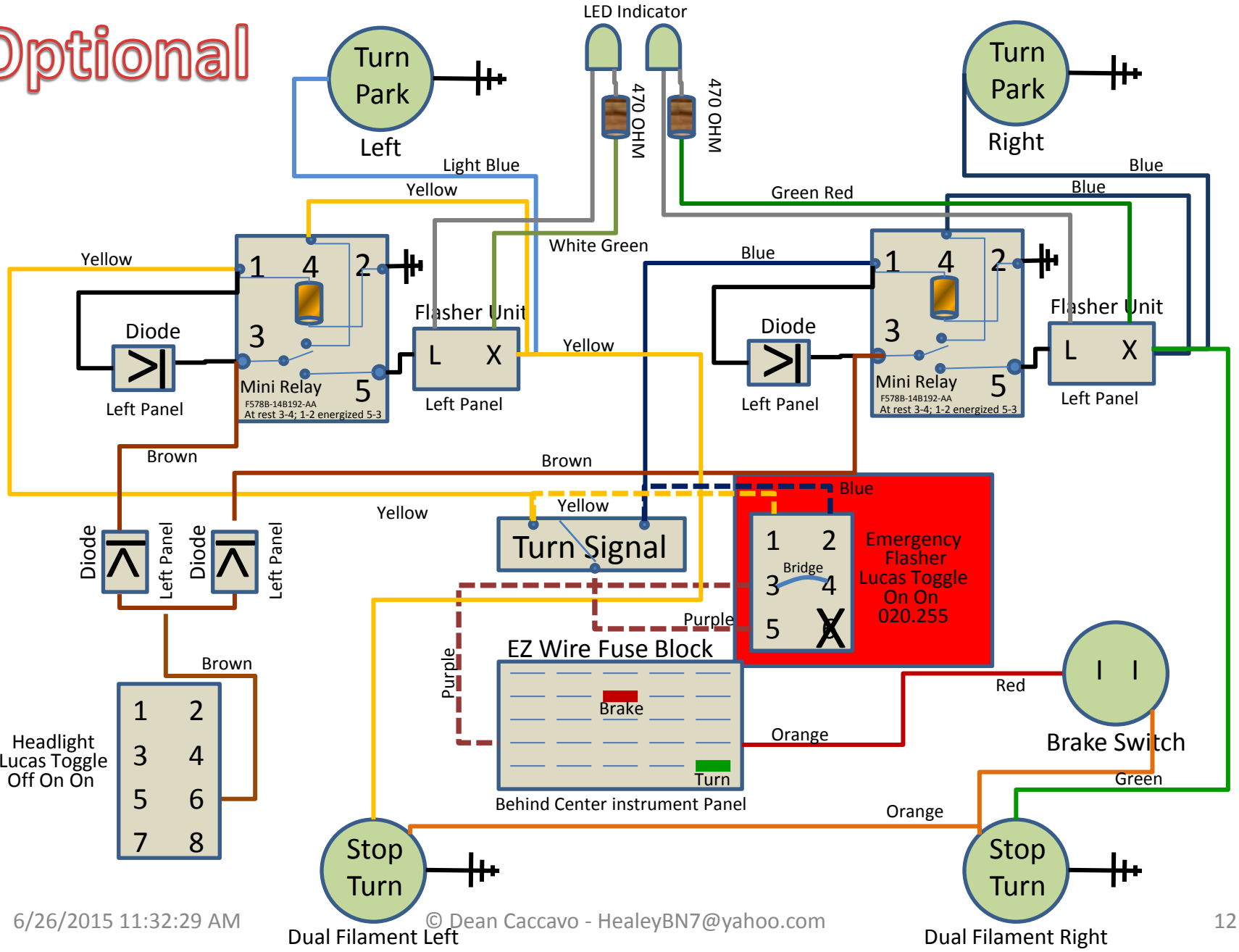
Turn Signals / Front Park / Rear Brake Lights

Unchanged



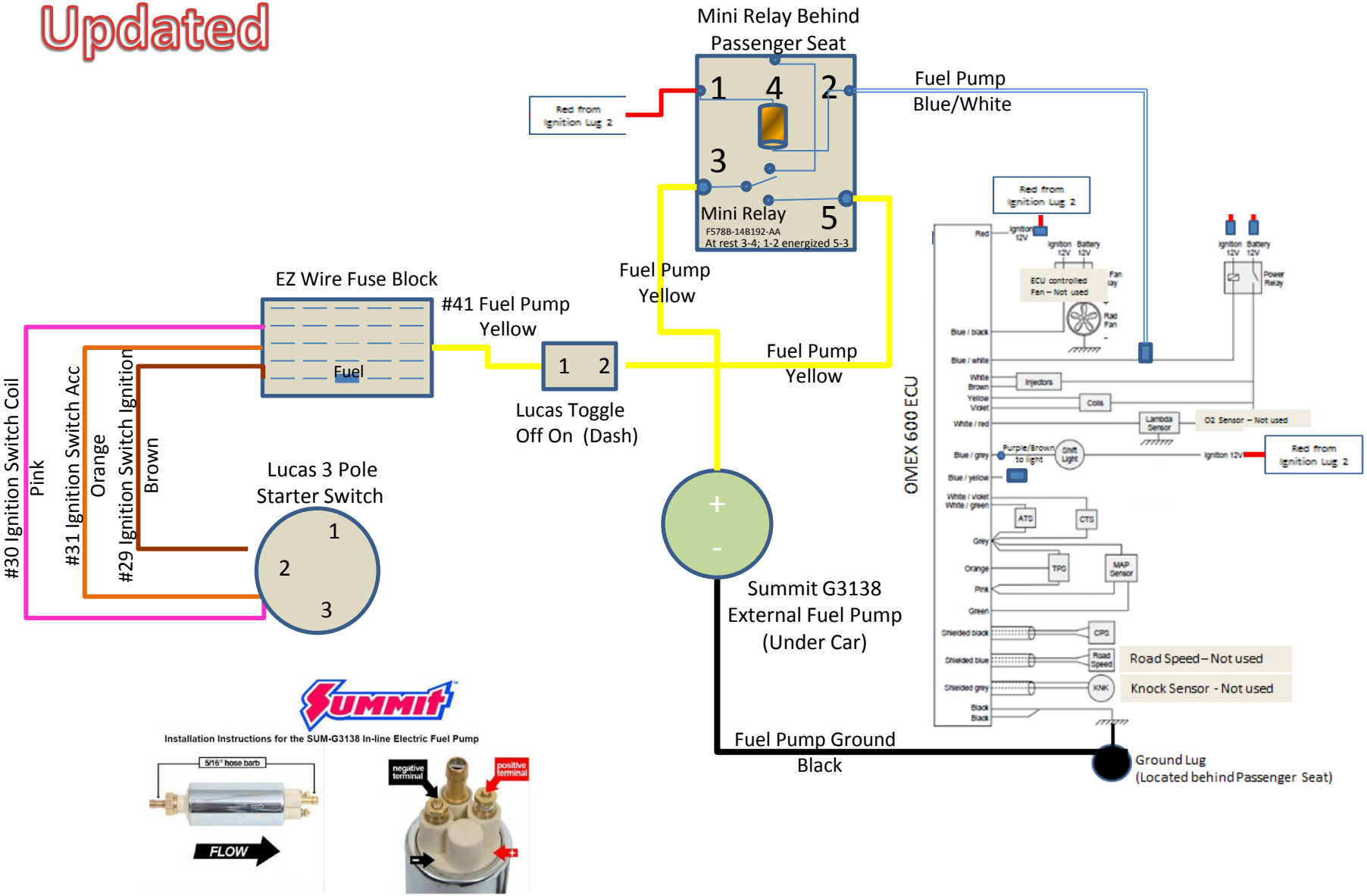
Turn Signals / Front Park / Rear Brake Lights/E-Flasher

Optional

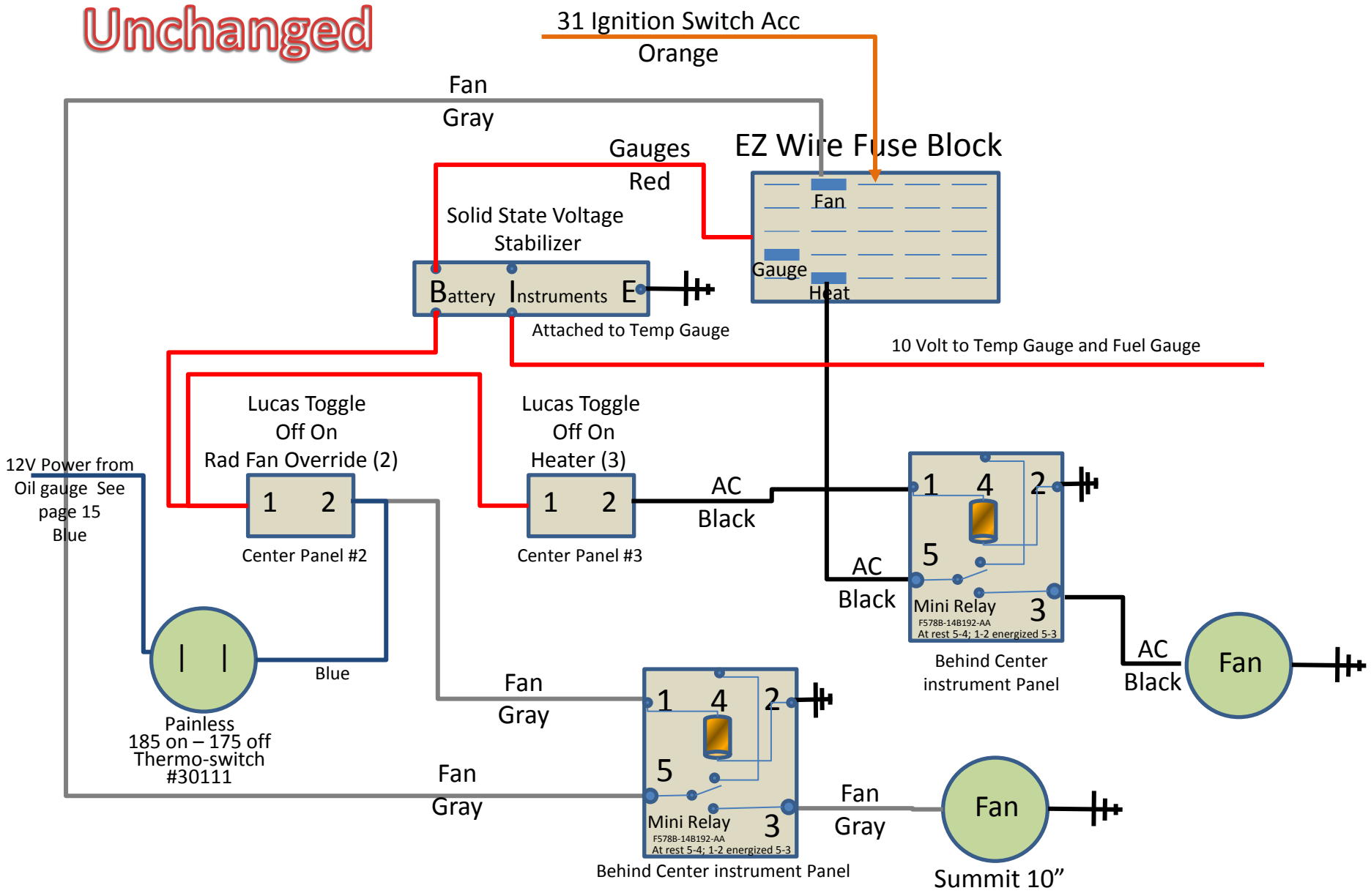


Fuel Pump

Updated

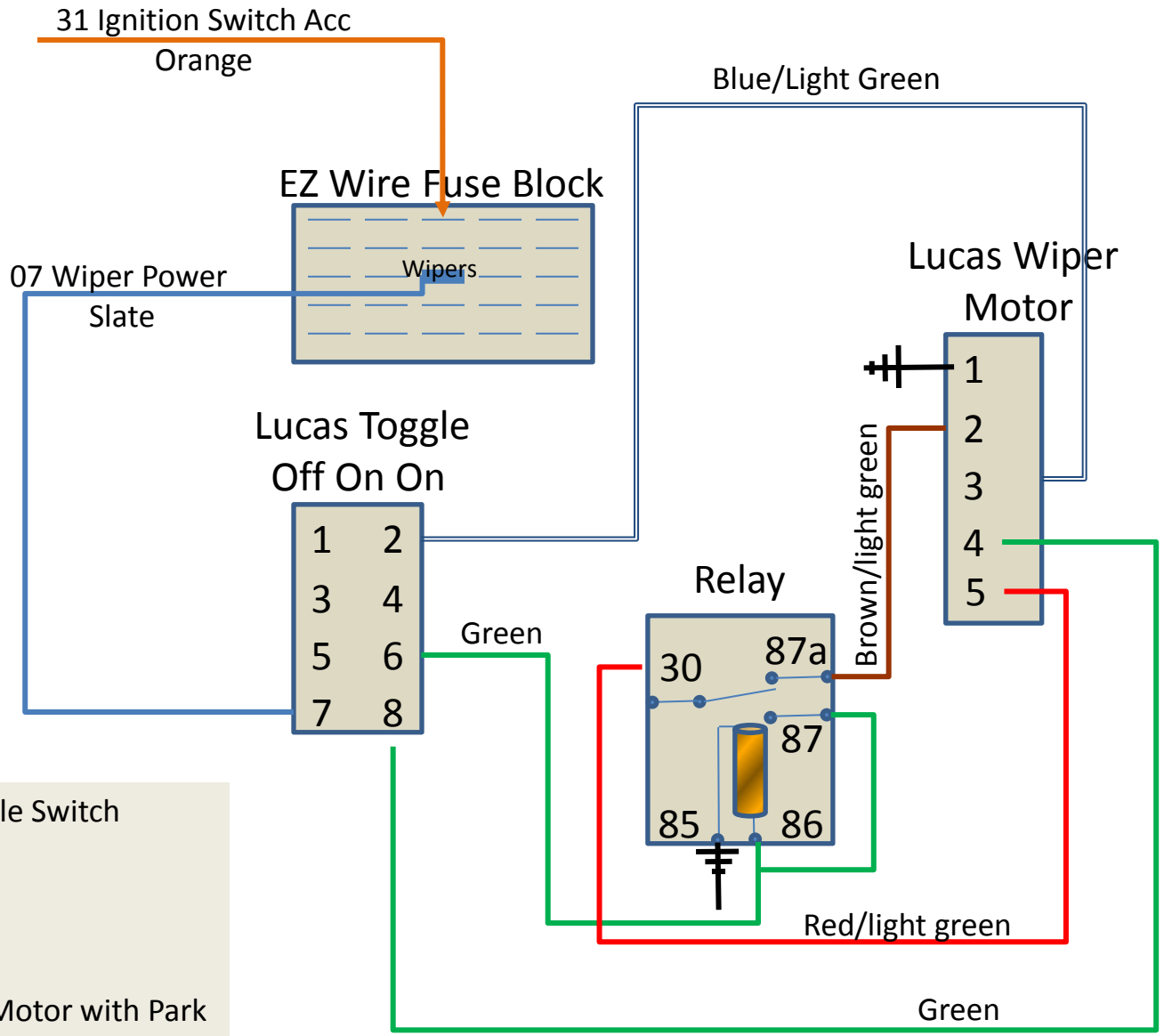


Radiator and Cabin Fan



Wiper Motor

Unchanged



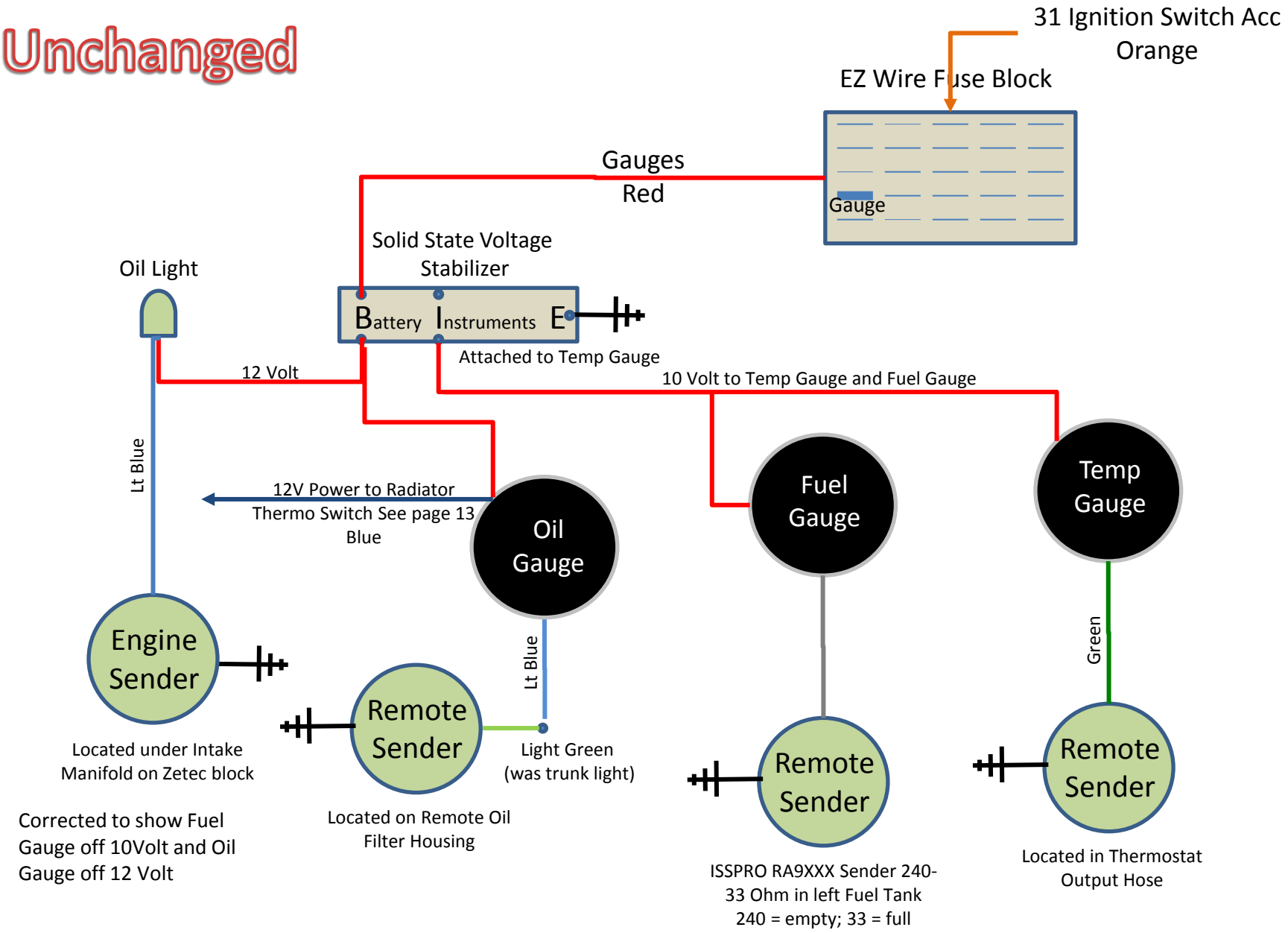
Lucas Off-On-On Toggle Switch
Europa Spares #119

Standard 5 pole Relay

Lucas 2 Speed Wiper Motor with Park

Oil Light, Oil, Fuel and Temperature Gauges

Unchanged



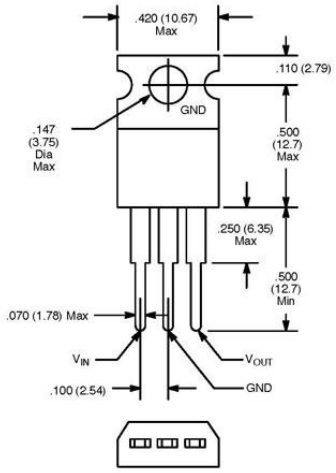
Lotus Europa Wiring Diagrams

Reference Material

Voltage Stabilizer – Solid State

Solid state voltage regulators are inexpensive, but they may be difficult to find locally. The easiest places to purchase them are online. "Google" the part numbers to identify potential suppliers.

National Semiconductor's "LM2940T-10.0" and NTE Electronics' "NTE1953" are low dropout (LDO) solid-state voltage regulators. If you supply either of them with a DC voltage between 10.5V and about 30V, they will provide a constant output voltage of 10.0V. Similar to an old-fashioned bimetallic Voltage Stabilizer, they can't boost voltage: so if the supply voltage drops to below about 10.5V, these LDO's will "dropout" and simply pass through whatever supply voltage is available.



Note: there are other alternative voltage regulators that could also be used. One example is Texas Instruments' part number "UA7810CKCS" (a.k.a. "7810" or "LM7810") which frankly you're probably more likely to find at your local Radio Shack. The main advantage of the National Semiconductor or NTE Electronics devices is their somewhat lower dropout specification.

Also needed: just a few basics including a soldering iron, solder, about six inches of insulated wire, heat shrink tubing (or possibly electrical tape), etc.

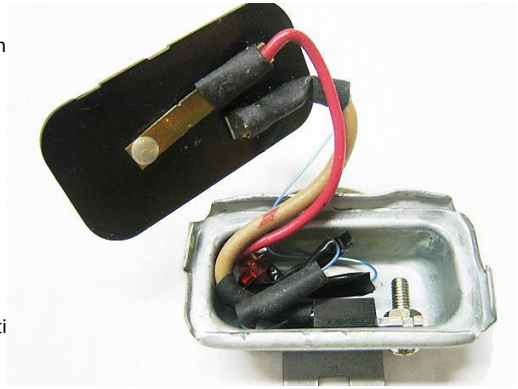
Optional extras: a small LED lamp and a 1000 ohm resistor.

Directions

1. Disconnect the car's battery and remove the original Voltage Stabilizer from the car. (Note: the Voltage Stabilizer is mounted on the drivers-side firewall just above the steering column.)

2. Open the voltage regulator by carefully prying back the tabs that clamp the metal cover to the plastic base.

3. Cut and remove the old bimetallic regulator mechanism, being careful to leave enough of the two terminals for soldering wires onto th later.



4. Prepare your solid-state voltage regulator by cutting off the center of its three terminals. (This terminal is nominally a "ground" connection, and it would be redundant with the mounting tab in our installation. They're connected internally...)
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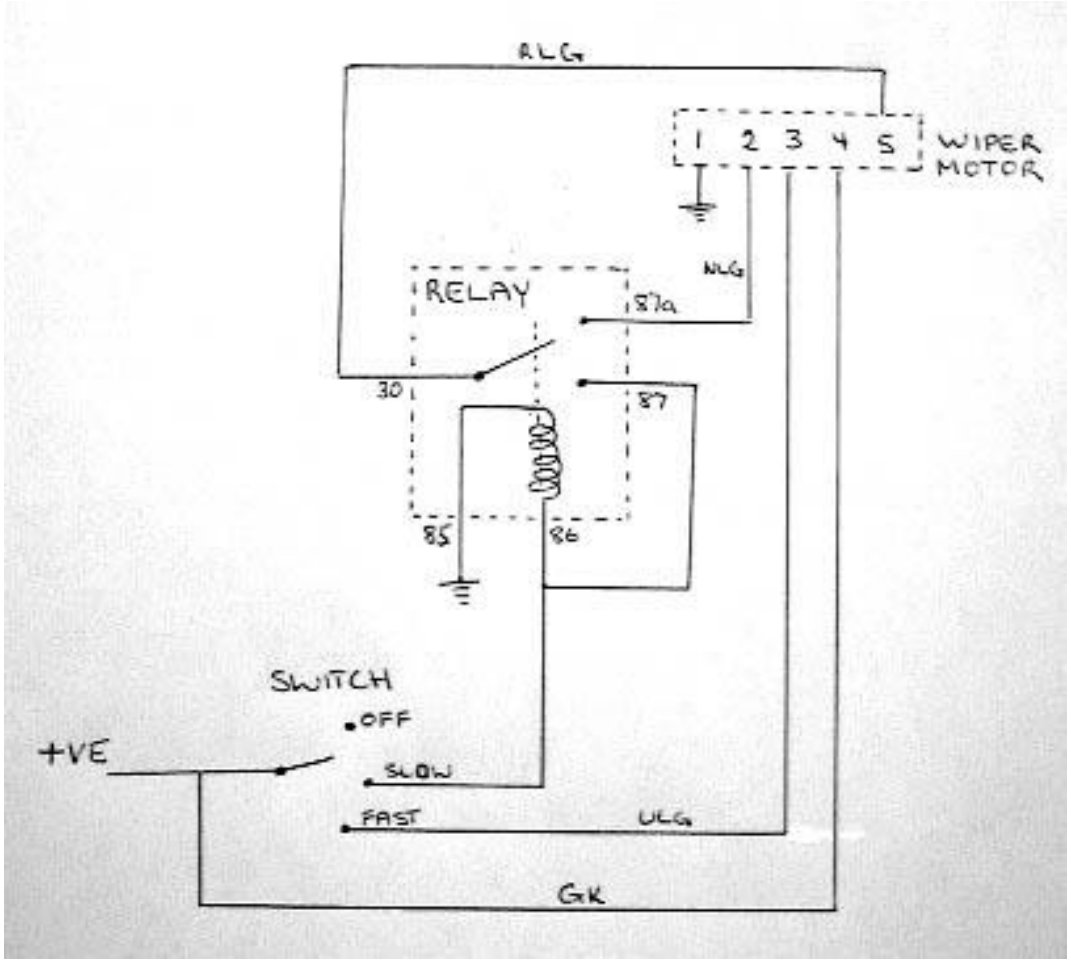
To contribute to our operating budget, please click here and follow the instructions.
(Suggested contribution is twenty bucks per year. Feel free to give more!)
5. Using a short length of wire, jumper between the solid-state voltage regulator's V_{IN} (12V in) terminal to the "B" terminal on the plastic base. Carefully solder both connections.

6. Using a short length of wire, jumper between the solid-state voltage regulator's V_{OUT} (10V out) terminal to the "I" terminal on the plasti base. Carefully solder both connections.

7. The LED indicator is optional. Its purpose is just to show that the system is powered and grounded, and that the voltage regulator is functioning. The LED is connected at one end to the voltage regulator's 10V "OUT" terminal, and at the other end it's connected to ground through a 1000 Ohm resistor.

8. To function properly, the solid-state regulator must be electrically well-grounded to the rest of the vehicle. Accomplish this by (first) connecting it to the voltage regulator's metal cover with a machine screw and nut. Note: the voltage regulator itself must in turn be grounded to the car by its mounting. If the fasteners are corroded or dirty, they should be cleaned at this time.

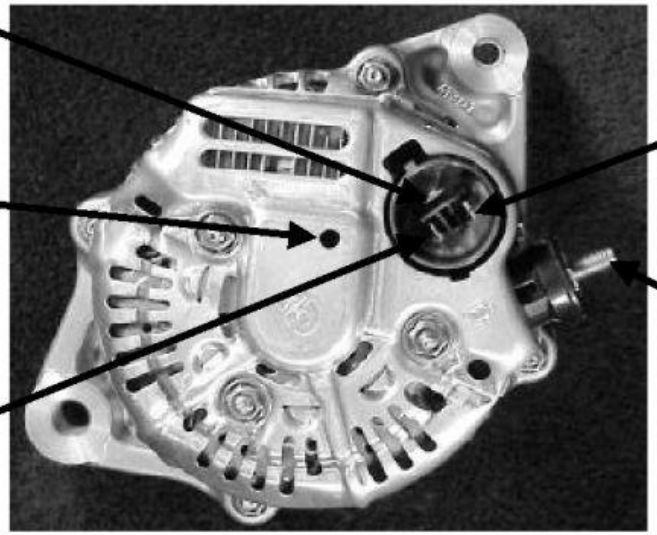
Lucas 2 speed plus park wiper



http://www.vitessesteve.co.uk/LucasStuff/LucasStuff2.html

Understanding the Alternator

Alternator Terminal Identification



ND #100211-6720
Lester # 13214

Denso Regulator
71-30002 or
71-30024
Important that the Regulator does not have a sensing or soft start feature

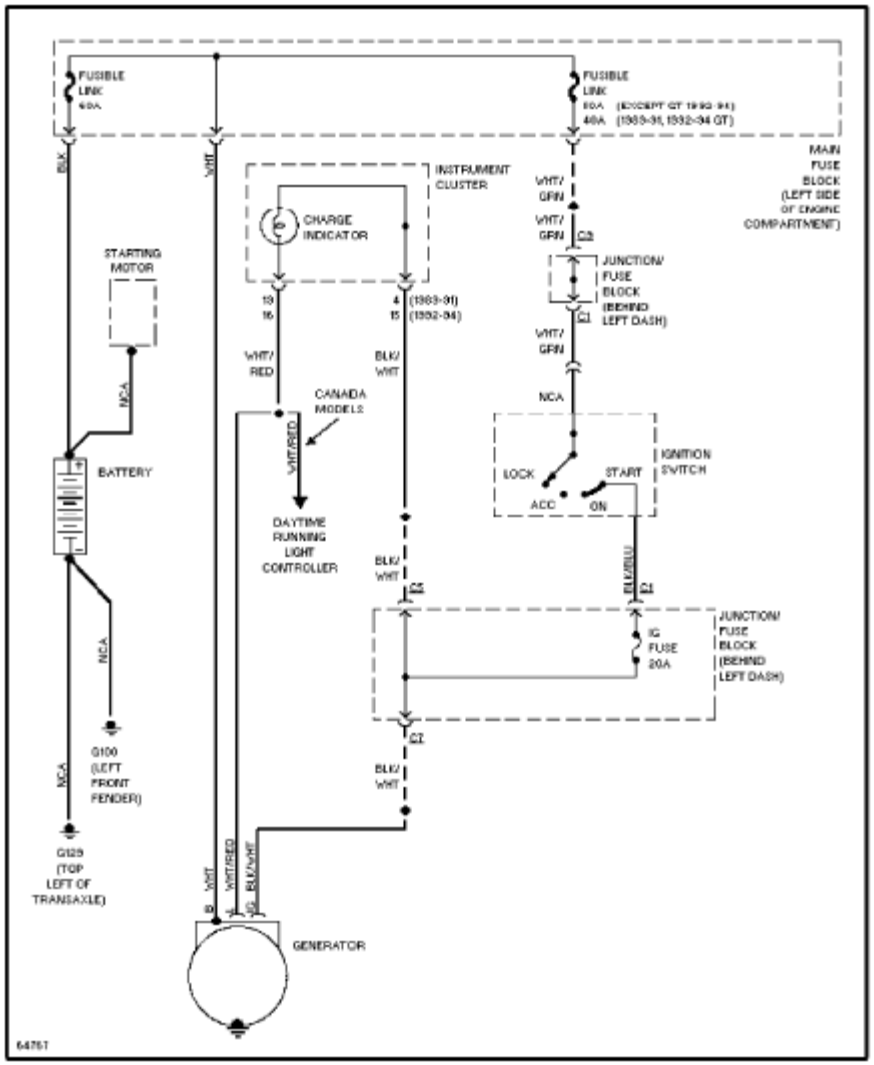
On most ND three pin plug style alternators the pins are marked as "L" / "D" / "IG" The only other connection is usually a large single post terminal marked "B" This is the main wire connected to your battery and is hot at all times.

"IG" This is the Ignition wire and issues the "wake up" to energize the circuit when ignition is switched on

"L" This terminal is connected through to the charge warning light on your instrument cluster

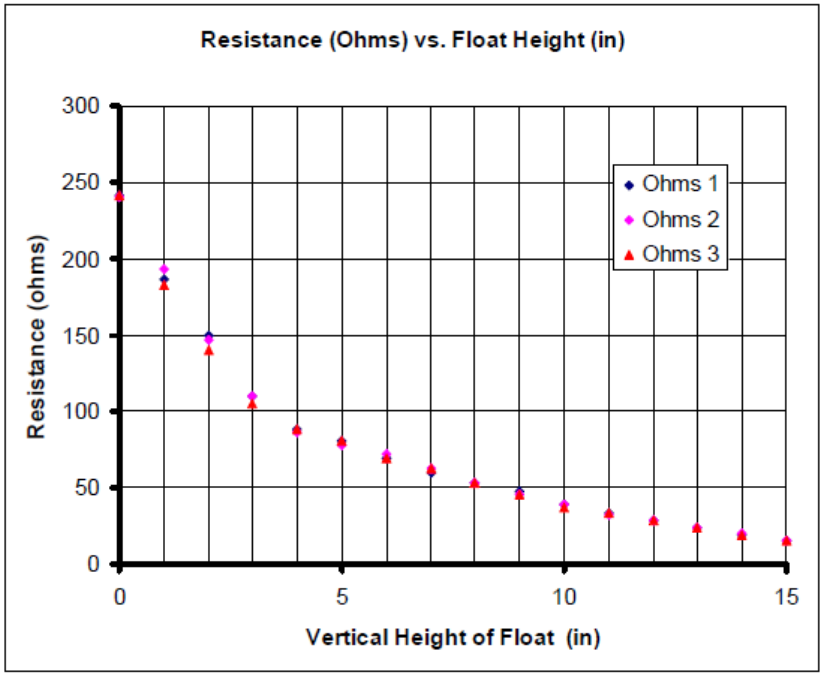
"D" – Dummy – not used

SYSTEM WIRING DIAGRAMS
Charging Circuit (p. 7)
1989 Suzuki Swift



OE Smiths Fuel Sender Operation

Smiths



Smiths

Data from Resistance Chart

Position (in)	Ohms 1	Ohms 2	Ohms 3
0	241	240	241
1	186	193	183
2	150	147	140
3	110	110	105
4	88	86	88
5	80	78	80
6	69	72	69
7	60	62	62
8	53	53	53
9	47	45	45
10	39	39	37
11	33	32	33
12	28	28	28
13	24	24	24
14	19	20	19
15	15	15	15

ISSPRO →

RA9500 Series Ultimate Fuel Level Senders

ISSPRO, INC.'s ultimate fuel level sender is the best value sensor on the market today. As one of the most widely used component parts for major OEMs, it is built tough to provide reliable readings. The RA9500 series is available for most fuel tank sizes and in the resistance curves listed below. Other resistance curves, wiring harnesses and connectors are available by custom order. Consult factory at 800-888-8065. Not all part numbers are kept in stock, please call for lead times.

- Senders must be installed within ± 5° from vertical for best results.
- End cap keeps tube free of debris.
- Fluids measured: gas/diesel/biodiesel/alcohol(ethanol)/hydraulic non potable water
- Temperature range: -90°C to 105°C
- Standard SAE five bolt hole mounting.
- Made in the USA.

Ordering information: Find appropriate length of tube or depth of tank. Replace XXX suffix with resistance curve desired. For low profile cap with 8" wire leads, add LP to suffix after XXX specification.

Resistance curves available*	(Empty – Full):	
RA95XX-IS	240 – 33 ohm	Stock items and pricing.
RA95XX-AC	0 – 90 ohm	Non-stock specialty item. Call for lead time and pricing.
RA95XX-FORD	78 – 10 ohm	
RA95XX-EURO**	10 – 180 ohm	
RA95XX-OAC	0-30 ohm	

Section 2

Lotus Europa Heater/Radiator Water Routing/Diagrams

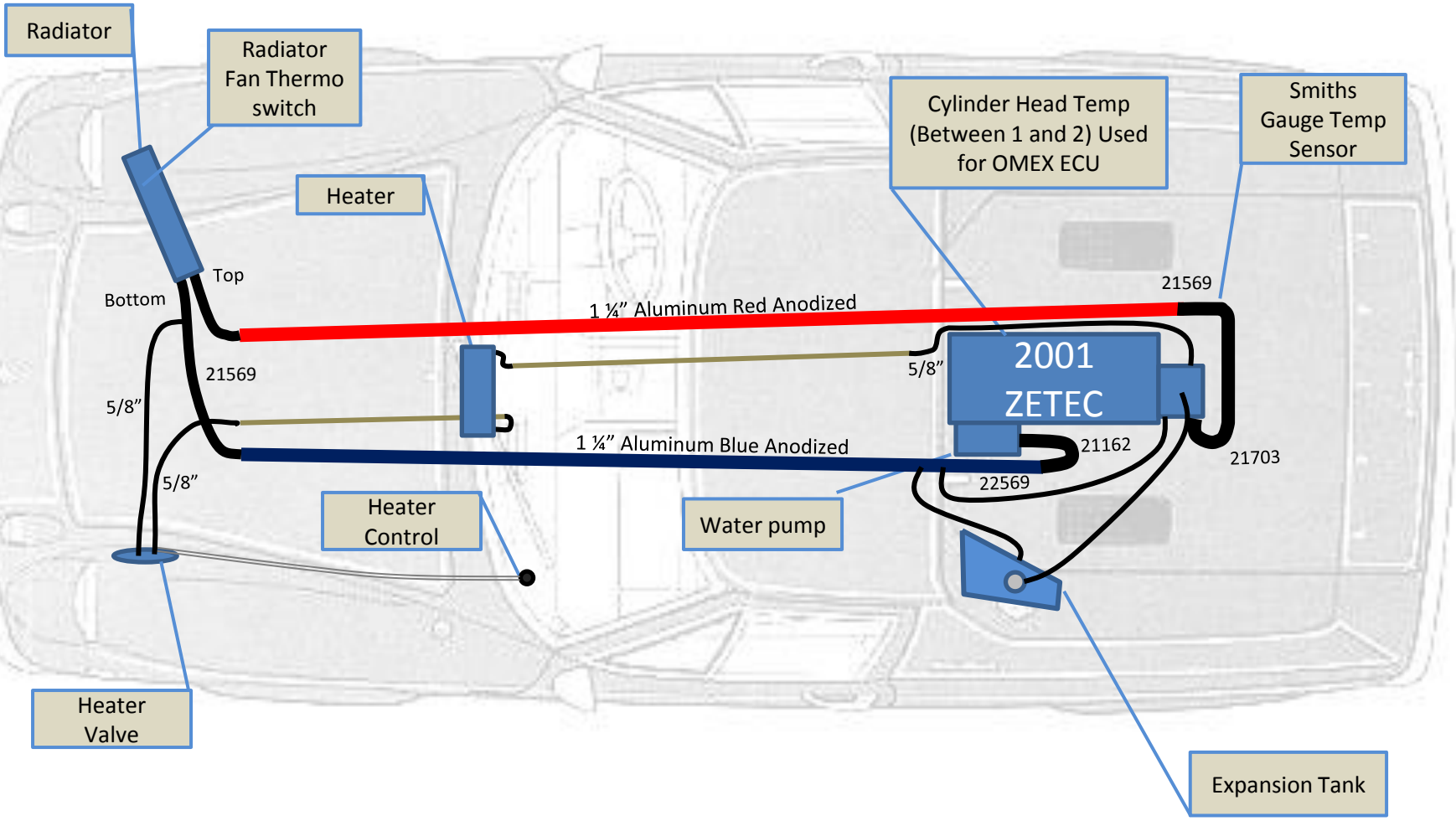
Mac's Aluminum Radiator/ Aluminum Transfer Tubes/ Zetec / Relocated Heater Control for 47 Dash Layout

Gates Hoses

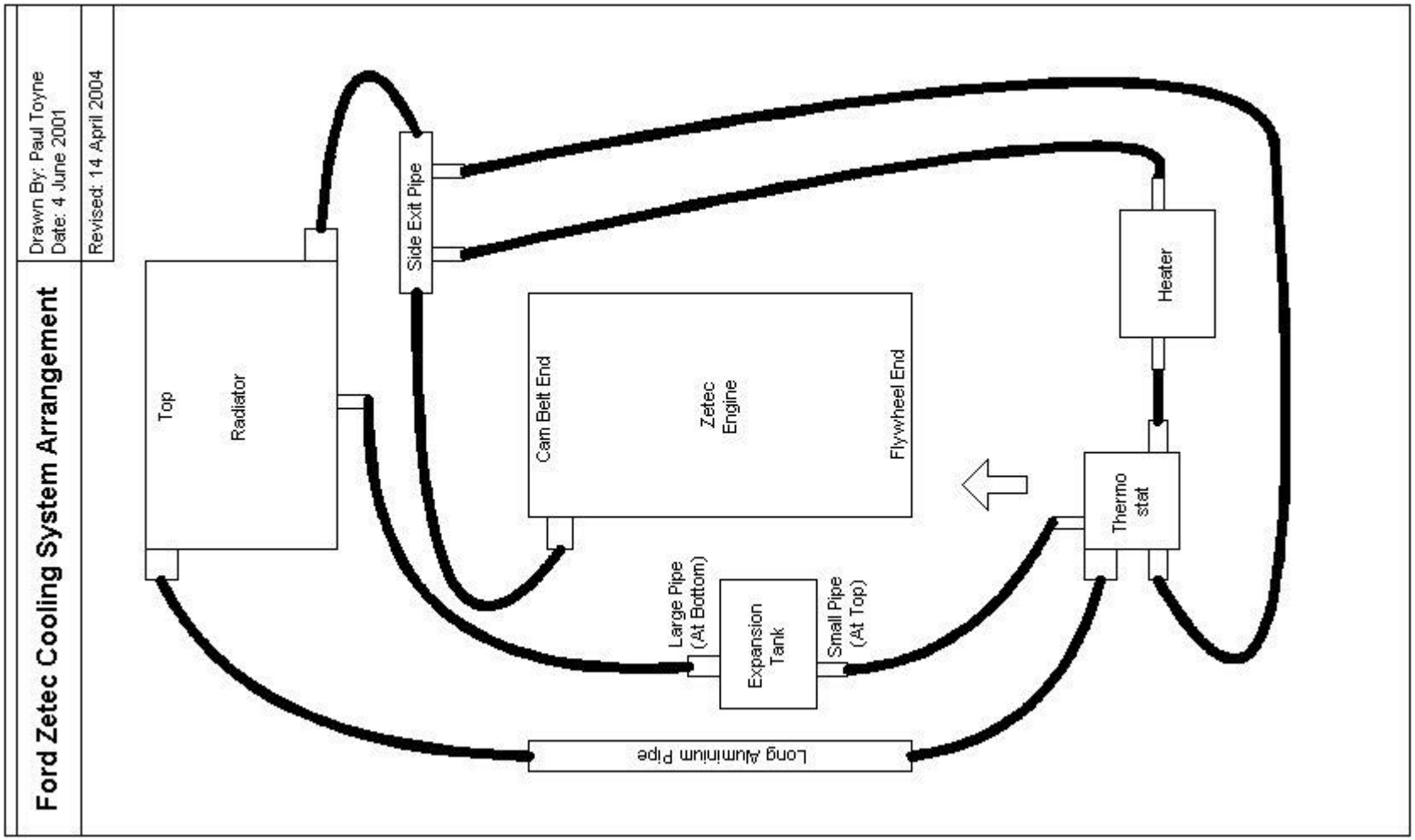
Component Layout

Updated

NAPA	Gates	Gates ID
9202	22569	42612569
7868	21162	42611162
8393	21703	42611703



Zetec Cooling System Diagram



http://www.toyne.org.uk/docs-cooling.html

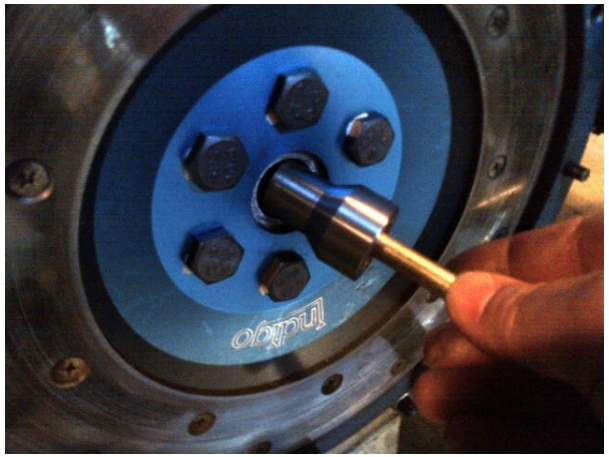
Section 3

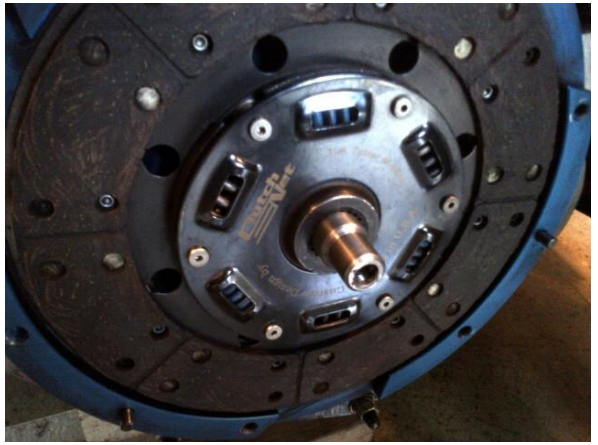
Lotus Europa Zetec/Renault 336 Transmission/Clutch

Parts and Installation notes

Flywheel/Clutch Pressure Plate

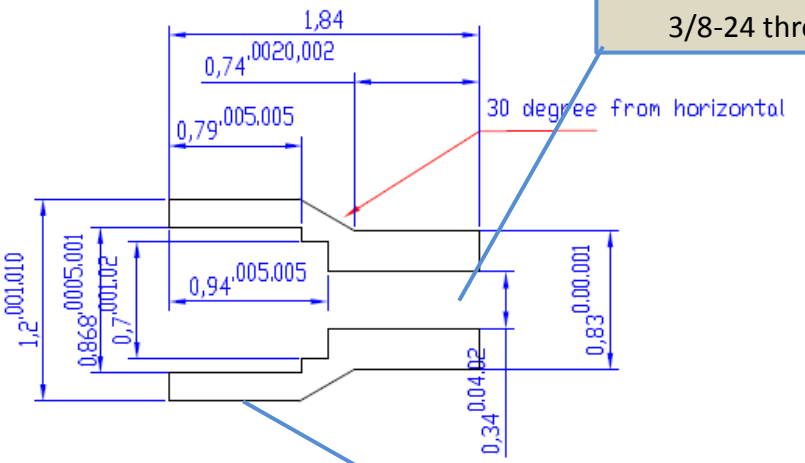
- Findinza Ford Focus aluminum flywheel
- ClutchNet disk – Sized for Ford Focus pressure plate and flywheel, yet with Renault center splines – .125 removed from center hub on the transmission side
  - **Performance "SMOOTH LOCK PRO" ™ Sprung Hub**
- Pilot bushing holder David Anderson design
  - Modified to include a 3/8-24 threaded hole for “easy” removal
  - Trimmed to .5” in projected bushing height
  - Removed .125 from the transaxle input shaft
- Stock Ford Motorsport pressure plate
  - Shimmed .0365 between pressure plate and flywheel to maintain ~3/8” clearance between disk hub and pressure plate fingers
- Wilwood pull slave





Pilot Bushing Drawing

Courtesy of David Anderson



David Anderson
Transmission shaft steady
Material: steel of some kind.

Large id to have oilite bush pressed in to first step. Bush reamed to 17mm for slip fit over 17mm shaft.

The stepped id is needed to provide enough wall thickness.

Oct 31, 2007

Modified to include 3/8-24 thread

.50 bushing height

Remove .125" from the input shaft to prevent the input shaft from contacting the back of the steel pilot bush holder

Transmission Mount

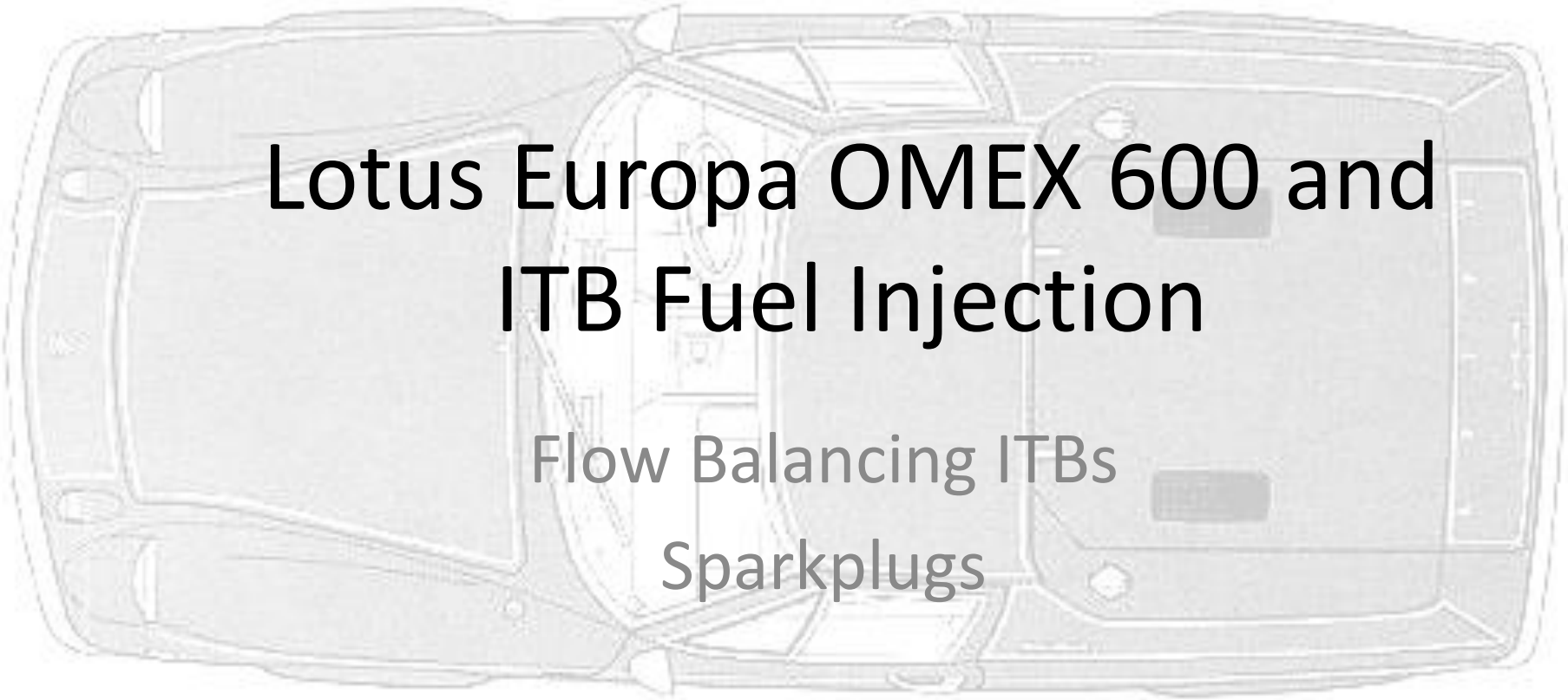
- New transmission mount fabricated to take standard Jeep leaf spring poly inserts

Brand:	Energy Suspension
Manufacturer's Part Number:	2-2110G
Part Type:	Leaf Spring Bushings
Product Line:	Energy Suspension Leaf Spring Bushing Sets
Summit Racing Part Number:	ENS-2-2110G
UPC:	703639260226
Shackle Bushings Included:	Yes
Spring Pad Bushings Included:	No
Hardware Included:	No
Sleeve Included:	Yes
Bushing Material:	Polyurethane
Bushing Color:	Black
Quantity:	Sold as a kit.
Notes:	Includes 4 bushings.

336.56 Transmission

- Input shaft seal for TC
  - A074Q6005Z
- Output shafts nuts are 11mm in depth
  - Use double lip seals
- Gasket sealant
  - Hylomar
- Redline Shockproof Lightweight Manual Transmission Fluid – 2

Section 4



Lotus Europa OMEX 600 and ITB Fuel Injection

Flow Balancing ITBs

Sparkplugs

NEW OMEX ITB Balancing

1. Close all the bypass ports
2. Balance the ITB pairs (1-2 to 3-4)

3. Use the bypass port to fine tune and balance within the individual ITB (1 to 2) and (3 to 4)

Set idle air flow to 5hg

The ECU resets the TPS on each start, so no need to recalibrate it.

Spark Plugs

- Denso 5338 ITV16 stock (not installed)
- Denso 5339 ITV20 one step cooler than stock (installed June 2012) Gap .051in

Section 5

Lotus Europa Alignment/Tires

Alignment and Pressure Settings

Tires/Alignment/Springs

- Front 250# springs - Camber -1.5
- Rear 110# springs - Camber -1.5
- Front Toe in 1/8
- Rear Tow in 1/8
- Toyo R888
  - 32 lbs front
  - 25 lbs rear

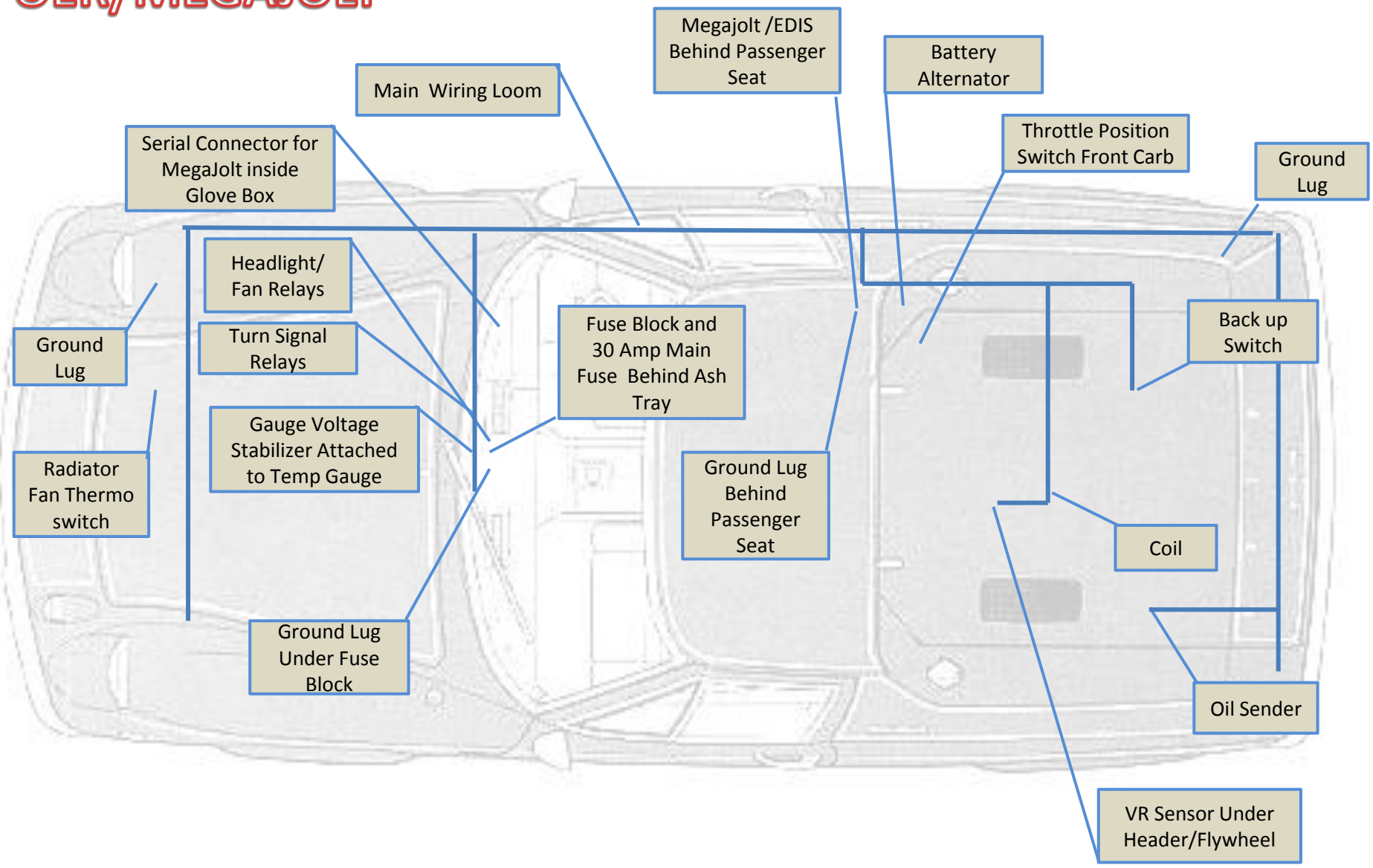
Section 6

Lotus Europa DCOE/MegaJolt – Prior Installation Materials

Reference for others…

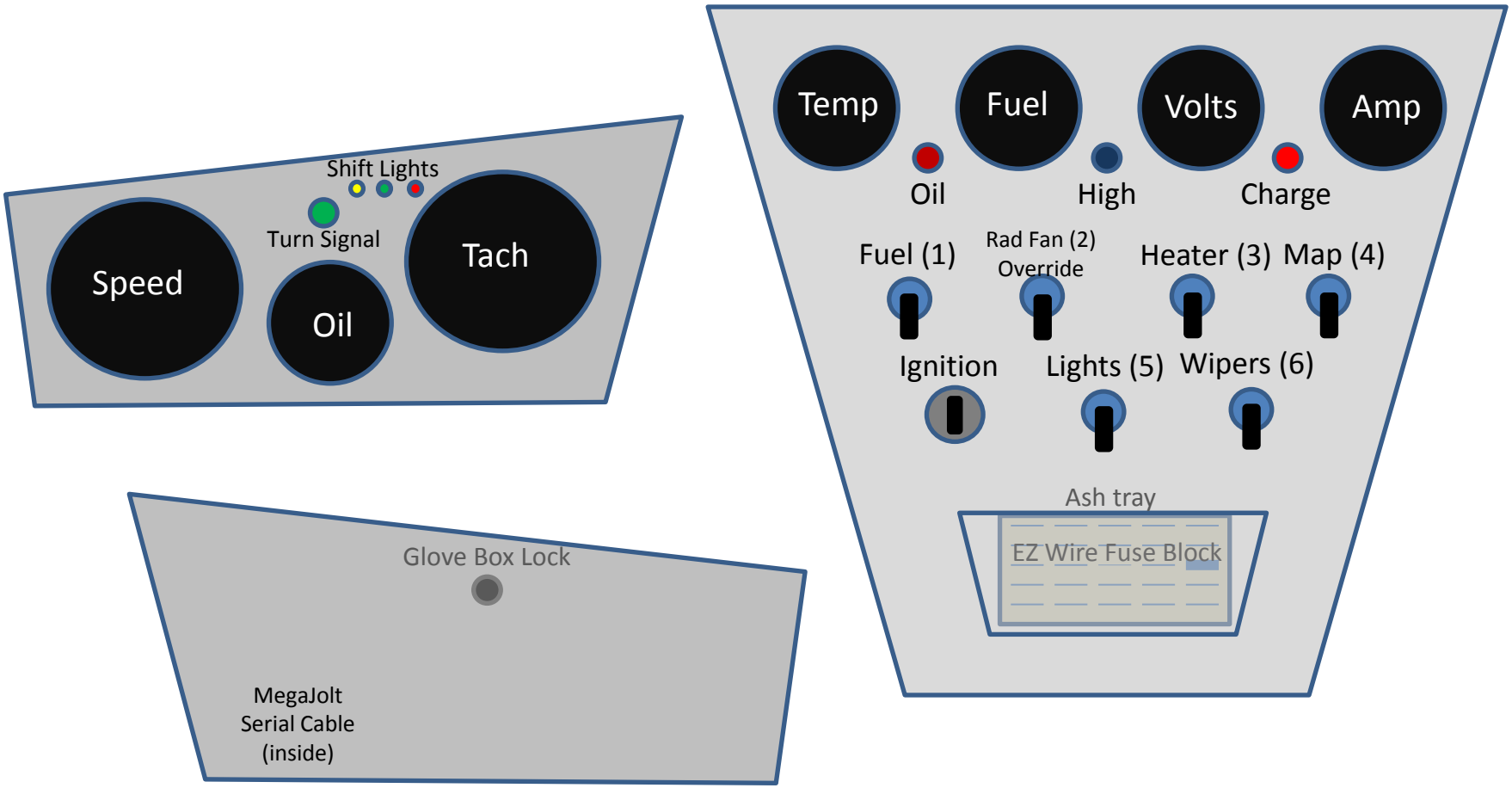
Component Layout

OER/MEGAJOLT

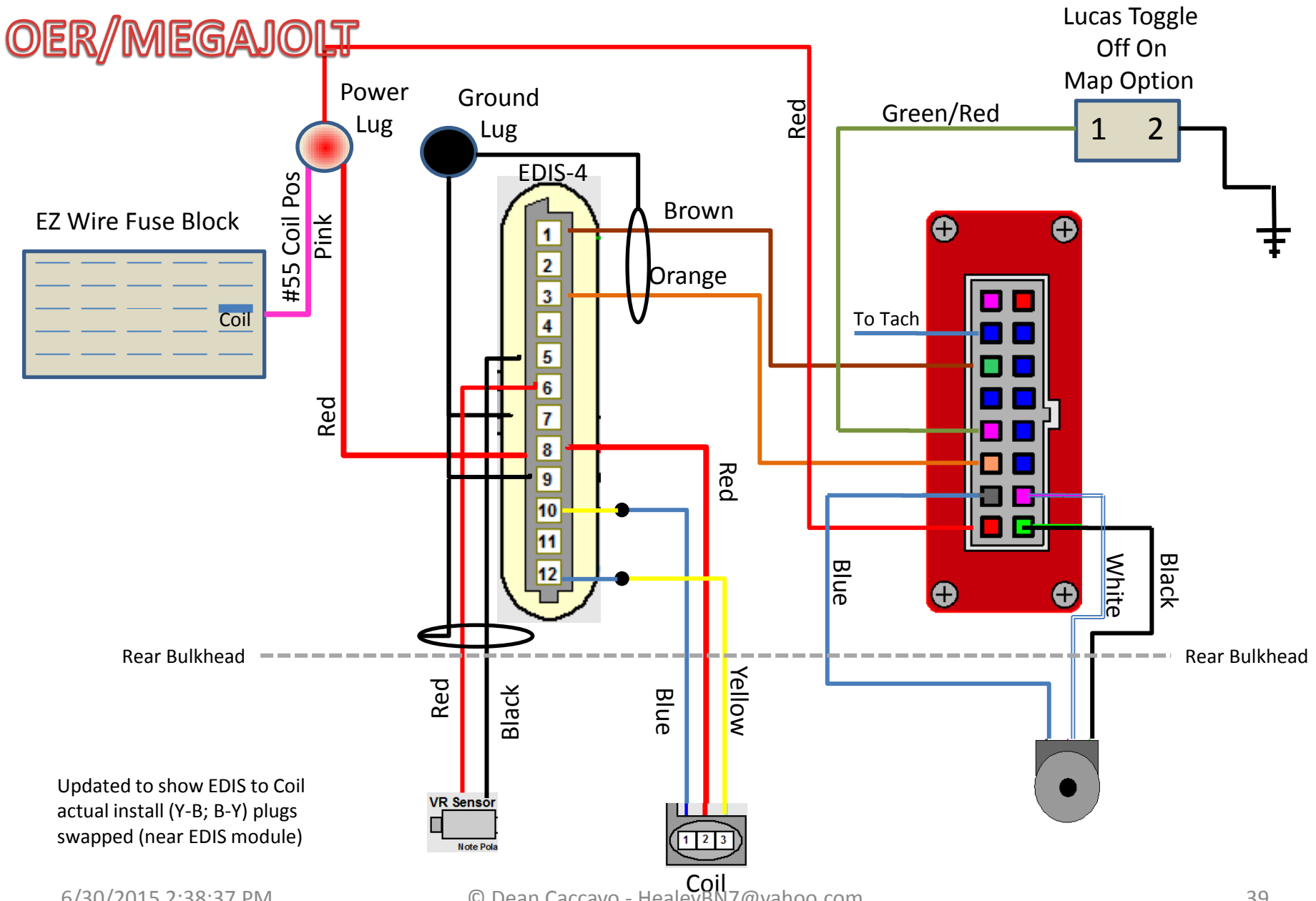


Dash Layout

OER/MEGAJOLT

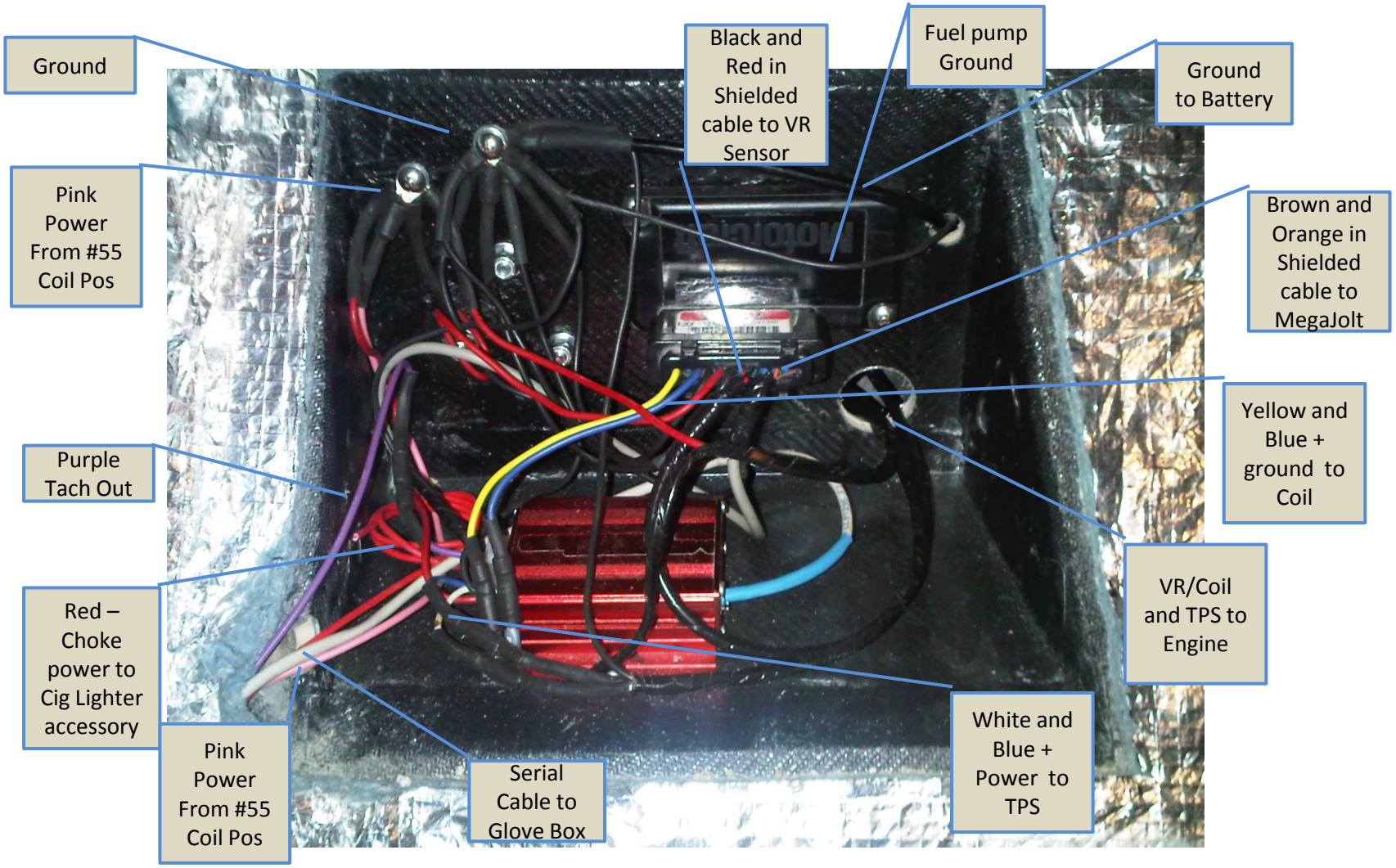


Ignition



OER/MEGAJOLT

MegaJolt Lite Jr V4
Ford EDIS-4



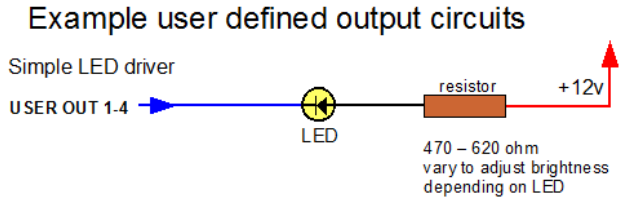
Shift Lights

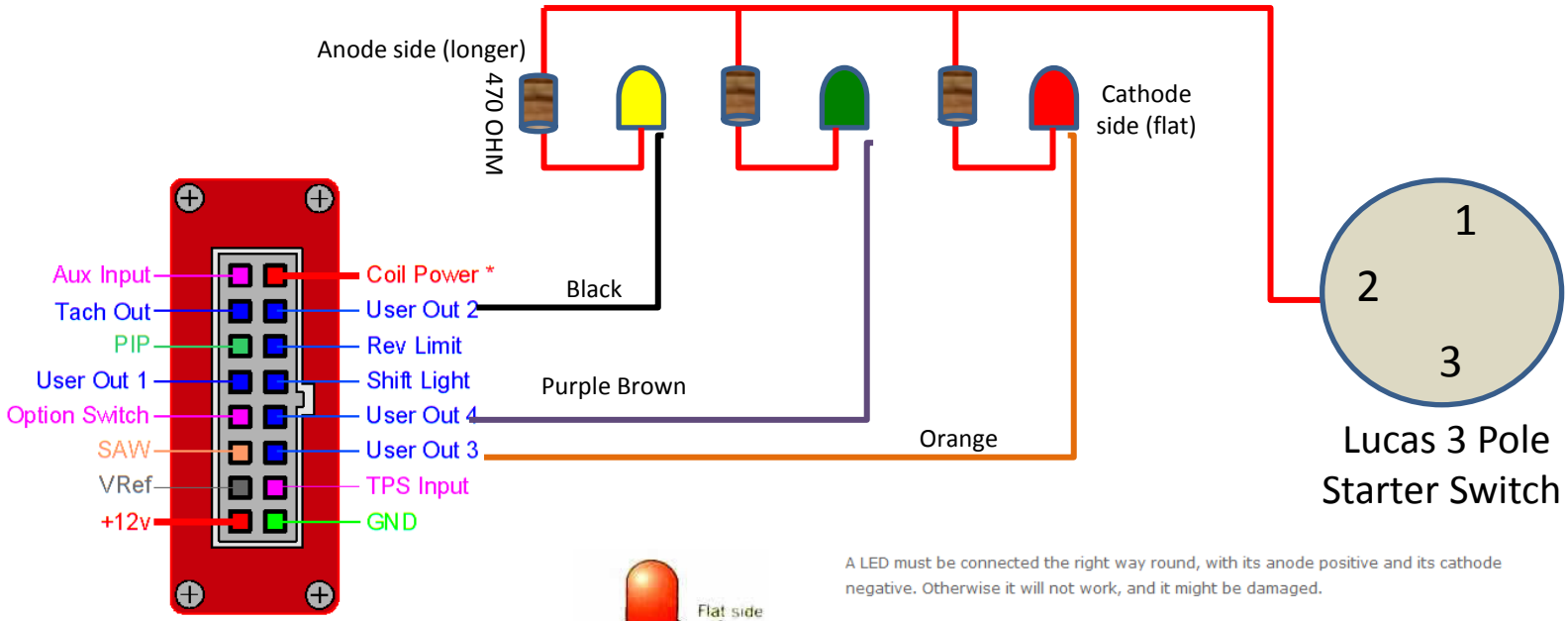
OER/MEGAJOLT

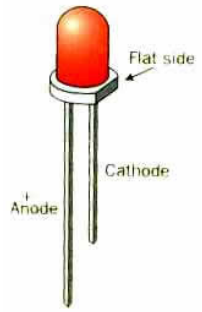
Wiring

When a User Defined Output is **activated** the MJLJ connects the pin representing that output to **Ground**. Therefore, powering a device using the User Defined Outputs involves connecting the positive input of the device to +12V, and the negative input of the device to the appropriate pin representing the MJLJ User Defined Output.

See the following diagram for examples of powering various devices:







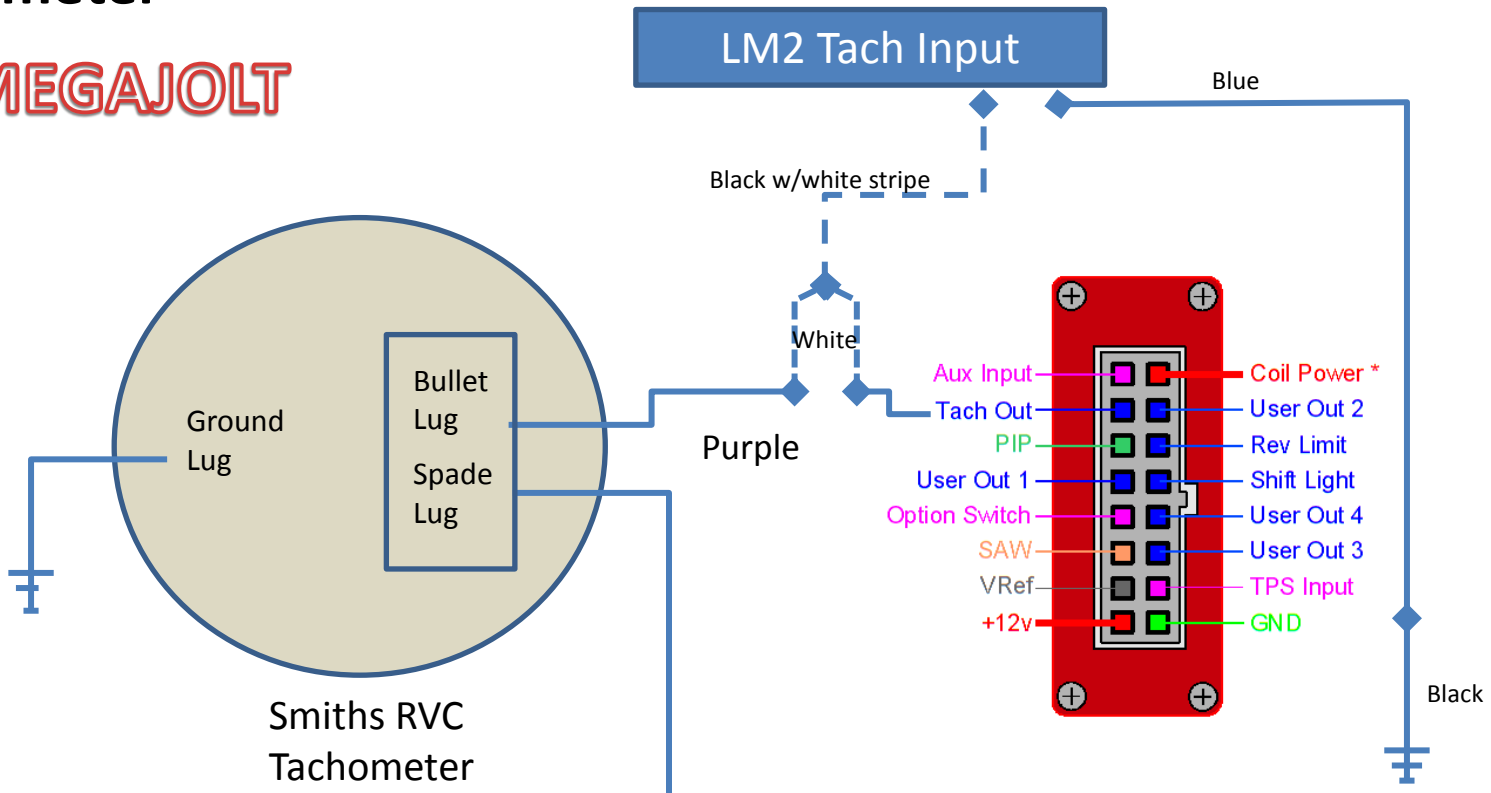
A LED must be connected the right way round, with its anode positive and its cathode negative. Otherwise it will not work, and it might be damaged.

There are two ways to spot the cathode. Usually one side of the LED is flat, and this on the same side as the cathode.

The cathode leg is also shorter than the anode leg.

Tachometer

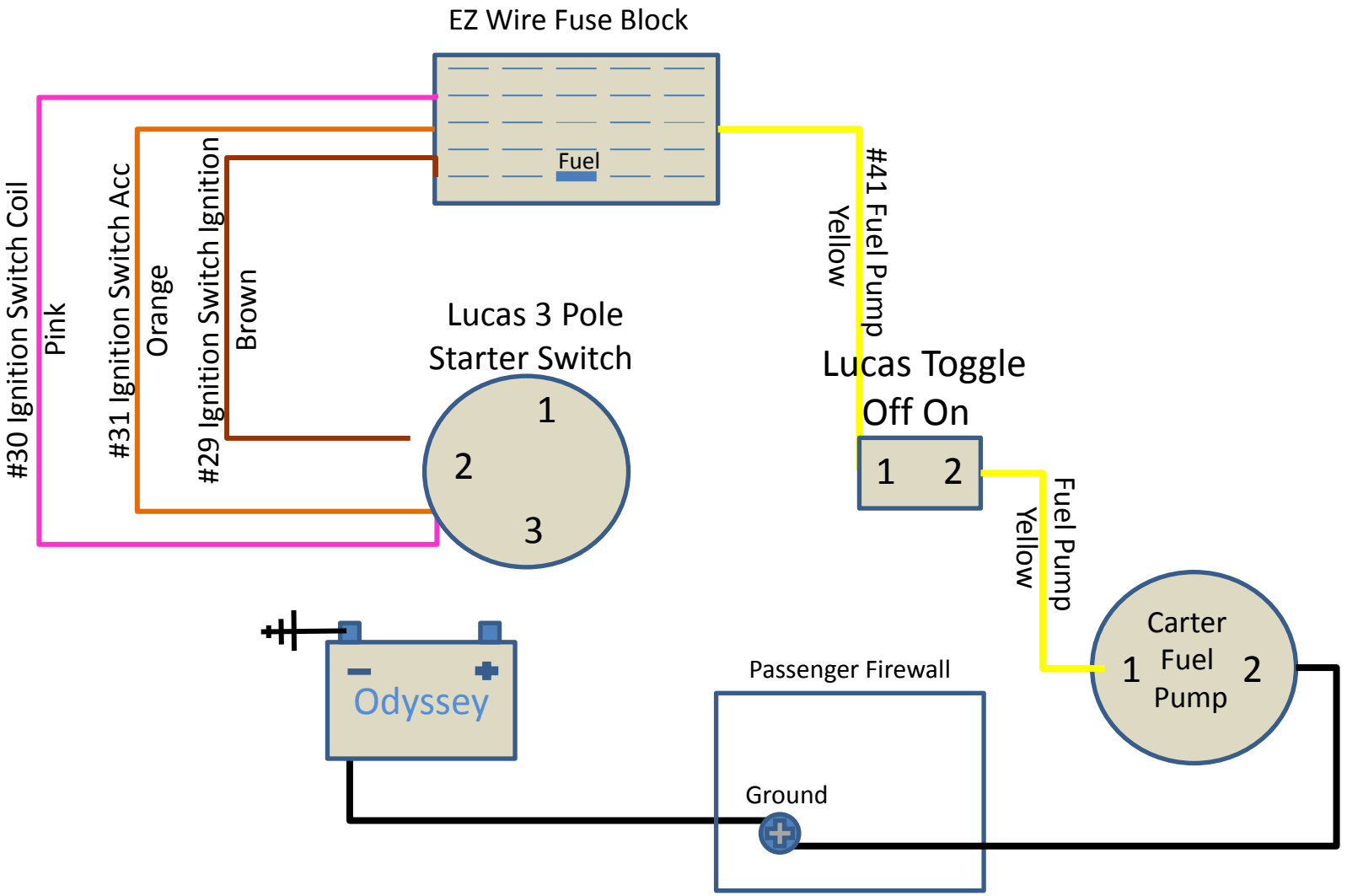
OER/MEGAJOLT



terminal 1 is for the power
terminal 2 is for trigger lead which will go to terminal on coil marked 'cb' or earth
terminal 3 is earth ; Source http://dosjebroseven.se/tips.htm

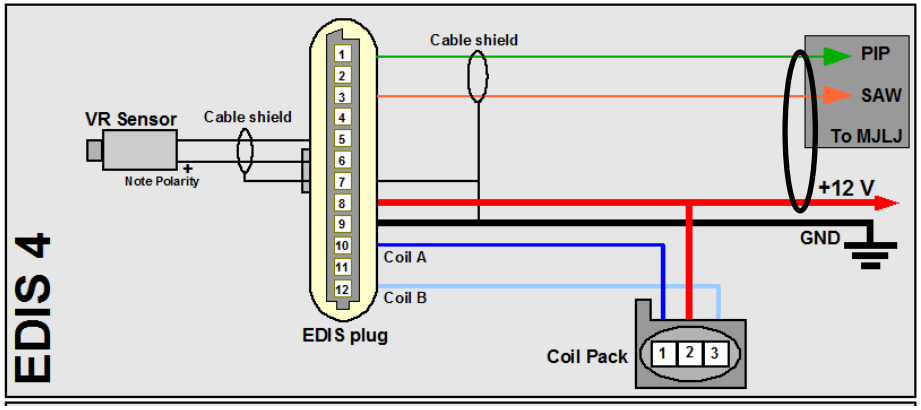
Fuel Pump

OER/MEGAJOLT

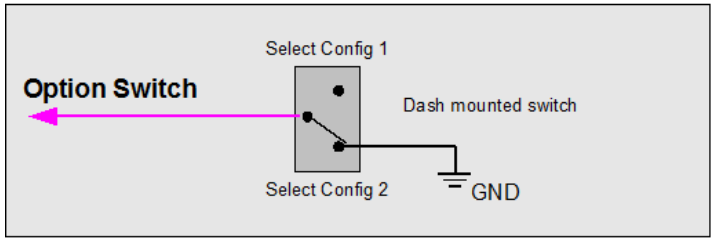


OER/MEGAJOLT

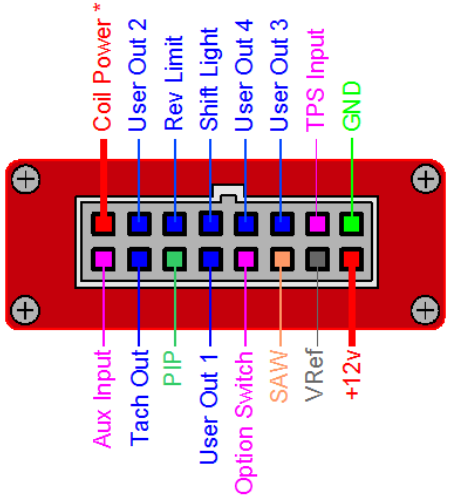
MegaJolt Lite Jr V4
Ford EDIS-4

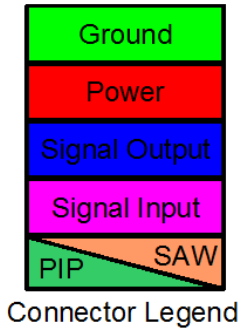


MJLJ V4.x Option Switch Wiring

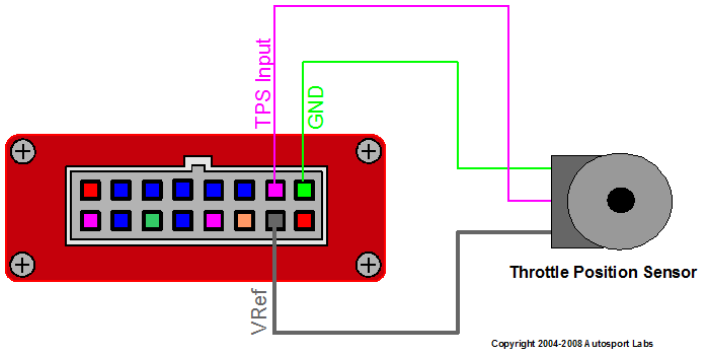


MegaJolt Lite Jr. V4.x connector pin-out





Megajolt Lite Jr. V4.x Throttle Position Sensor Wiring



Zetec Thermostat Housing Modification

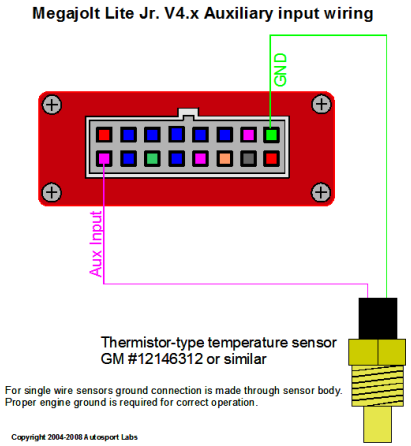
OER/MEGAJOLT

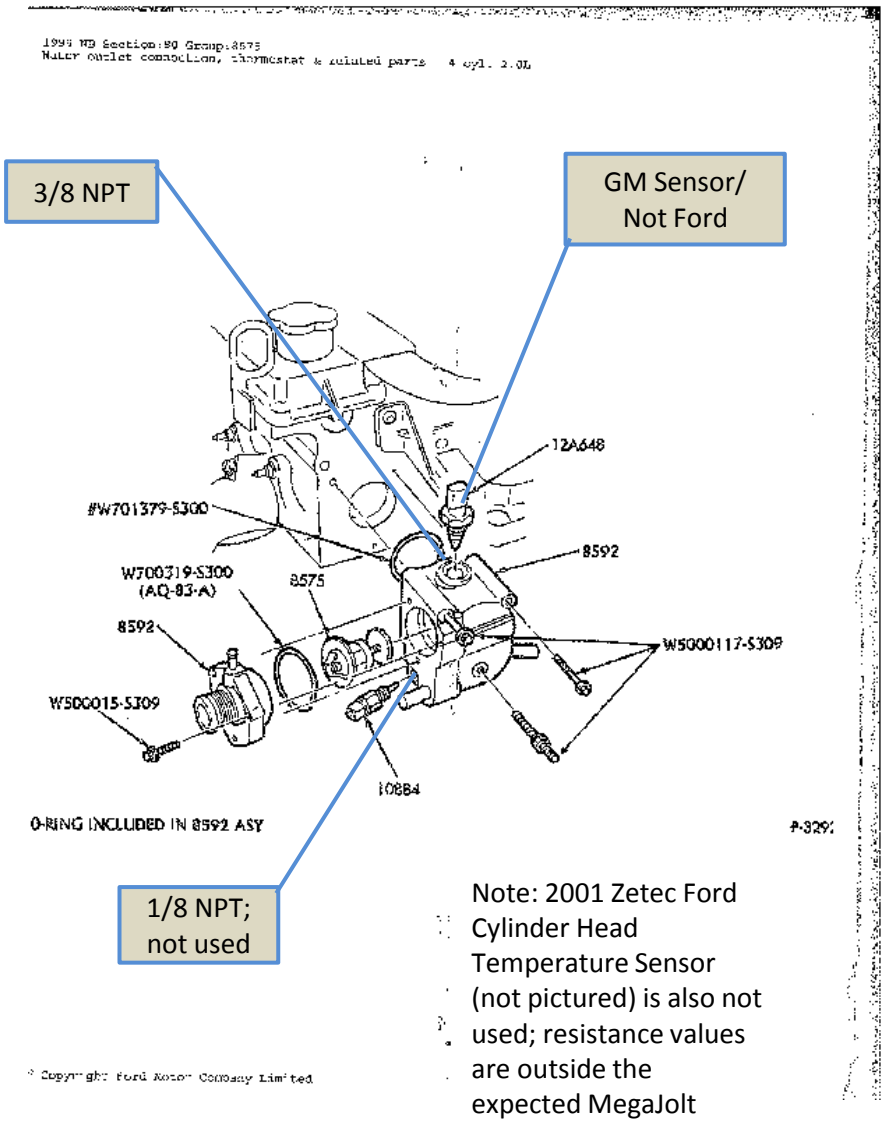
1999 Ford Contour 2.0L thermostat housing installed on 2001 Ford Zetec 2.0L head to provide a 3/8 NPT fitting to accept a GM Coolant Temperature Sensor

Replacement requires:

1 8592 Housing
1 8592 Outlet
1 8575 Thermostat
1 W700319-S300 O-Ring

1 GM Coolant Temp sensor
1 GM Coolant Temp sensor connector
Ordered from Boost Engineering
Same as
GM part number
12146312





Note: 2001 Zetec Ford Cylinder Head Temperature Sensor (not pictured) is also not used; resistance values are outside the expected MegaJolt range.

OER/MEGAJOLT

OER Jet Setup

Jets	Initial	4/16/11	4/17/11	4/17/11	4/22/11	4/30/11	1/6/12	4/15/13	7/22/13	11/4/13	7/1/14	7/4/14	7/5/14	7/5/14			
Emulsion	F4	F11	F11	F11	F11	F11	F11	F11	F11	F11	F11	F11	F11	F11			
Main (Increase size to enrichen)	145	145	145	145	145	145	145	145	145	150	150	130 drilled	119 drilled	130	130		
Air Corrector (decrease size to enrichen)	155	170	155	155	165	160	160	160	155	155	155	170	170	170	180		
Idle (F9 is richer than F8; Increase size to enrichen)	F950	F955	F955	F855	F855	F855	F855	F855	F855	F855	F855	F855	F855	F855			
Chokes	36	36	36	36	36	36	36	36	36	36	36	36	36	36			
Pump	40	40	40	40	40	40	40	40	40	40	40	40	40	40			
Idle Screw	1 turn	1.25 turns	1.25 turns	1.25 turns	1.25 turns	1.25 turns	1.25 turns	1.25 turns	1.25 turns	1.25 turns	1.25 turns	1.25 turns	1.25 turns	1.25 turns			
Needle/Seat	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8			
Air Filter/Screen	Screen	None	Screen	Screen	Screen	Screen	Screen	Foam	Foam	Foam	Foam	Foam	Foam	Foam			
Float Level. Baseline = 29mm from gasket to fuel level (unscrewing lowers float and leans mixture)	Base	-2 turns (lower)	No Change	No Change	No Change	No Change	-1.5 turns	-1.5 turns out	No Change	No Change	Back to OER spec (4mm higher then 11/4 setting)		-2 turns (lower)				
Comments		Too lean above 3000	Too rich across all RPMS	Too Rich over 3000	Stumbles on tip in	Good all around – Stumbles on hard lefts	Stumbled on hard autox rights	Lean over 3000	Runs out of fuel on long hard pulls	Rich at 3000 cruise; better top end	AFM 11.0 at idle – 9.5 at 3000 – too rich	Far too rich (9.0) across all RPMs over 3000	Too lean over 3K	Idle 12.5, but 10.9 at light throttle 4K, 14 at WOT			

OER/MEGAJOLT Weber Tuning Manual

TABLE No. 2

Size per cylinder in cc's	Idle Jet Fuel Bleed Hole Size in mm.
200	.35 or .40
250	.40 or .45
300-350	.45 or .50
400	.50
450-500-550	.50 or .55
600	.55 or .60
650	.60 or .65
700	.65 or .70
750-800-850	.70 or .75

TABLE No. 3

'F' Number	One Hole Type Hole Size in mm	Two Hole Type Hole Size in mm
F1		1.35
F2	1.30	
F3		1.60
F4	1.30	
F5	1.60	
F6	0.70	
F7		1.20
F8	1.20	
F9	1.00	
F10	No hole for use in IDA carburettors where air correction is in idle jet carrier or holder.	
F11	1.20	
F12	0.90	
F13		0.90
F14	1.20	

12.

TABLE No. 4

Idle jet air correction or bleed holes arranged from rich to lean

Rich	F6
	F12
	F9
	F8–F11–F14
	F13
	F2–F4
	F5
	F7
	F1
Lean	F3

PART 2

IDLE JET

Both the DCOE and IDA carburettors have an idle jet assembly which meters both fuel and air into the idle circuit.

At idling speed the idle mixture adjustment can be set to control the volume of mixed or emulsified fuel and air provided by the idle jet assembly and if a correct jet has been selected the setting of the idle mixture screw should be between a half and one full turn open.

As the throttle is opened from the idling position the throttle disc crosses a series of holes which are referred to as the secondary idle bleed circuit or progression ports. These are fixed holes having no adjustment and are also fed by the idle jet assembly. Naturally it is important that a controlled mixture is fed through them so that smooth acceleration takes place from idle until the main jet assembly comes into operation. The control of this mixutre is very closely associated with the idle jet air bleed (the 'F' number in DCOE units or the idle jet carrier in IDA models).

SELECTION

To determine these jet hole sizes, tables have been prepared, table number 2 deals with the fuel bleed hole designated by the numbers 35, 40, 45, 50, 55 etc. and the sizes are given in mm. against the capacity of each cylinder. Where an engine has Siamese inlet ports it may be necessary to go one size larger than quoted.

Table number 3 gives the size of the idle jet air correction or bleed hole or holes against each 'F' number in mm's. It will be seen that the 'F' numbers do not run in sequence, but in table number 4 they have been arranged in their order from rich to lean.

13.

EXAMPLE

Take a four cylinder engine of 1275 c.c., divide by 4, this is 319 c.c., per cylinder. From TABLE No. 2 it shows that both 300 and 350 c.c., can use, as a starting point, either a 45 or 50 idle fuel bleed hole size, but as the example has siamesed ports, 50 is the jet to start with.

To get a reading for the correct selection of the idle air bleed or 'F' number hole size, it is recommended that a midway choice, say F8 (1.20MM) be used which will give an idle jet assembly number of 50F8.

To check this selection, start engine and bring it up to normal operating temperature; leaving chokes, secondary venturi, mains, emulsions, air corrections, etc., as fitted. Carefully set the idle mixture screws (diagrams 1 & 2) to obtain the most even idling. This is done in conjunction with the idle speed screw (diagrams 1 & 2). Take time to allow engine to settle down after each adjustment—due allowance should be made if a competition camshaft is fitted as this generally produces rough idling.

PROGRESSION PORT CHECK. Having correctly set the idle speed mixture and rate, increase engine speed, by turning idle speed screw, to a point just below that at which mixture is seen to come from the secondary venturi discharge nozzle. To check for correct progression port mixture, turn idle mixture in and out.

If mixture is correct, turning screw either way will drop engine speed. Should speed increase when screw is turned in, it means the mixture is too rich. Conversely, if speed increases when screw is turned out, the mixture is too lean.

Correction of lean mixture may be accomplished by increasing the idle fuel jet diameter or reducing the idle air jet diameter. Determination for either of these can be found by reference to the number of turns out the the idle mixture screw had to be turned to achieve a smooth idle. Optimum setting on an idle mixture screw should be 1/2–1 turn out; if it was necessary to go beyond this setting and progression stage as outlined above is weak increase fuel jet diameter. If idle mixture screw setting was acceptable and progression stage is lean—decrease the idle air jet diameter. Should progression port mixture be rich, obviously the reverse procedure would apply.

This setting is very critical to ensure a smooth changeover from idle to main jet operation.

14.

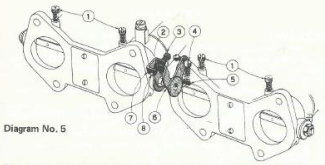


Diagram No. 5

To ensure proper engine idle operation with paired WEBER DCOE series carburettors proceed as directed below.

- Disconnect the tie rod at accelerator lever (6).
- Slacken the throttle setting adjustment screw (4) of the rear carburettor.
- Slacken screw (3) of lever (7) on front carburettor.
- Check spindles for free movement by actuating levers (6) and (7).

After performing the above check proceed with the synchronization of the opening of the throttles in both carburettors as follows:

- Press lever (6) so as to overcome the load of plunger (8) on lever (7) and make sure the throttles in both carburettors are perfectly closed.
- Still pressing on lever (6), turn screw (3) of lever (7) until it contacts lug (2) of lever (6).
- Under this condition, the throttles must result still set in fully closed position.
- Next, turn adjusting screw (4) until it rests lightly on lug (5) of lever (6).
- Tighten half a turn screw (4) and back out 3/4 turn from locked position the four screws (1) thus obtaining a rough adjustment of idle speed.

The final setting adjustment of engine idle speed rate must be made with engine warm and running, proceeding as follows:

- Initially adjust the minimum opening of throttles by operating on screw (4) until engine runs steadily.
- Next, by screws (1) adjust the mixture metering of each barrel to obtain the fastest, steadiest and more balanced rate allowed by the position of throttles as set above.
- Should engine idle operation still be unsatisfactory after these adjustments on account of an imperfect matching of the two carburettors, correct slightly the setting of screw (3).
- Then, reduce the opening of throttles by slackening screw (4), until optimum idle speed rate is ensured.
- Finally, re-connect accelerator control linkage tie rod.

15.

PART 3

CHOKE TUBE

The choke tube governs the gas speed through the carburettor.

As the choke tube and carburettor size is very closely associated the following information can be used as a guide to carburettor size selection as well, if this has not already been done.

The main points to be kept in mind when selecting choke tube sizes are as follows.

1) Use of the vehicle – road or track, if track a) hill climbing, good torque characteristics required, smaller chokes.
   b) Road racing, fast circuits which require more power at the top end of the rev. range, larger chokes. Slow circuits, which require better torque, smaller chokes.
2) Weight of the vehicle, the lighter the vehicle for a set engine capacity, increase the choke size.
3) Number of forward speed gears and gear ratios, with 5 and 6 speed close ratio gear boxes giving an ability to keep the motor up to maximum torque and power output, use larger chokes.
4) For engines of the same capacity and number of cylinders the following design features affect choke tube selection.
   a) Bore and stroke ratio – oversquare, this design allows for high revs, larger chokes, undersquare smaller chokes.
   b) Position and number of camshafts.
      i) Push rod, smaller chokes.
      ii) Single overhead camshaft, larger chokes.
      iii) Twin overhead camshaft even larger again.
   c) Valve Timing – where camshafts have a long duration of valve open- and a high lift larger chokes can be used.
   d) Exhaust system – a well designed extractor exhaust system, larger chokes.

The following tables numbered 5,6,7 and 8 give a guide to the selection of choke tubes for 4 cylinder (an inlet port per cylinder), 4 cylinder (siamese ports). 6 cylinder and V8 Engines respectively. The capacities given are in CC's per cylinder.

16.

TABLE NO. 5

A Guide to Choke Tube Selection

4 cylinder engine, with an inlet port per cylinder. (Push rod valve operated engines in production touring or sports cars e.g. Volvo, Morgan).

STATE OF TUNE OF ENGINE

Capacity Per Cylinder in cc's	Standard Choke Size in mm	High Performance Choke Size in mm	Competition Choke Size in mm	Carburettor/s
200			27	38DCOE. X2
250	27	28	30	38 DCOE. X2
	27	28	30	40 DCOE, X2
300	27	29	31	40 DCOE, X2
350	29	31	33	40 DCOE, X2
400	30	33	36	40 DCOE. X2
	30	32	35	42 DCOE, X2
450	32	34	36	40 DCOE. X2
	32	34	36	42 DCOE. X2
500	33	35	37	45 DCOE. X2
550	33	35	38	45 DCOE. X2
600	34	36	40	45 DCOE. X2

TABLE No. 6

4 cylinder engine, with siamese inlet ports. (Push rod valve operated engine, in production touring or sportscars e.g. Renault, MG Midget, M.G. 'B')

STATE OF TUNE OF ENGINE

Capacity per Cylinder in cc's	Standard Choke size in mm	High Performance. Choke size in mm	Competition. Choke size in mm.	Carburettor/s
200	27	28	30	40 DCOE X1
			30	42 DCOE X1
250	28	32	35	40 DCOE X1
	27	31	34	42 DCOE X1
300	33	35		42 DCOE X1
	32	34	38	45 DCOE X1
350	33	34	38	45 DCOE X1
400	33	35	40	45 DCOE X1
450	34	36	40	45 DCOE X1
500	36	38	40	45 DCOE X1

17.

TABLE NO. 7

6 cylinder engine, with an inlet port per cylinder. (Push rod and overhead camshaft valve operated engines in production touring and sports cars. e.g. Triumph 2000, GT6, Jaguar 'E' Type.)

STATE OF TUNE OF ENGINE

Capacity per Cylinder in cc's	Standard Choke size in mm.	High Performance Choke size in mm.	Competition Choke size in mm	Carburettor/s
300	27	28	30	38 DCOE X3.
	27	28	30	40 DCOE X3.
350	27	29	31	40 DCOE X3.
400	28	30	33	40 DCOE X3.
	28	30	33	42 DCOE X3.
450	30	31	34	42 DCOE X3.
	30	30	34	45 DCOE X3.
500	30	32	35	42 DCOE X3.
	30	30	35	45 DCOE X3.
550	32	33	36	42 DCOE X3.
	32	32	35	45 DCOE X3.
600	33	34	36	45 DCOE X3.
650	33	35	38	45 DCOE X3.
700	36	38	40	45 DCOE X3.

TABLE NO. 8

V8 Engine, with an inlet port per cylinder (Push rod valve operated engines in production touring or sports cars. e.g. Mustang, Corvette).

STATE OF TUNE OF ENGINE.

Capacity per Cylinder in cc's	High Performance Choke size in mm.	Competition Choke size in mm	Carburettors.
450		38	48 IDA x 4.
500		39	48 IDA x 4.
550	38	40	48 IDA x 4
600	38	41	48 IDA x 4
650	40	42	48 IDA x 4
700	40	43	48 IDA x 4
750	42	44	48 IDA x 4
800	42	45	48 IDA x 4
850	42	45	48 IDA x 4

18.

PART 4.

Secondary or Auxiliary Venturi.

Secondary venturies are supplied in the following sizes 3.0, 3.5, 4.0, 4.5, 5.0 depending on the various model DCOE and IDA carburettors. These sizes relate to the cross feed hole which delivers fuel from the main jet assembly. The feed hole is rectangular in shape having a radiused edge at feed end and tapered slightly towards the delivery point in the venturi proper.

Small secondary venturies (3,5) should be used where a large choke tube has been selected in relation to the cylinder capacity.

PART 5.

Main jet, Emulsion Tube, Air correction jet Assembly.

This assembly screws into a fuel well having three delivery points.

1) Bottom – inlet hole through which the main jet draws fuel from the float chamber.
2) Top – Air inlet through which the air correction jet supplies air to the emulsion tube.
3) Side – mixed or emulsified fuel and air outlet to the secondary or auxiliary venturi.

Function

When the air flow through the secondary venturi is of sufficient velocity, fuel is drawn from the annular space in the emulsion tube well. This space can be varied by the use of emulsion tubes having the same number, size and disposition of holes but of different diameters e.g. F2 and F15; F3 and F7. Therefore to obtain a large initial flow of fuel a small diameter emulsion tube should be used. As the fuel level drops in the well, the main jet replaces it up towards its normal level subject to the volume of fuel being drawn from the emulsion tube well through the secondary venturi. The rate of fuel drawn from the emulsion tube is governed by the air speed through the secondary venturi and this speed varies according to the engine demands, consequently as the fuel level drops, it uncovers the correction holes in the emulsion tube, resulting in a corrected mixture. So it will be seen that a number of factors control the delivery of fuel to the engine.

1) Size of the secondary Venturi.
2) Diameter of the emulsion tube.
3) Size of the main jet.
4) Size of the air correction jet.
5) Number and disposition of air bleed holes in the emulsion tube.

Dealing with the above items, 1 and 2 have already been disussed, Item 3, the main jet, usually can be calculated, as a good starting point by multiplying the choke tube size by 4, e.g. 30 choke tube multiplied by 4 equals a 120 main jet.

19.

Item 4, the air correction jet size, does not have a simple formula as the main jet. It can be classified in three basic groups.

a) Standard and high performance engines using DCOE carburettors, (but not siamese ported 4 cylinder engines) the air correction jet size is usually the main jet size plus 60, e.g. 120 main gives a 180 air correction jet.
b) DCOE carburettors used on racing engines, the air correction can be as suggested in a) or the same size as the main jet (this is usually the case when large choke tubes are used in relation to cylinder capacity and carburettor size) e.g. 2.5 litre 4 cylinder Coventry Climax engine 58 DCO 3 carburettors 47mm chokes 200 main jets and 200 air correction jets.
c) IDA carburettors only on competition vehicles, the air correction jet is usually the main jet size minus 50 to 60. A 170 main uses a 110 to 120 air correction jet.

TABLE No. 9

Selecting an Emulsion Tube

NORMAL FUNCTION	TYPE
Most current usage	F2–F3–F4–F7–F9 F11–F14–F15–F16–F20
To richen at low RPM and/or during minimal acceleration	F7
To weaken at low RPM and/or during minimal acceleration	F2–F3–F11–F14 F15–F16
To lean top end when air correction jet is bigger than 2.00 mm.	F11–F19
Alcohol usage	F2–F3–F4 F7–F17

EMULSION TUBE PART No's.

The following are all applicable to 38, 40, 42, 45 & 48 DCOE & 48 IDA.

PART No.	REF.	PART No.	REF.
61450.026	F1	61450.064	F34
61450.027	F2	61450.071	F6
61450.028	F3	61450.091	F7
61450.029	F5	61450.092	F8
61450.030	F9	61450.111	F10
61450.031	F11	61450.131	F12
61450.032	F15	61450.166	F14
61450.061	F4	61450.181	F16
61450.062	F17	61450.210	F19
61450.053	F20		

20.

PART 6

Accelerator Pump – Power circuit

The pump circuit is made up by several parts, listed below are the items in order of their operation.

1) Intake valve.
2) Pump well.
3) Pump rod, spring and piston assembly.
4) Exhaust orifice.
5) Pump jet.
6) High speed power device.

1) Intake valve, this is found in the bottom of the float chamber between the "jet block" and the pump well. The valve incorporates the exhaust orifice 4) which shall be explained later. The intake valve is a fixed size and therefore is not necessary to consider when tuning is being carried out; its function is to allow fuel to pass into the pump well.
2) Pump well is a fixed size store for the pump jet, but is metered by two units, the pump rod and the exhaust orifice.
3) Pump rod, spring and piston assembly, the pump rod governs the amount of fuel in the pump well. The DCOE model carburettor has varying lengths of rods available to change this volume factor while the IDA unit can be changed by the use of a collar on the pump rod to shorten its stroke. Piston spring, the speed of thrust of the pump piston can be altered by the use of springs of different pressures.
4) Exhaust orifice: the feature of this unit is to control the amount of fuel at the disposal of the pump jet. Consequently there are varying sizes of this unit starting with the "closed" or type with no exhaust orifice which gives the pump jet all the fuel available in the pump well to the pump jet, whereas the others exhaust an amount in accord with their size back into the float chamber.
5) Pump jet, this does exactly as the name suggests, and that is to meter the amount of fuel available from the pump well or govern the volume and time of flow of fuel.
6) High speed power device, in the DCOE and IDA carburettors the pump jet also acts as a high speed power device. When the depression in the carburettor bodies or throats becomes great enough, the ball and rod weight is lifted off its seat in the DCOE and a ball check valve in the IDA and fuel bleeds into the system via the pump jets.

For assistance in the selection of the pump circuit parts, refer to table number 12, the suggested jet setting list.

21.