CAT CHAT YOUR OWN MAGAZINE

ANNUAL MEMBERSHIP SUBSCRIPTION IS £22 due January first.

Since the summer of 2002 I have been producing the Wildcat Owners Club magazine 'Cat Chat' many of you will be aware of the amount of time it takes to research, find photos and make sketches that fill the magazine. Building the Spanish flyer keeps me going with a few pages and then I have the off shoots I need to complete a talk which ends up as an article for you to think about. However it's a difficult job to write 40 plus pages every other month and think of things that might interest you. Frankly I am about used up on ideas. Next year I must look towards you all to supply me with articles photos of the car or the car on holiday or at shows, notes ideas, venues, whatever you found good for your car, polish, parts etc and let me know so that I can pass it on to others. QA few words to accompany the information would be extremely helpful as a photo of a car on a wind and rain swept beach in July goes not give me a lot to go on. It is through these members of the club that I will be able to produce your bi monthly magazine and give you the opportunity to improve your Wildcat and I really do need your help in keeping the club magazine going. I may be reduced to telling you how much I made in the swear box this year. We have several new and overseas members and I hope to hear from them about their cars, not necessarily the Wildcat.

This booklet contains many articles that are new and some that have appeared in the magazine over the last year or so and will be new to some of you. I hope you will find this booklet informative and interesting but it's far from being definitive on what modifications can be done and understanding the working of your car, that would take a very long time, but at least it's a start. Austerity Thanks to our club Sec and our printers and we are holding the subscription at £22 for another year. Alan Hart Editor December 2014

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Wildcat Owners Club 2014

Wildcat Workshop 4

INDEX

3	Soldering wires together
4	Changing brake shoes
7	Suspension anomalies
8	Wire wheel spokes
11	Testing the alternator
12	Trace a short circuit
15	Vibration
17	Engine cooling Pt 1
21	Engine cooling Pt 2
26	Harrington bumpers
33	Voltage drop short finding
36	Windscreen radio aerial
38	Wing mirror positioning
39	Voltage stabilisers
41	One push one wipe
42	Understanding relays
45	Soldering with a third hand
46	Shine and repair bodywork
47	Red oil light
49	Electro plating
51	Metric tapping chart
52	Understanding screw threads
53	Setting head light beams
55	Changing tyres affects speed
57	Changing to LED Lights

The Kelvin (K) (absolute) temperature scale describes the colour temperature or the "whiteness" of incandescent lamp light. By convention, yellow-red colours are considered warm and blue-green casts are considered cool. In reality, higher Kelvin temperatures (3600-5500K) produce cool tones of white, while lower colour temperatures (2700-3000K) produce warm colours. The whiter the white, the more brightness is perceived in a given space.

The higher the Kelvin, the whiter and brighter (higher Lumens) the lamp will produce.

When choosing an LED lamp compare how many Lumens the new LED lamp produces with how many Lumens your old lamp produces. You may be tempted to go for the kiss ass lighthouse LED such as the X-tremeVision LED 6000k Xenon but I read somewhere that 4000k was the limit for road legal lights. But I blow that away later

I wanted to finish of by suggesting a certain type of LED for rear lights. but after two day of trawling the net the only comparisons on to conventional filament (or incandescent) lights are related to household lighting which is not much use unless you run an electric car when the study reading light is hidden on the boot and shines through two holes. Strangely there appears to be no current there legislation regarding the intensity (Lumens) of light emitted from either rear of brake lights.

I do know that some chips are able to emit more than 100 Lumens per watt (L/W). I doubt you want top know this but it's a dinner party silence breaker.

- Lumens = Watts x Lumens per Watt
- So a 5w lampx100L/W = 500 Lumens

An LED producing 70L/W is termed as very good. So by that I would guess that it gave out twice as much light as a standard lamp. Table 1 uses 70L/W in the calculation).

Important LED Features

LED bulbs have many features that can make them either a good or a bad choice for installment within a vehicle. It is important to be aware of these characteristics, as the LED market offers a fairly big selection. Knowing what to look for ensures that the bulbs purchased do not fall short in meeting requirements. What is interesting is the 'Intensity

Feature	What to look for
Angle of illumination	The wider the angle is, the better. (Recessed is not good)
Low/high distinction	Lamps that offer two levels of brightness (Dim/Dip or Rear/ Stop) should have a big distinction in light intensity.
Compatibility	Easy instalment is important. (Direct replacement)
Intensity	The LED bulb intensity should not be under the recommended level for the position where it is installed. (See table 1)

which should not be under the recommended level'bit, which nobody seems to be able to define. I can only assume this is the wattage associated with the normal filament lamp, which can range from side lights at 4W to main beam which is 55/60W and rears at 5W and brake at 21W.

So using 70 Lumen/watt as a start point, Table 1 left gives you some indication of the Lumens you need your LED to produce to better the standard lights on your car. Sorry it's the best I can do. You will know if your lights are too bright as someone in the queue behind you will kick them in at the first opportunity.

Table 1 Lamp position	12v /Watts	Required LED Lumens
Side lights	4W	280L
Rear Lights	5W	350L
Stop/Brake Lights	21W	1470L
Main beam	55/60W	3850L

G

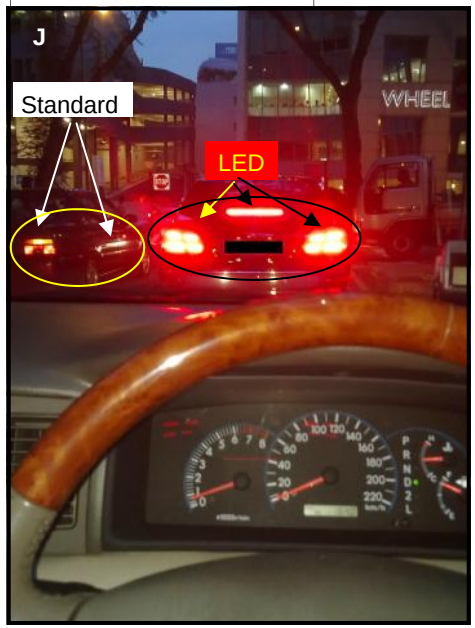
Standard

When night driving you need to feel that those behind can see your driving lights and your brake lights are bright enough for a warning you are stopping or slowing down.
No matter what bright light you may put into E and F its unlikely to make any real difference to the original light because of its recessed position. Although in all fairness this not an unusual practice on modern cars where side view of lights is limited. Its my view that having good rear lights is a must but on the other hand they should not be so bright as to blind someone behind you. Demonstrated by two cars side by side one with standard lamps and the other with LED's as shown in J.
There is no doubt in my mind the standard light needs improving and that the LED lights are too bright.
Having got this far and assuming you don't have E Type rear lights fitted, how can you improve your rear lights so everybody knows you're there. Well its not only viewing from the rear you should also show some side indication as well. So I would go for the Standard rear light which has a raised bowl Fresnel lens. (I should point out most lamp covers are the Fresnel lens type so don't ask for them you will only confuse shop owner). Rather than buy new lamps you can change the filament lamp for an LED lamp which has all round luminosity as shown in K. This has illumination at the front and the sides of the lamp giving excellent all round light. Most of these are interchangeable with the filament lamp. In fact you can buy dip/main beam LED lights to replace the normal filament and are H4 12w 6500K with four LED producing white light. The k represents temperature and the colour of the light. Ie white/blue.
Temperature is another factor to bear in mind. Hot temperature experienced when removing a standard lamp after it has been burning for a while tend to remove your fingerprints for a month where the L:ED, although warm is easily handled. As with any electrical item, keeping them cool is always a good thing.
LED lamps also have a live far in excess of the standard lamp, plus they are reported to last 50,000 hours without replacement which is over 5 years of continuous operation. Try getting that out your standard filament lamp. The problem with filament lamps is the bit of curly wire (filament that wobbles about) and because of its thermal cycling becomes brittle and eventually breaks.

H

LED

J



K

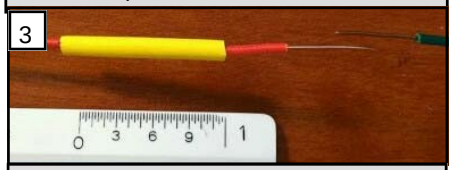
L

SOLDERING TWO WIRES TOGETHER

1 Heat controlled Soldering Station

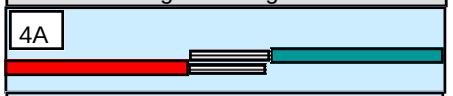
1. Turn on the soldering iron and adjust the knob so that is 3/4 of the way to full power. (Temp 230+°C for 60/40) Allow it to warm up for 8 minutes.

2. Strip back 6mm of insulation

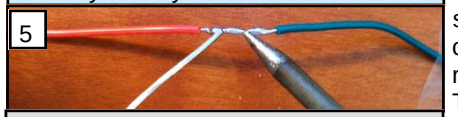


3. Heat Shrink sleeving to cover joint

4. Twist together single core wire



4A. Lay side by side for multi-core wire



5. Apply solder to wire

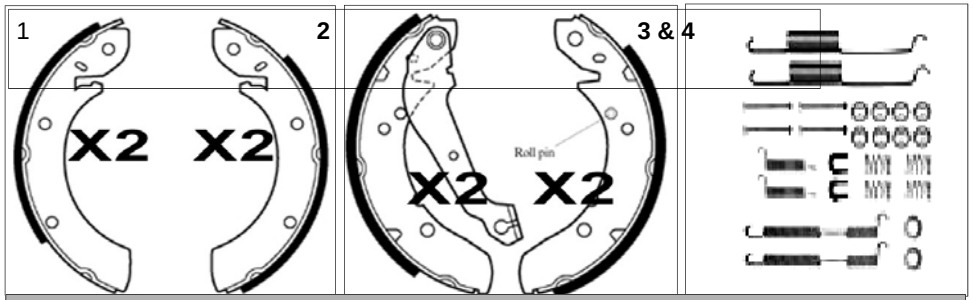
6. Apply heat to HSS to insulate joint

Wires are a necessary part of working with electronics. It is inevitable that, one day, you may need to connect two wires -- either because of an accidental shear or the need for a longer wire. Luckily, soldering two wires together is the one of the easiest things to solder and a great introduction to using a soldering iron. I recommend 60/40 solder (60%tin/40% lead). Tip, transfer the solder to the wire NOT solder to the soldering tip then the wire.
1.Get yourself a soldering station that has variable soldering tip temperatures
2. Get the two wires to be soldered together and strip back half an inch (or 6mm whatever suits you best! of insulation. (Fig 2) Make sure the battery is disconnected or the power is off on the leads.
3. Once soldered together you will need to insulate the bare cable. Lasso/insulating tape is not the best stuff to use its better to pay out £2 for some heat shrink sleeving (HSS) and do the job properly.
Cut a piece of HSS 1" (25MM) long and place a it over one of the wires and move down the wire away from the soldering area. (Fig 3) If it gets too close the heat from soldering will activate its shrink quality. You might like to use red HSS for a power line, black or green for the earth wire.
4&4A Depending on the wire type you have two options for manually joining the wire. Twist them together if they are a single core copper wire shown in Fig 4 or lay them side by side as in Fig 4 A if they are multi cored wire.
5. Place the hot soldering iron on the bare wires for two seconds, just to warm the wires, (DANGER– too much heat wire melt the insulation on the wires) Apply enough solder to the wires (not the soldering iron) to cover the entire copper wire surface, and then remove the solder and soldering iron.
Tip. Clean off any excess flux as this may contain a corrosive elements.
6. Two ways you can shrink the sleeve, by using the heat from the body of the soldering iron or you can use a hot air gun. If you use a hot air gun be sure to rotate the wire so both sides of the HSS shrink onto the wire and around the soldered joint.

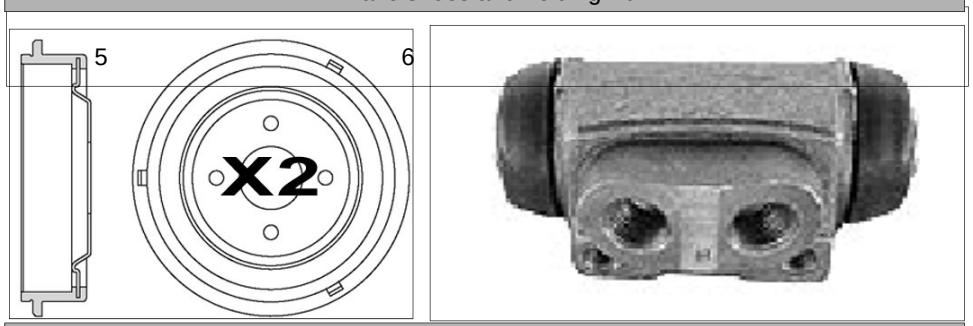
CHANGING THE BACK BRAKE SHOES

I am always a bit apprehensive when I do anything to the rear brakes. Most apprehensive is 'have I got the right replacement brake shoes? I found a web site for you that sell the Ford Cortina brake shoes for models from 1977 to 1982 Mk 4/5 and 2.3 V6 which is Brakepartssuperstore.org.uk. The part number s are

1.	Brake Shoes Models built up to 1979 228.6 x 45.0mm	BS S7087 6245	£19.64
2.	Brake shoes Models built after 1979 228.6 x 45.0mm	BS S7512 6245	£21.84
3.	One Brake Shoe Hold down kit (Use with BSS7087)	BS S7087	£11.55
4.	One Brake Shoe Hold down kit (Use with BSS7152)	BS S7087	£8.90
5.	Two Brake Drum	BDR6149 245	£47.88
	Four hole mount I.D 229-230mm. OD 273.5mm. Height 70mm		
6	Wheel cylinder I.D 17.8mm	BWC5082 6245	£6.72



Brake shoes and holding kit



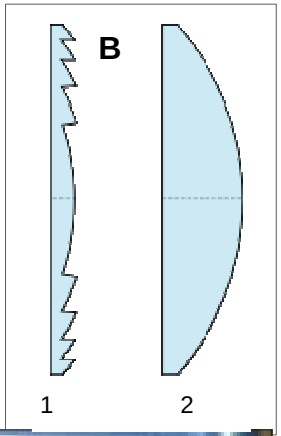
Brake drum and wheel cylinder

Drum brakes are easily produced and can be used on the rear of a vehicle were only about 30% of the braking is created. Sometimes special brake shoe removal tools are required. Rear brake shoe performance can be affected when wet and the braking ability can be greatly diminished.

Before you begin, park the car on a level surface, block the front tires to prevent the vehicle from moving. You will be dealing with asbestoses which is a hazardous material so wear protective gloves, clothing and eyewear.

Have a good look at the drum and identify all the parts. Clean out the brake dust and don't breather in the dust particles. Swipe the drum down to make it as clean as you can which just makes working on it a bit easier and cleaner.

GLIMS, LIGHTS, LAMPS, BULBS, LED'S WHATEVER!



Alan Foxton before fitting jag lights

Paul Johnston's pre paint round recessed lights

Here's a new word for you the 'Fresnel' lens Its used in lighting and reduces the amount of material required compared to a conventional lens by dividing the lens into a set of concentric annular sections as shown in Fig A. In some lenses, the curved surfaces are replaced with flat surfaces, with different angle in each section. Rather like pyramids close together. Fig B shows:

1: Cross section of a spherical Fresnel lens

2: Cross section of a conventional spherical convex of equivalent power.

So you can see the material saving plus the Fresnel lens concentrates the light onto the outer surface of the lens. That's how you front and rear light lens gives such a diffused, even light over its surface rather than a 'beam' of light.

- The Wildcat has front indicator pods using a lens like Fig C and rear lights as shown in the three examples of Wildcat rear lights.
- D is the typical Wildcat box light that serves rear light, brake light, indicator and reflector.
- E shows a similar box type lamp holder but recessed into a rear scoop into the boot area.
- F shows round individual lamps let into the bodywork just below surface level

Whilst D is the best type of light for all round illumination in terms of angle the light can be seen,

E and F are the most elegant but with the worst possible position for viewing the light emittance from the side.

However in today's modern world, lamps have become brighter with 'all round' Lumens rather than the standard filament lamp, (you recall I worked in the electronics industry for about 7 years and learnt on the first day that you plant bulbs and light lamps!), these are called LED lights.

Speed is the measurement of distance over time. But a car speedometer doesn't actually measure how fast you travel from Point A to Point Boca Speedos usually work by measuring rotation of the car's driveshaft, axle or wheel. Then use some basic maths to extrapolate that rotation and determine how fast you are travelling. It's a very similar concept to a bicycle speedometer. However, if the diameter of the wheel/tyre alters, the extrapolation calculation will be incorrect. For example, the diameter will increase if you put new tyres on the car (more tread, which wears down over thousands of miles) or increase the tyre pressure. This means that, for each revolution of the wheel, the car is travelling further, meaning your speed is greater.

If the diameter decreases (eg – worn tyres, less air in the tyres, a different brand of tyre with slightly different dimensions, more load in the car weighing it down and compressing the tyres), then the car will be travelling a shorter distance for each revolution of the wheel, therefore you will be going slower.

Margin of error in a car speedometer

The differences in wheel diameter resulting from the above circumstances could be tiny (maybe a few millimetres), but at 30mph your car wheels are rotating 6-7 times every second, so it can quickly make a difference of a few miles per hour. This margin for error is taken into account in how the law is applied, and how manufacturers calibrate their car Speedos.

How a sat-nav speedometer works

Satellite navigation units (either portable or integrated into the car) calculate your car's speed by measuring actual distance travelled over time using GPS satellite tracking. They repeatedly locate your exact position on earth via satellite and calculate how far you have travelled, then divide by the time it took for you to travel that distance. Sat-nav accuracy is determined by satellite signal quality and is unaffected by your car's tyres. Many sat-nav's are unable to account for changes in vertical direction, so may be less accurate if you are travelling up or down a steep hill. They are also inherently more accurate at higher speeds, as a larger distance over time reduces rounding errors, but a Sat-nav will usually be much closer to a car's true speed than the speedometer.

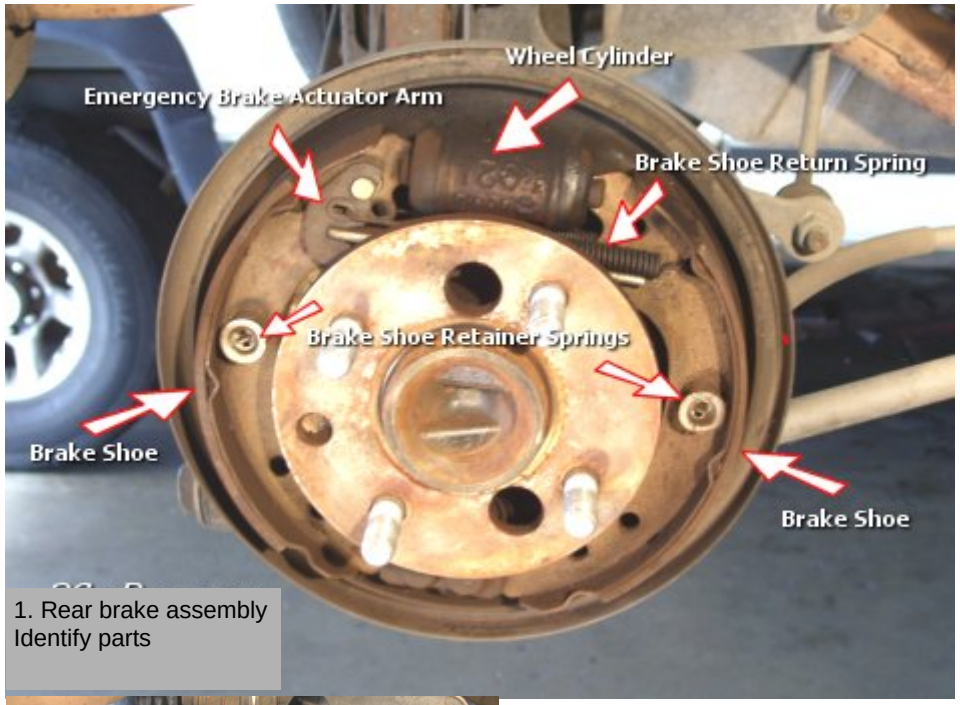
Some factory sat-nav systems will also use data from the car to integrate with the GPS signal to improve overall accuracy.

The law for car speedometers in the UK

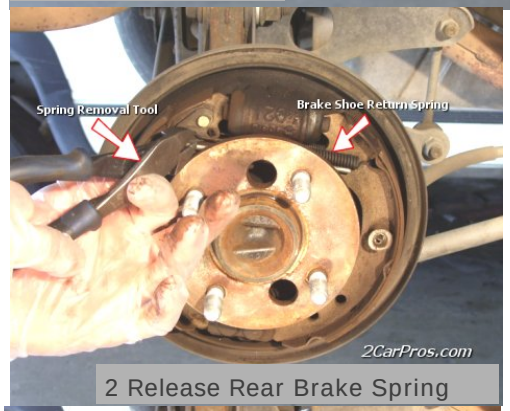
The UK Law is based on the EU Standard with some minor changes. A Speedo must never show less than the actual speed, and must never show more than 110% of actual speed + 6.25mph.So if your true speed is 40mph, your Speedo could legally be reading up to 50.25mph but never less than 40mph.Or to put it another way, if your Speedo is reading 50mph, you won't be doing more than 50mph but it's possible you might actually only be travelling at 40mph.

To ensure that they comply with the law and make sure that their speedometers are never showing less than true speed under any foreseeable circumstances, car manufacturers will normally deliberately calibrate their Speedos to read 'high' by a certain amount. Your sat-nav is not the designated device by which a car's speed is measured, it does not need to incorporate any fudge factoring.

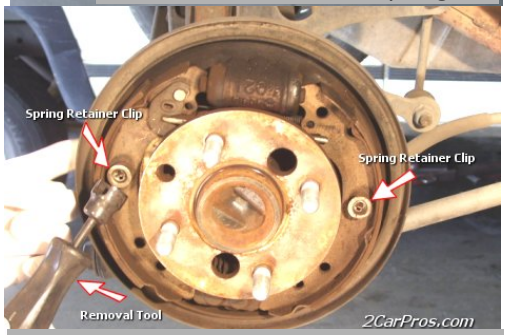
One particularly handy gadget is 'Road Angle' It gives loads of information like black spots, speed cameras but primarily its read out is MPH which makes it easier to see your speed when mounted on the windscreen than looking at the Speedo.



1. Rear brake assembly
Identify parts



2 Release Rear Brake Spring



3 Release Rear Brake Shoe Hold Downs

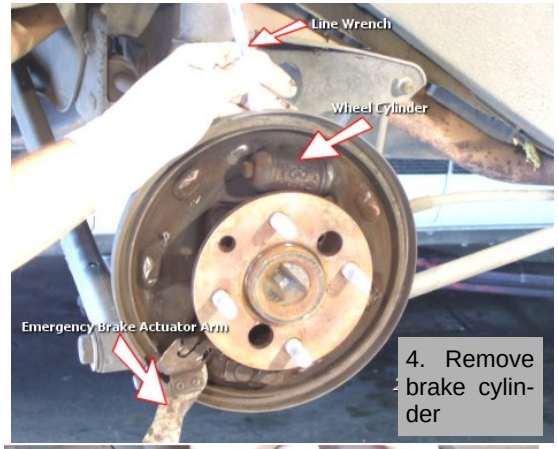
Remove brake drum to inspect brake shoes for wear. If the brake material is less than 1/8 inch, they need to be replaced in most cases.

Check the wheel cylinder for leaks. Remove the dust boot from the side of the wheel cylinder and check for brake fluid leaks. If brake fluid is present the wheel cylinder needs replacing. Also check brake shoe hardware, return and mounting springs, and replace if damaged or broken.

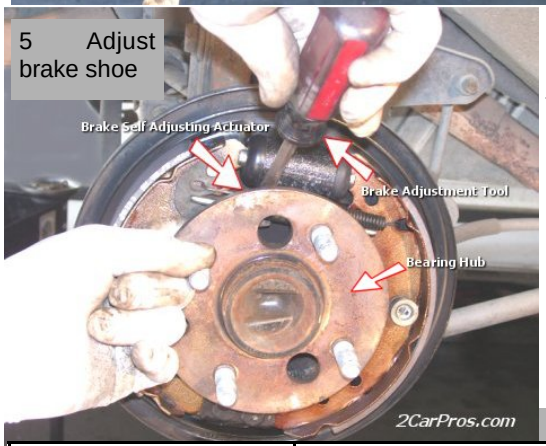
Use the brake spring tool to remove the return spring to each of the brake shoes. (Fig 2) Hold the rear of the retainer pin. Insert brake shoe removal tool over retainer clip, press down and twist counter clockwise. (Fig 3) Remove spring and retainer. Inspect and replace as needed.

Then remove the rear brake shoes and remaining hardware.

Match the old brake shoes to the new brake shoes. Both sets should match up exactly. Then transfer hardware to new brake shoes.



4. Remove brake cylinder



Reassemble with new brake parts and make sure all the brake hardware is mounted correctly.

Note: when changing rear brake shoes, only disassemble one side at a time so you always have a reference copy on the side that is still together.

After brake shoes have been installed they need to be adjusted. Normally they are self adjusting but the first time after installation, a primary adjustment must be made.(fig 5) After installing the brake drum and spinning it on the bearing hub, adjust the brake shoes to lightly contact the brake drum and recheck regularly. After the brake shoes are adjusted, bleed the brake system until free from air in the brake fluid and leaks. Test brake system before driving.

Remember these are the things that stop you bumping into other cars. Its important you check them at least once a year

CAUTION: DO NOT DRIVE OR MOVE VEHICLE UNTIL NORMAL BRAKE PEDAL OPERATION IS PRESENT!

	**Rear Brake Shoes -** The rear brake shoe is actuated by wheel cylinders that force the brake shoe against the brake drum with hydraulic pressure from the master cylinder.
	**Wheel Cylinder -** Brake fluid pressure from the brake master cylinder is applied to the brake wheel cylinder forcing the brake shoe against the brake drum.
	**Brake Drum -** The brake drum is used to slow the wheel speed through braking action. The brake shoes are applied to the drum to cause friction.

WHY CHANGING TYRES AFFECT YOUR INDICATED SPEED


Some of the Wildcat owners have taken to changing the Cortina wheel to larger ones. And I wondered if this affected the Speedo? Of course it does but for an explanation why it does this is the reason why.

No speedometer can be 100 percent accurate. In fact, most manufacturers build speedometers so they fall within a fairly narrow tolerance range, no more than 1 percent to 5 percent too slow or too fast. As long as a car is maintained at factory specs, its speedometer should continue to register vehicle speed within this range. But, if a car is modified, its speedometer may need to be recalibrated. This can be done by Speedy Cables for £65

You will have to go to the Speedy cables web site and fill in three questions.

To ensure that your speedometer reads accurately when fitted to your particular vehicle, we will need to calculate the required "revolutions per mile" >>>>

For calibration of a new instrument, or re-calibration of an existing instrument, we will need you to provide the following information from your vehicle...

(1) Take the measurement from the centre of the hub of a drive wheel to the ground, with the tyre pumped to normal pressure.

ANSWER:(1)_____ distance in Inches

(2) Put a chalk mark at the bottom of the measured wheel also marking on the ground where it meets. Push the vehicle forward one revolution of the chalk mark and record the distance travelled

Answer:(2) _____ distance in Inches

(3) Now disconnect the speedometer and place a cardboard arrow on the end of the protruding inner speedometer cable.

Put a chalk mark at the bottom of the measured wheel and then push the car straight forward (with gear in neutral), counting exactly 6 revolutions of the wheel, whilst a partner counts the number of times that the arrow on the cable revolves.

ANSWER:(3)_____ number of turns of the cable. (N.B. include parts of a turn e.g. seven and a quarter turns).

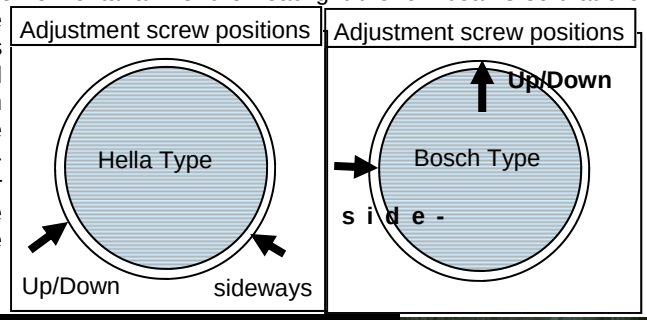
Changing tyre size is one of the most common things car owners do that can affect speedometer accuracy. That's because larger tyres cover more ground in one complete revolution. Consider the example below.

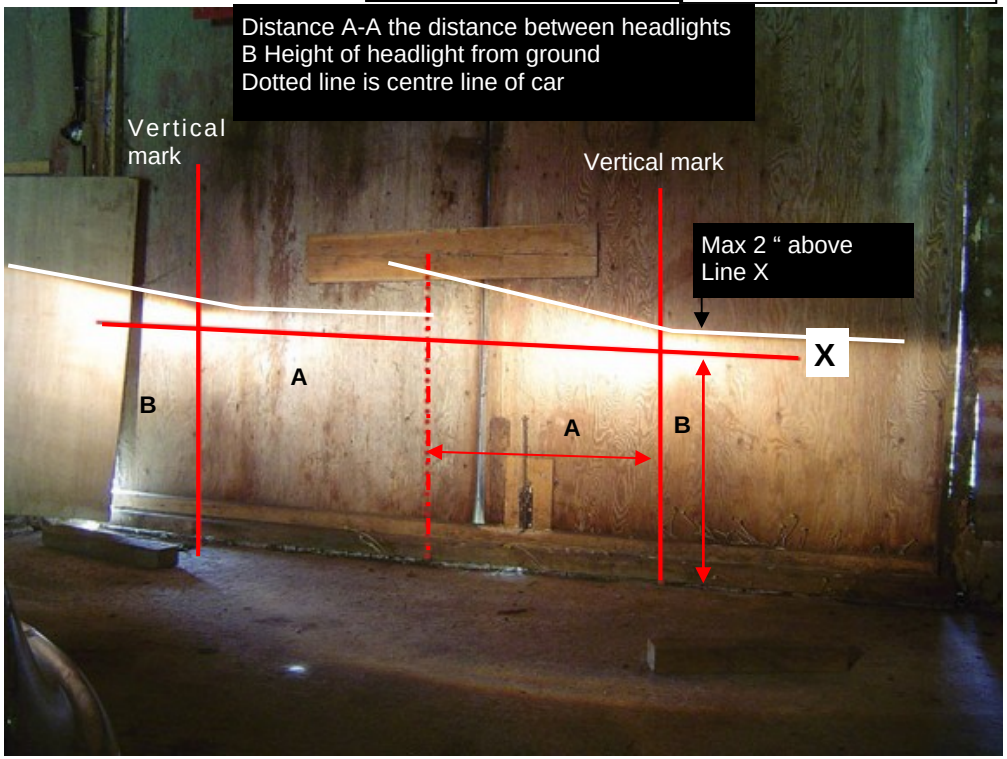
Your car comes with factory-installed tyres that are 21.8 inches in diameter. That means the circumference of each tyre is 68.5 inches. Now let's say you want to replace the stock tyres with new tyres that are 24.6 inches in diameter. Each new tyre has a circumference of 77.3 inches, which means it travels almost 10 inches farther with each complete revolution. This has a tremendous affect on your speedometer, which will now indicate a speed that is too slow by almost 13 percent. When your speedometer reads 60 miles per hour, your car will actually be travelling 67.7 miles per hour.

As you know the Spanish Flyer is left hand drive so the Speedo cable from the Cortina gear box is going to be short... One of the items to investigate how to get the drive into the dash without a long loop in the cable. So where routing of the cable requires a tight bend through the bulkhead an angle drive can be used. This will greatly extend cable life and ensure a smoother action. Then there is the change in the end fitting from a Cortina Speedo and a Jaguar Speedo I will get these through Speedy cables who I have dealt with before and found that they give a good service. If you remember with the BRC I had to change the Speedo from a mechanical drive to an electronic drive as the BMW drove the Speedo off the back axle which was a rotating disc passing over a magnet.

3 You will have to remove the chrome trim around the headlight to get at the adjusting screw. If I remember correctly sealed beams have the adjusting screws are at 2 o'clock and at 7 o'clock. And conveniently non sealed beams in the same positions, so that's lucky.
4 Adjust the horizontal aim of the low beam so that the point at which the cut-off of the beam begins to slope upwards is located at the vertical marks.
5. Cover the headlight adjusted and do the same with the other one.
6 Bounce the car and turn off the lights turn on the lights again. The headlight beams should be centres on the crosses on the garage door, with the kick up starting approximately 2" above the horizontal line and rising to the left as shown below so that the lights illuminate the nearside of the road and don't dazzle oncoming cars.

Adjustment needs a long Philips screwdriver (It may be a slotted screw) adjust the vertical aim of the headlight so the top horizontal cut-off of each beam is located along the horizontal line drawn on the wall. Adjust the horizontal aim of the headlight the low beams so that the point at which the cut-off of the beams begin to slope upwards and is located at the vertical marks. If no cut-off is visible, aim the low beam lights so that the lights 'hot spots' are on the respective vertical centrelines or two inches to the right of the lines, and at the horizontal line or slightly below.





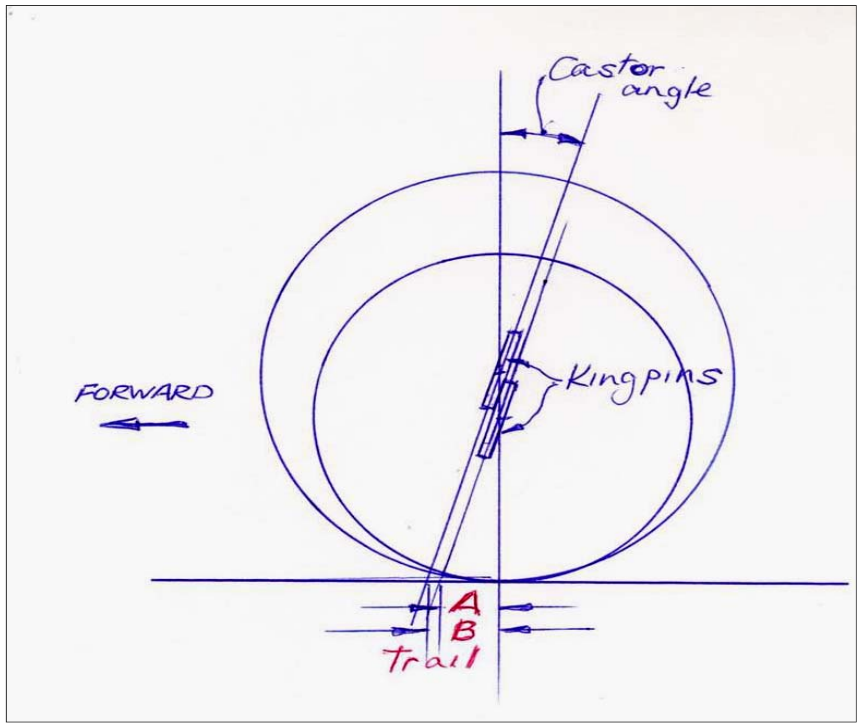
TECHNICAL TOPICS SUSPENSION ANOMALIES

I was looking at a photograph of Alan Critchley's Wildcat some time ago and saw that the new attractive wire wheels that he has fitted were probably of 15" diameter, at least they look large and well in keeping with the car. This got me thinking. What effect, if any, could the move to a change in wheel size make to a car. Would larger wheels make any difference to the handling or feel of the car? Then again, would smaller wheels change things, remembering that the Cortina suspension was originally fitted with 13" wheels. Let us think about this with a diagram to see what is involved. Do realise that I have had to exaggerate the different size of wheels and the caster angle for the sake of clarity

The trail of the original smaller wheel is shown marked as A and the trail of the larger wheel marked as B, the castor angle staying the same in each case. The original trail with the smaller wheel that had an ideal castor angle would give the perfect straight-line stability as well as return to the straight ahead position after a corner smoothly and at just the right speed slipping through the hands.

In the case of distance B where there is more trail we would find that the steering became heavier and the steering wheel would want to return too quickly to the straight-ahead position after a corner. The trail would be too great.

With a Wildcat the only means of reverting to acceptable trail after changing to larger wheels would be to make an adjustment of the length of the tie-bar. Since the tie-bar is connected to the lower suspension arm, by lengthening this arm the lower arm would move backwards in a radius about its inner pivot point and cut down the amount of trail. One would be reducing the castor angle in effect but be careful do not overdo it since if the trail is too short there would not be sufficient trail to ensure that the car would run straight without constant steering correction. Try a little adjustment at a time. Derek Argyle



DOES IT 'PING' OR DOES IT 'PLONK"?

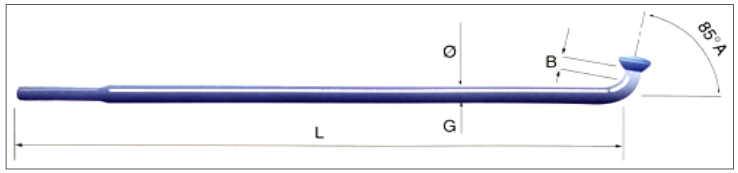
I don't necessarily expect you to do this rebuild but if you have a broken spoke then you can replace it without the expense incurred of shipping the car across the country and expecting a hefty bill. The other option is to buy another wheel off e-bay, but again you pay your money and take your chance. While you're at the point of finding out you have a spoke gone (It goes 'Plonk' instead of 'Ping' like the others when you strike it with a screwdriver check the condition of the spline on the wheel. Spokes are around £11 each depending on number of spokes, type etc. You can get more details of replacement parts here www.http://www.central-wheel.co.

Lets get to the tech part first, deciding on spoke size etc.

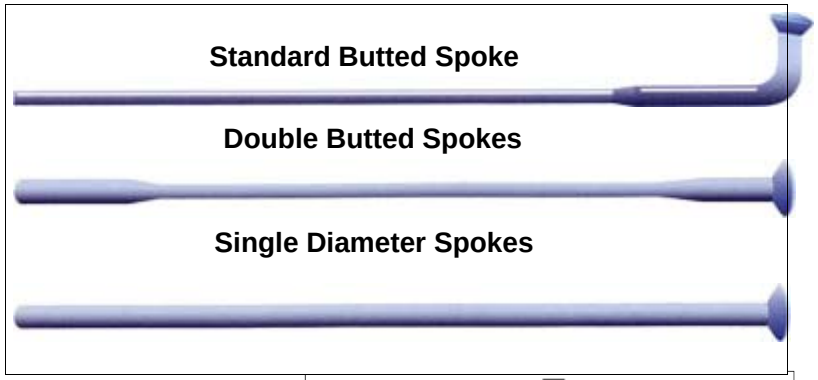
Hub and Spoke Sizes

Spoke.

The tables will enable you to establish your wheel hub and spoke sizes. Some spokes are butted so that the hub end of the spoke has a larger diameter than the rest of the spoke. Always mention it if your spokes are butted but describe them using the smaller diameter. The end of the spoke is threaded using rolls which make the finished thread of larger diameter than that of the spoke. The thread is of B.A. form and has 32 threads per inch Spokes can either be straight or butted, which refers to the standard wire gauge (diameter of the spoke). Straight spokes are the same wire diameter across the full length of the spoke, for example 7 s.w.g.

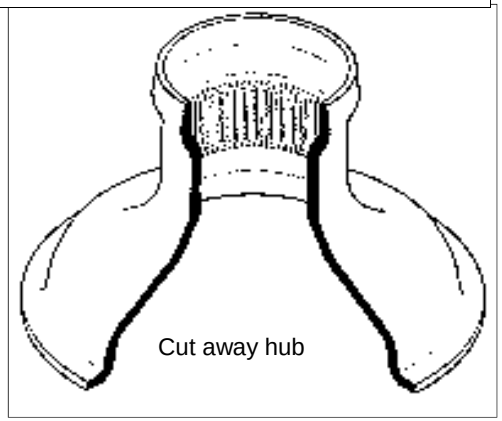


L = Length of Spoke A = Angle of Spoke G = Gauge of Spoke
B = Length of Bend of Spoke **Example**: 40 Spokes, L = 150mm, G = 9, A = 90 Degree, B = 12mm



Butted spokes have thicker diameter at the hub end than for the rest of the spoke, for example 4/7 s.w.g. normally butted spokes are used as standard due to their higher strength and durability, In Europe most hubs are of the Rudge-Whitworth type.

Be aware your car will fail the MOT if he drags his screwdriver round the spokes and one goes plonk



SETTING THE HEADLIGHT BEAMS

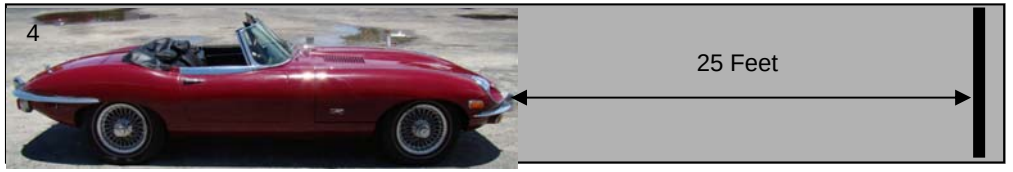
Duff headlight? Time to change the lamp (I was told the word is lamp as you plant bulbs) but you might find that variances in the filament position throw the lights out of position.

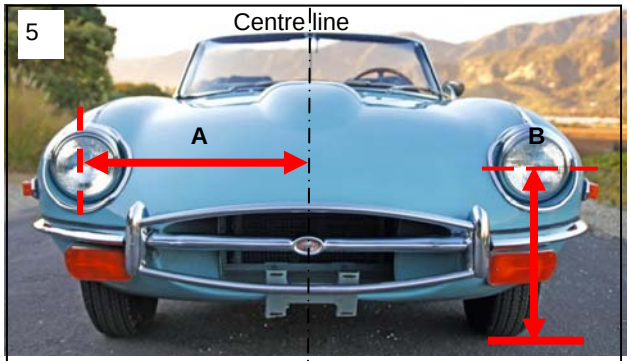
It's also a wise option to change the other lamp as well as if one has aged to destruction the other must be pretty close to its own demise. If your doing a pre MOT check then don't forget the lights which is where we start.

It's important to have your car lights set up correctly and over time or changing the sealed beam unit on the Wildcat (if you haven't changed them to normal type that take halogen—plus) so setting the lights up is a task that will save a MOT failure or blinding some-one coming the other way at night.

Setting up the car

1. First find a flat surface, maybe in font of your garage doors or a convenient wall.
2. Drive the car to the garage door as close as possible
3. Find the centre line of your car and mark it on the door
4. Pull back 25 feet from the garage doors.
5. Check the tyre pressure so the tyres are evenly displaced and and push each corner up and down to ensure your shocks are settled into the normal position..





Measurement 'A' . Low beam centre to cars centre line

Measurement 'B' Low beam centre to ground measurement

Making the measurements shown in Fig 5

A From one of the low beam headlights to the cars centre line

B From the ground to the centre of the headlight lenses

C Draw one horizontal line on the garage door (narrow Masking tape will do providing its straight) exactly 2" lower than measurement A.

D on the line make vertical marks both the right and left centre line mark at the distance B from the cars centre line shown in Fig 5

The next step is checking the light pattern.

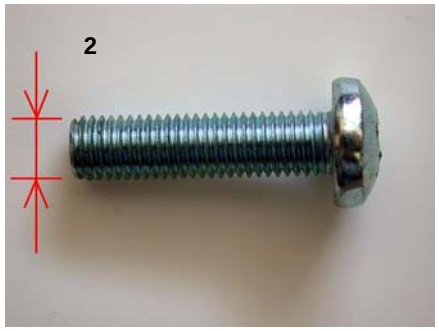
1. Turn the headlights on (Did I mention this is best done at night? Er Hum!)
2. Cover one headlight and adjust the vertical aim of the exposed headlight so that the top horizontal cut-off of the beam is located along the horizontal line X drawn on the garage

UNDERSTANDING SCREW THREAD NOMENCLATURE

You have a loose machine screw and walk into the hardware store to obtain a replacement. There, you encounter an entire aisle of screws, nuts, washers, and other small hardware. Which one do you need? To read a screw thread callout, follow these guidelines. There are several ways to find out what the screw is. Some screws have their threads or names tattooed on the head of the bolt or the side of the nut. If you live in the USA then most hardware stores have a board with different nut and bolts on it and you just try your nut onto a bolt or try you bolt into a nut to find the size.

1 Read the number, they will look something like this

- 4-40 x .5
- 1/4-20 x 5/8
- M3-0.50 x 10



2 Interpret the first number

- 4-40 UNC The 4 represents the diameter in metric
- 1/4-20 x 5/8 1/4 (0.25") represents the diameter in imperial or Christian units.
- M3-0.5 M represents 'Metric' and 3 is the diameter in metric ie 3mm

3. Interpret the second number. It has to do with the distance between adjacent threads. It may be given as the number of threads per unit length, or it may be given as the distance between threads (also called the thread pitch

- **For Unified threads,** the number given is threads per inch. For instance, a 1/4-20 screw has 20 threads per inch.

- For **metric threads,** the thread pitch is given in millimeters per thread. Thus, an M2 x 0.4 screw has threads every 0.4mm. Although most metric fasteners have two or more standard pitches (fine & coarse threads), the pitch is often omitted from a thread callout; it is always helpful to carry a sample with you to the hardware store.

Nuts usually have the type of nut on the side of the bolt ie UNC/UNF/M for Metric and sometimes the size.

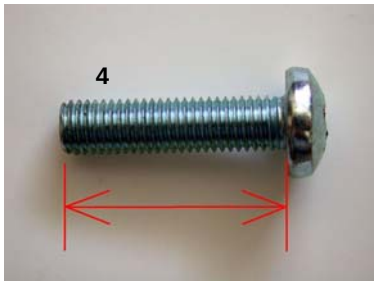


Table 1	Wire Gauge - diameter of spokes		
Imperial Wire Gauge	America Wire Gauge	Diameter in inches	Diameter in millimetres
	2	0.258	6.527
3		0.252	6.400
4		0.232	5.894
	3	0.229	5.816
5		0.212	5.384
	4	0.204	5.181
6		0.192	4.876
	5	0.182	4.622
7		0.176	4.470
	6	0.162	4.114
8		0.160	4.064

(This may be because of the Rudge motor bike Co but certainly Whitworth was 'THE' thread for wires before the introduction of pressed steel wheels) with V-shaped standard splines having dimensions as in Table 2. In America, and also on Rolls-Royce cars, you may find RAF type hubs which have square splines. Actual hub diameter is taken across the outside of the splines on the car, not from the wheel hub which is shown here in cross section. The wheel type designation refers to the maximum size of the outer bearing in millimetres which can be used with that hub.

Wheel Hubs

In Europe most hubs are of the Rudge-Whitworth type with V-shaped standard splines having dimensions as below. In America, and also on Rolls-Royce cars, you may find RAF type hubs which have square splines.

Actual hub diameter is taken across the outside of the splines on the car, not from the wheel hub which is shown here in cross section. The wheel type designation refers to the maximum size of the outer bearing in millimetres which can be used with that hub. When ordering your replacement parts, it will pay you to order two of everything so that you are prepared for the next broken spoke. You will need a screw driver to lever the butt section off the rim and a spanner to undo the nipples.


Tools to do the job

Now you have the offending spoke out and the replacement spoke in place and it has to be tightened and the wheel trued. Mounting the wheel back on the front axle of the car would work but is also a bit difficult. If you have a spare hub this would provide a wheel hub for truing the wire wheels and later painting them. If not you will have to use the hub. The disadvantage as said is difficulty, although I would say inconvenient rather than difficult. The advantage is it will be true to the hub

Table 2	Wheel Hubs - dimensions in millimetres			
Wheel type	Actual hub diameter	Number of splines	Spline length Short hub	Spline length Long hub
35	52.0	62	36	56
42	62.5	75	37	62
52	73.0	88	37	62
62	82.5	100	57	78
72	92.0	112	55	84
80	102.0	124	58	87
90	111.5	136	56	94
100	123.0	150	59	97
120	137.0	168	63	101

In the photograph below the wheel hub was mounted to an angle that could be clamped in a vice or to a steel table as shown. With the wire wheel mounted it would be possible to rotate the wheel for truing and later for painting. The hub also served as the template for the repairs that were made to the wire wheel hubs where the holes had become oval.

Nipple sizes	5.75mm	(0.225")
	6.40mm	(0.250")
	7.00mm	(0.275")
	8.00mm	(0.300")

The photograph shows a wheel fully trued. Each ferrule was removed from the spoke and both the threads of the spoke as well as the threads of the ferrule coated with Never-Seize. Application of the Never-Seize was to insure the ferrules don't rust onto the spokes. This should allow for tightening of the spokes later if necessary.
Once each of the ferrules were finger-tight an index finger was mounted to the table and a pointer positioned at the inside flange of the rim.


Setting up the rim pointer for true

As the wheel was rotated how out-of-true (side-to-side motion as well as up and down motion of the rim to the index pointer) the wheel was could be determined. Through loosening and tightening of spokes the wheel was brought into being true. Next each spoke was tightened 1/2-turn and the wheel checked for true. This process was continued until all the spokes were tight. It's a relatively easy job to re-spoke but you may have a problem getting the old spoke out. You may also have to think about repainting the wheel if the supplied spoke is not the same colour or the wheel paint has faded.
On replacing the wheel on the spline make sure you use copper or good grease on the spline to stop the spline and hub rusting. Fit the spinner and make sure you give it a good belt with either an aluminium hammer and a block of wood or a rubber hammer. Don't worry as the thread on the hub is such that when the wheels rotate the spinner is tightened by centrifugal force.
Some years ago I wrote about a new Tweel tyre being tested that was the ultimate spoked tyre they have been testing these for several years now. Resilient Tech was developing them for the military. These tyres are airless and are scheduled to be out on the market very soon.

The bad news for law enforcement is that spike strips will not work on these. Just think of the impact on existing technology:. No more air valves. No more air compressors at gas stations. No more repair kits. No more flats.100,000 mile life. Michelin was supposed to deliver to the military Dec 2011. I must have missed the launch but with a long life I expect it to be as successful as the ever lasting light bulb.

METRIC TAPPING CHART

Just like the old BS screw thread and the unified screw threads (UNC and UNF) metric threads come in two forms, Course and fine. I don't know why but they just do so its important that you find out if the thread is course or fine and the way to do this is either compare with a known thread or count the threads. In the good old days it was threads per inch now its threads per millimetre so a M2x0.4 means it has threads ever 0.4mm. If your messing with a lot of different sizes it will pay you to buy thread gauges which helps with the thread count. Below is a handy tap chart for most metric screw threads

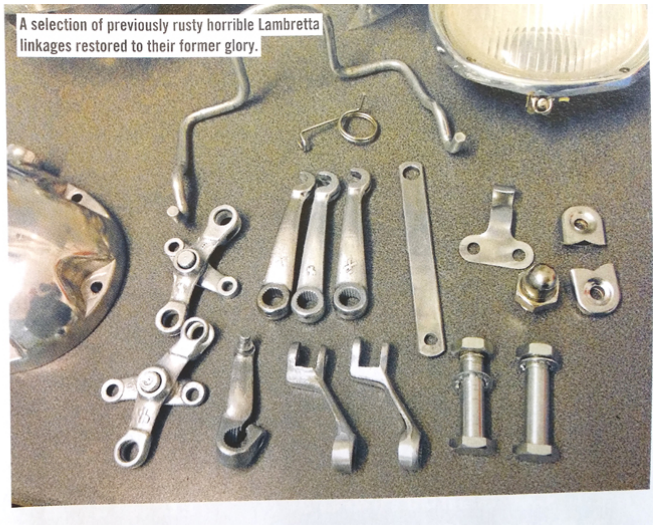
Course Thread Sizes

Thread Size	Tap Drill (mm)	Thread Size	Tap Drill (mm)	Thread Size	Tap Drill (mm)	Thread Size	Tap Drill (mm)
M4 x 0.35	3.60	M10 x 0.75	9.25	M16 x 1	15.0	M24 x 1.5	22.5
M4 x 0.5	3.50	M10 x 1	9.0	M16 x 1.5	15.0	M24 x 2	22.0
M5 x 0.5	4.50	M10 x 1.25	8.8	M18 x 1	17.0	M26 x 1.5	24.5
M6 x .5	5.50	M11 x 1	10.0	M18 x 2	16.0	M27 x 1.5	25.5
M6 x .75	5.25	M12 x .75	11.25	M20 x 1	19.0	M27 x 2	25.0
M7 x .75	6.25	M12 x 1	11.0	M20 x 1.5	18.5	M28 x 1.5	26.5
M8 x .5	7.00	M12 x 1.5	10.5	M20 x 2	18.0	M30 x 1.5	28.5
M8 x .75	7.25	M14 x 1	13.0	M22 x 1	21.0	M30 x 2	28.0
M8 x 1	7.50	M14 x 1.25	12.8	M22 x 1.5	20.5	M33 x 2	31.0
M9 x 1	8.00	M14 x 1.5	12.5	M22 x 2	20.0	M36 x 3	33.0

Fine Thread Sizes

Thread Size	Tap Drill (mm)	Thread Size	Tap Drill (mm)	Thread Size	Tap Drill (mm)	Thread Size	Tap Drill (mm)
M4 x 0.35	3.60	M10 x 0.75	9.25	M16 x 1	15.0	M24 x 1.5	22.5
M4 x 0.5	3.50	M10 x 1	9.0	M16 x 1.5	15.0	M24 x 2	22.0
M5 x 0.5	4.50	M10 x 1.25	8.8	M18 x 1	17.0	M26 x 1.5	24.5
M6 x .5	5.50	M11 x 1	10.0	M18 x 2	16.0	M27 x 1.5	25.5
M6 x .75	5.25	M12 x .75	11.25	M20 x 1	19.0	M27 x 2	25.0
M7 x .75	6.25	M12 x 1	11.0	M20 x 1.5	18.5	M28 x 1.5	26.5
M8 x .5	7.00	M12 x 1.5	10.5	M20 x 2	18.0	M30 x 1.5	28.5
M8 x .75	7.25	M14 x 1	13.0	M22 x 1	21.0	M30 x 2	28.0
M8 x 1	7.50	M14 x 1.25	12.8	M22 x 1.5	20.5	M33 x 2	31.0
M9 x 1	8.00	M14 x 1.5	12.5	M22 x 2	20.0	M36 x 3	33.0

Polishing the plated part. This can also be done by hand just as effectively using metal polish and soft wire wool.



A selection of previously rusty horrible Lambretta linkages restored to their former glory.

left in the tank the thicker the build-up of plating, so moving parts such as a Lambretta gear swivel might be tight if left to plate for too lon

Quality

Speaking of a gear swivel, the finish on mine, as well as the clutch arm, is still as good as when I first plated them after more than two years of English weather and a good helping of rock salt thrown at them. I have also recently been using the Super Bright plating kit which is described by Frost as giving a chrome-like finish. The parts I have used it on have all been of a rough finish such as Lamretta brake arms, fork links, etc. Obviously a chrome lated part is highly polished prior to plating to give a smooth surface, so a back to back comparison of a chrome plated part and the finish of the Super Bright kit wouldn't really be fair. However, it is definitely shiny and looks good so I am more than happy with it.

Costs

It is also worth pointing out that when the plating solution is mixed it can be used over and over until it runs out, it is not just a one shot mix and it can be stored ready to use for as long as it is kept in an airtight container. The only thing to have needed to be replaced in the intervening two years is the crocodile clips used to suspend the anodes and the parts to be plated.

They need to conduct the power supply from the support rods but for some reason, and to be honest that reason is probably because I didn't clean them properly before putting them away, they stopped conducting.

Overall the kit has done exactly what it says on the tin and comes highly recommended from us hear at Scootering. In terms of value for money it will certainly pay for itself, may be not immediately, unless you are plating a lot of items all at once, but definitely over time. It is may be worth looking into buying a kit between club members to spread the cost so that everyone can get some use out of it.

- The Common Plating Module, which is required for all plating types costs £52.
- The Cadmium Zinc Plating Module gives a hard wearing finish and costs £67.91.
- The Super Bright Chrome Like Plating Module is probably the one to go for in terms of cost and cosmetic value (it contains Super Bright anodes, 1-Super Bright salts, trivalent passivate, Super Bright CC57 Brightener, a 10 litre tank, scouring powder, test kit and instructions) and cost £61.50 for the five litre version.
- See www.frost.co.uk for the full range of products.

(Barrie Braithwaite, Scootering Magazine, September 2014 issue)

HOW TO TEST A CAR ALTERNATOR.

With the engine on:

Step 1: Open your hood and so you have clear access to the car battery. Locate your alternator and check to be sure the alternator belt isn't loose.

Step 2: Turn your multi-meter to the 20 V setting.

Step 3: Start the engine. At this point, check to make sure the alternator pulley / belt is spinning properly without slipping.

Step 4: There are two ways to test the voltage coming from the alternator.

If you have easy access to the alternator without getting your body parts / clothing / etc tangled in the spinning pulley's, then place the positive multi-meter probe (red) and touch it to the red terminal connector coming out of the alternator. Now take the negative (black) multi-meter probe and touch it to some metal part of your car frame (like a bolt head nearby or even the negative terminal on the car battery). Don't ground to the alternator itself. That would be potentially bad. You should now be getting a reading on your multi-meter display. If you don't have good access to your alternator, then you can simple test the alternator by touching the positive multi-meter probe to the positive terminal on your battery and likewise the negative probe to the negative terminal on your battery.

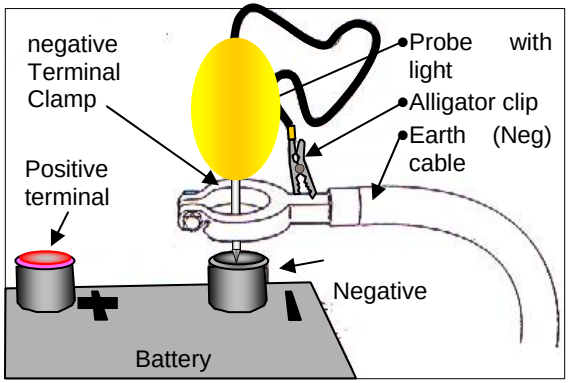
If the alternator is working well, your multi-meter should read somewhere in the vicinity of 14 volts (typically 13.8-14.2). If it is reading excessively higher than 14 volts (greater than 15 volts) it is possible that the voltage regulator on your alternator is faulty or going bad. If it is reading lower than 13-14 volts, there are a number of possibilities as to the reason. First, it is possible that your engine idle speed is too low for the alternator to put out sufficient voltage/ power. Try revving up the engine to 2000 RPM or higher and take a reading. If the voltage is still too low, check to be sure all the connectors on your alternator are tight and that the alternator belt is not slipping and is spinning on the pulley correctly. If it is still not putting out sufficient power, then the alternator's voltage regulator could be bad or the alternator itself may need replaced.

A car alternator needs to be putting out at least 13-14 volts (ideally between 13.8 and 14.2 volts) to effectively charge a 12 volt car battery. If the alternator is putting out too much voltage (15+ volts), it is likely your battery acid will boil over out of the battery. When a battery is near fully charged the alternator will cease to put out sufficient voltage to charge the battery and the reading you will get from the battery probing method will simply be the voltage coming from the battery itself. In this case, you can simply leave your lights on with the car off for ten or fifteen minutes to drain your battery a little bit.

It can also be helpful to test at the battery terminals with the engine off and then turn the car on and test again at the terminals. If your battery is more or less fully charged, it should read at around 12-13 volts with the car off. If you've run your car for a long time and while the car is running the voltage reading is in the 13-14 volt range, but then you shut the car off and the battery voltage instantly drops to well below 12 volts (10 volts or under; 9 volts or under in freezing weather conditions), it is likely that your battery needs maintenance or replaced.

LOOKING FOR THE SHORT CIRCUIT

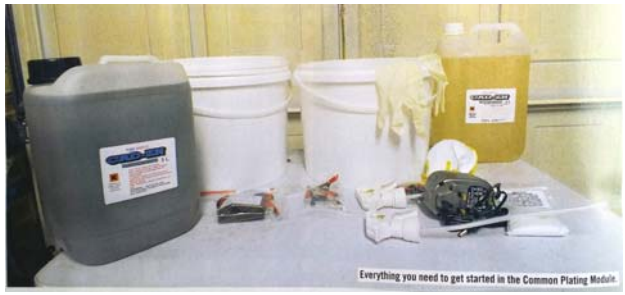
Short circuits are the bane of my life, one because building the Spanish Flyer and two because it sounds so much like the name they call me. ‘Short arse’.
Nothing can be more frustrating or confusing than trying to find a short in you car's electrical system)except finding a pair of short length trousers). Especially when it's not enough to blow a fuse but still drains your battery! Obviously, if you find a blown fuse, replace it, turn the key on, and the fuse blows immediately you've found the circuit within your car's electrical system that the short is in. However, if the draw does not create enough current to blow a fuse, than we have to find out which circuit it's in to fix it. Before I get started, my intention in this Tech Tip is not to teach Electrical Systems and Electronics. Instead, I just hope that this article will give anybody a systematic approach to finding a short. So lets get started...



First, lets make sure that you have a short! Electrical systems have a specific route for electricity to travel along and any change from this route causes problems. If electricity can find an easier route it will always take it. So lets find out if the electricity in your car is finding a ground sooner than it's suppose to... What we're going to do is take a test light and attach the clip end to the negative battery cable and put the tip on the negative battery post. Then we're going to remove the negative battery cable making sure we don't touch the test light. Now we haven't broken the electrical connection here.
All we're doing is letting the current, if any, flow out of the negative battery post, through our test light to see if it illuminates, and continue on along the negative battery cable to the short. Word of caution, If you're attempting this on a computer controlled car it is very important not to break the connection of the test light to the negative battery post. By not breaking the connection, the computer will maintain its learned driving strategy in the Keep Alive Memory (KAM).
It will also ensure your computer will not have to go to factory baseline and relearn controlling your car's engine for maximum fuel economy and performance. While we're on the subjects of computer control, module equipped cars have a small parasitic drain caused by the modules' KAM. This is normal and module or modules can draw 10-21 milliamps (mA) with the key off. However, If you have a parasitic draw that is in the milliamp range and is beyond normal specs, you will have to use an Amp Probe for a Digital Volt Ohm Meter (DVOM) to diagnose this and the method below may not work due to the very low current draw. But let's get back to those major shorts that give us all those headaches...
Oh! by the way, a DVOM can be used in place of a test light. Just ensure your leads are in the proper connections to measure Amps. Using this tool will not only tell you if you have a current draw when you're not suppose to, but will also tell you how many Amps are being drawn. Okay, you've confirmed you have a short, now how do you find it? The first and easiest test is disconnect the alternator and see if the test light goes out or the DVOM display changes. Often old or worn out alternators ground themselves internally causing a short. If it does you've found your short and repair or replace the the alternator or appropriate components. If the test light remains lit or the amperage on the DVOM does not change, you have to try and start isolating which circuit within your car's wiring has the short. This can be done by pulling fuses one at a time.

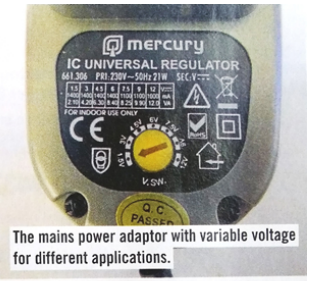
FROST ELECTROPLATING KIT

This article is a review of an electroplating kit which might interest you if you fancy your hand at re-chroming or tarting up some bright parts on your Wildcat
Way back in December 2011, I got my grubby mitts on a home-plating kit from Frost Auto Restoration, the reason being that virtually every metal part on your scooter is either plated or painted. From nickel to chrome, the finish is not purely cosmetic, it is there to prevent rust and keep everything in good working order, so being able to plate parts at home at your leisure can be quite handy. Just to recap, I got the Common Plating Module, which is basic equipment needed to start plating. The kit contains a 10 litre tube, power supply, variable control unit, suspension rods, support clips, crocodile clips, dust mask and gloves. When you are armed with this you then decide what type of finish you require for the parts you intend to plate, the process is the same but the basic finish can vary from matt to a chrome-like shine.


Everything you need to get started in the Common Plating Module.

When I initially used the kit it was to plate some parts on my Spanish Series 2 Lambretta ‘El Tigre’ which was being built at the time and I opted for a cadmium zinc plating kit which contains five litres of cadmium zinc anodes, 10 litre tank, scouring powder, test kit and instructions. Making the kit up literally consist of running some water into the plastic bucket (10 litre tank), pouring the salts in and waiting for them to dissolve. Mix the post plating passivate solutions with water in a separate bucket to dunk the plated parts in for 10-20 seconds, and that’s it! The anodes are plates which are suspended into the bucket (tank) from the support rod connected to positive (+) supply and then the part to be plated is suspended from the negative (-) supply. It really is a piece of cake to plate stuff, the only thing which experience of using the kit might bring is working out how long to leave parts plating. The longer the part is


When all the rust is removed mix the scouring powder with a drop of water to form a paste and scrub the part to be plated.



The mains power adaptor with variable voltage for different applications.


Keep a bucket of fresh, clean water handy for washing off parts pre and post plating.

Typically, engine manufacturers design bypass valves to open at a pressure differential of approximately 10 to 30 psi-d psi-Differential)) with some as low as 4 psi-d, and others opening as high as 75 psi-d . Some engine manufacturers locate the bypass valve in the filter mounting base on the engine, while others locate the valve within the filter. Either way, the same purpose is served.

Oil filters are designed to withstand differential pressures significantly greater than those experienced under normal operating conditions. Therefore, when a centre tube or element has collapsed, it is usually the result of a sticking or otherwise malfunctioning bypass valve.

In some instances, a sticky filter bypass valve alone is not enough to collapse the centre tube or element. The oil pump pressure regulating valve may also stick in the closed position, which results in increased pressure and oil flow through the filter. Although this condition may be only momentary, it can quickly collapse the centre tube if the bypass valve fails to, or is unable to, relieve the excessive differential pressure.

A collapsed centre tube or element can lead to a loss of filtration and oil flow to the engine. There is the possibility that interior parts of the filter or filter media may be physically displaced and could migrate into the system interfering with the oil flow. Additionally, debris and contaminants that are held by the filter may be released. The malfunction of the filter bypass and oil pump pressure regulating valves and the subsequent collapse of the centre tube or element may not cause noticeable damage. However, at times it can result in a catastrophic failure of the engine caused by the seizure of a piston, connecting rod or main crankshaft bearings among other failure possibilities.

The malfunction of filter bypass valves and pressure regulating valves has been traced to:

Sticky surfaces caused by cold, highly viscous oil
Oil contaminated by excessive condensation, coolant or oxidation
Neglect - extended oil drain and filter change intervals
Carbon grit that temporarily jams a valve
Sudden acceleration of the engine with any of the above conditions.

Discovery of a filter with a collapsed centre tube or element calls for the inspection of the bypass valve, if not built into the filter, and the oil pump pressure regulating valve, plus a review of the engine's performance and maintenance history.

They recommend changing the oil filter when you have an oil change and I would go along with that philosophy

Oil

They recommend changing the oil on a Cortina every 6000 miles which I would figure about a years motoring, but I think modern oils could quite easily extend this to 10/12000 miles.

Let's say that your engine has plenty of oil, but you never change it. Two things will definitely happen:

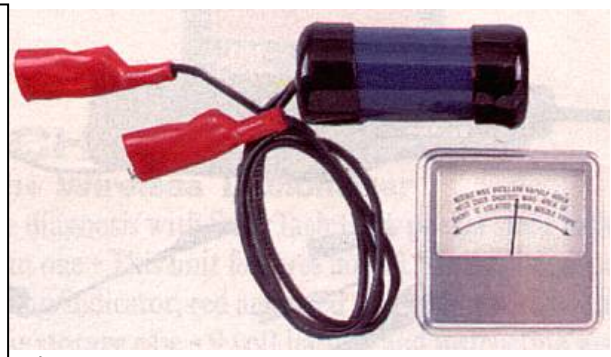
Dirt will accumulate in the oil. The filter will remove the dirt for a while, but eventually the filter will clog and the dirty oil will automatically bypass the filter through a relief valve. Dirty oil is thick and abrasive, so it causes more wear.

Additives in the oil like detergents, dispersants, rust-fighters and friction reducers will wear out, so the oil won't lubricate as well as it should.

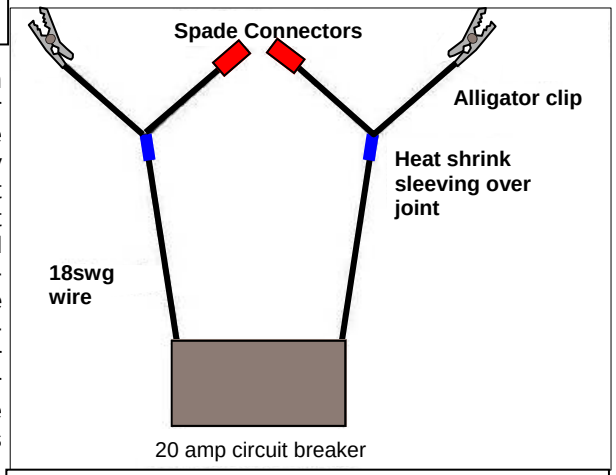
Eventually, as the oil gets dirtier and dirtier, it will stop lubricating and the engine will quickly wear and fail. Don't worry, this isn't going to happen if you forget to change your oil one month and it goes over the recommended change interval by 500 miles. You would have to run the same oil through the engine for a long time -- many thousands of miles -- before it caused catastrophic failure. So once a year struggle with the sump plug be prepared to have a black oil streak reaching from your wrist to arm pit, renew the oil and filter for a long life trouble free lube system.

A fuse is nothing more than system protection. All the current that flows through a circuit must go through the fuse.

MAC's ET251 SHORT CIRCUIT FINDER. Quickly locates short circuits in all 12v automotive electrical systems. Eliminates the need to remove upholstery and floor coverings. Operates through metal posts, panels, and other obstructions. Simple hooking to affected fuse posts; induction-type needle indicator pinpoints shorts. Packaged in high impact plastic box; schematic included



By pulling a fuse we've created an open and current can no longer flow. Continue doing this until the light goes out or the DVOM display changes showing no current draw. Once you've found the circuit that has the short you must find where in that circuit the short is located. It's always best to take the least intrusive method to diagnose. Besides, who wants to tear out the dash or remove the interior just to trace a wire. So this is where a simple tool you can make comes in very handy…



When electricity flows through a wire it creates magnetism. We're going to use this magnetism to find our short! Many tool vendors and auto parts stores sell short detectors. The one in my tool box is from MAC. It's convenient for me because it also has an audible alarm which I can hear in a noisy shop environment. I'm pretty sure NAPA sells one also. The tool to the right consists of a 10 Amp circuit breaker with buzzer, wire leads, clips, and a compass. But for our purposes we're going to make our own which I believe is better than the ones you can buy outright.. To make our short detector, we'll need the following items:

Connect the pieces together as shown. This should allow you to hook your tool up in place of a fuse no matter what type of fuses your car uses. The reason I recommend a 20 Amp circuit breaker instead of a 10 Amp one is it allows current to flow longer and thus building more magnetism. This is important especially if the wire that the short is in is buried under items like the carpet, rocker cover, door panel, pillars, etc. The more magnetism we can build the easier it will

- 1 x 20 Amp circuit breaker
- 2 x alligator clips
- 2 x spade connectors
- 2 x 2 foot pieces of 18ga wire
- 4 x 1 foot pieces of 18ga wire

.

At this point it helps to know how the wiring loom or wires run for the circuit that has the short. A schematic is very helpful here especially if it has component locations. If you cannot find one or your vehicle is older you will have to trace the wire(s) from the fuse on...but this is not that hard and you'll see why. The reason we want to know which way the wire is going from the fuse box is because we're going to use the magnetism that is built buy the electricity along that wire to locate the short. Place your tool into your fuse box or where you pulled the burnt fuse from instead of the fuse and turn the key on to the RUN position.

Now what's going to happen is electricity is going to flow to the short. Because we have a circuit breaker in there instead of a fuse we're allowing magnetism to build along the wire. As the current flows through the circuit breaker it starts to heat up (careful the tool may get very hot). The bi-metal strip inside the circuit breaker will eventually bend away from the contact breaking the circuit and creating and open before any damage can be done. This is always associated with an audible "CLICK" from the circuit breaker. With an open, no current can flow through the circuit breaker and the shorted circuit. With no current flowing, the bi-metal strips cools very quickly and reforms itself back to it's original shape and touches the contact allowing current to flow and once again creating magnetism

We're going to use this magnetism and our compass to locate the short. Here is how the this works... A wire (conductor) will build magnetism. A short will not. So we put our compass along the wire or wire loom and the current flowing through the wire is building magnetism. This magnetism will draw the north seeking arrow on the compass towards it (one way or another). We leave our compass in place until we hear the "CLICK" from the circuit breaker. When the circuit breaker opens the magnetism will be lost and the north seeking arrow of the compass will deflect back towards the magnetic pole of the earth momentarily. This deflection is important! Because once we get to our short there will be very little or no deflection at all. So after each click and deflection we move the compass about 6-12 inches along the wire, wait, and watch for the needle to deflect as the circuit breaker opens and closes. We continue doing this until we come to a portion of the wire where the needle is not being drawn towards the wire (weak or no magnetism) and there's no deflection of the compass needle when the circuit breaker opens. Congratulations! you've found the area where the short is located. However, you still have not found the short, but at least you know where to dig in. Expose that portion of the wire and locate the short in the wire. Here's a hint - if there's a bunch of wires there, shorts create heat. So look for the hot wire, hot metal, or hot component. Then look for any wire or component that may be broken, cracked, smashed, exposed, or punctured.

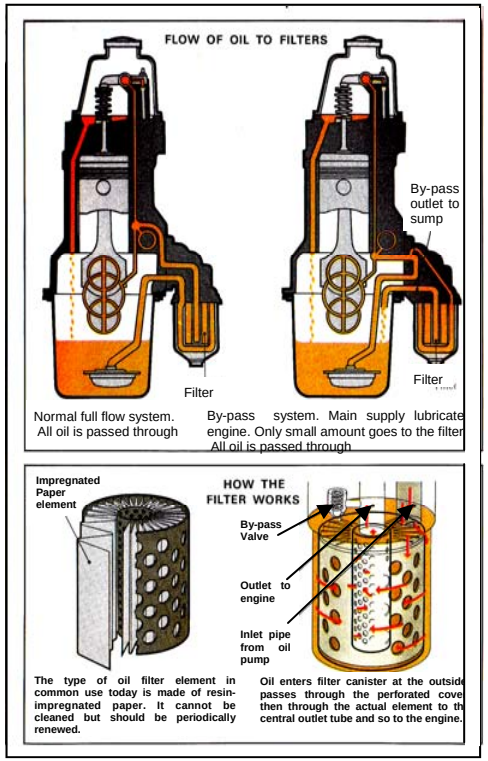
Now that you've found the short, repair it by splicing in a new piece of wire, fixing, or replacing the shorted component. You can cut & solder, use a butt connector, or electrical tape if you have nothing else and are really desperate. Be aware eventually the tape will unravel and cause another short. Do not use Scotchlok or twist connectors as I have found they can come unlatched leaving the wires exposed or the American twist connector which is primitive and should it come undone leaves a nice spike of wire to short out on. At one time automobile manufactures only recommend solder, however, the quality of butt connectors are so good today that many allow this type of repair. Now that you have the short out of your system verify your repair, replace the fuse if necessary, and pat yourself on the back for a job well done.

Do not use Scotchlok or twist connectors

THAT LITTLE RED OIL LIGHT IS TELLING YOU SOMETHING!

The red oil light flickers on your car but goes out when your driving but sometimes it comes on a stays on until you turn off and begins the irritating on/off when you drive.

The red light warns of low oil or low oil pressure and should not be ignored. The first thing to check is the connection to the oil pressure sender and the second is to replace it, If this doesn't work then there is something wrong with the engine system and continuing without checking could cause



Engine Damage

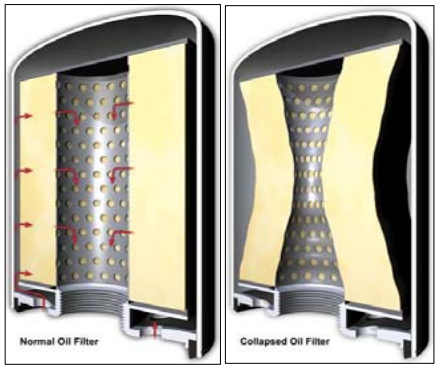
Engine damage is one the most expensive problems that can occur as a result of a bad oil filter. Ultimately, a poor oil filter means the oil is performing below optimal level. This could cause the engine to overheat. Parts could also become not adequately lubricated. This could become an issue where the piston ring meets the cylinder bore. A bad oil filter may burst, which can cause extensive engine damage. Poor oil filters cannot withstand variations in temperature and pressure that occur within an engine.

Leaks

If an oil filter cannot withstand the pressure or the temperature involved in its operation, it may leak back into the rest of the oil pan. This can create a wider leak, which may cause oil to spill out of the vehicle and onto the surfaces. This can be difficult to clean up and may require repair work on the oil pan.

Clogging

An oil filter can get clogged. If this occurs it may cause the bypass valve to open, which may cause unfiltered oil to travel around the engine system. The purpose of filtering oil is to remove potentially harmful material that can corrode or damage components within the vehicle. Unfiltered oil will, as with a leak, cause extensive damage to other parts of the vehicle's machinery and possibly the engine as a whole. Overheating is one of the most common side effects of an oil filter malfunction.



Collapsed oil filter

When a collapsed centre tube or element is discovered, the natural tendency is to assume something is wrong with the filter. This is generally not the case, but instead is a symptom of problems with internal engine components.

Most engines incorporate a bypass valve across the inlet and outlet of the full flow oil filter within the lube oil system. The valve is designed to open and bypass oil around the filter and/or element when the restriction reaches its opening pressure. The bypass flow circuit ensures oil flow to the engine when there is a significant restriction across the filter due to element plugging or cold start conditions.

SHINE AND REPAIR BODYWORK

One thing we have over the normal ‘Classic’ car is we don't have to put giant patches into holes caused by rust. With the fibreglass and gel-coat it’s pretty much indestructible with age. Couple of things will change one is that your lovely shine will fade and the other is you may well get cracks appearing in the gel-coat. Oxidation caused by exposure to oxygen is part of the problem and can be slowed by good maintenance which is an excuse to polish the car regularly and replace your sweat with beer. Despite your best efforts, you will, eventually, find yourself losing the shine. Surfaces may look dull and tired and also feel rough to the touch. It may be time to consider some plastic surgery

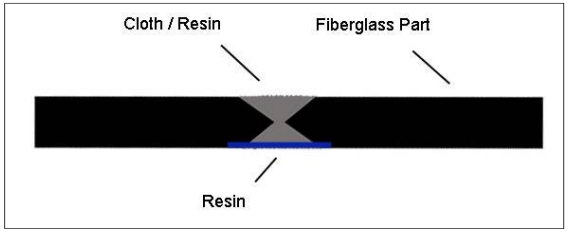
The first is easy to fix but entails several more large beers to replace the sweat you will lose when you polish out the ‘bloom’. You need to remove a fine layer of gel-coat using an abrasive polish, almost like liquid sandpaper. A rotary polish (with variable speed is a good investment) I used Farecia G3 with a water sprayer not only gave a good shine but followed up with Farecia G10 give a glass like finish. Let me be a Dutch uncle and help here with the way to put the polish on. Apply compound evenly to the gel-coat, over an area no bigger than 1 square metre. With the polisher switched off, spread the compound around the area you plan to work. Set the polisher on very slow and applying a little pressure, start compounding. Holding the mop flat to the surface of the gel-coat, keep it moving and be methodical. Keep an eye out for the surface becoming dry. When it does, either apply more compound or move on. Maintain your mop by frequent water sprays. After a few passes, the compound will breakdown and go clear - this is when you stop! When you have a handle on how the compound is performing you can increase the speed a little but be aware of overheating the gel-coat. Once you have completed an area, wipe it down and examine. You don't need me to tell you to repeat if it needs it, but the entire oxidation layer should be gone. Seriously neglected gel-coat may need multiple passes.

Cracks/stars in the gel-coat are normally associated with damage to the underlying fibreglass. This can be flexing the bonnet when lifting it from the wing or flexing you buttocks and hitting something. To say it’s easy to repair is not wrong but it can be expensive because you will have to res-pray the car to its original colour and finding the original colour is going to be difficult and could mean different door colours or a complete paint job.

Undo all your hard work and clean off any polish or wax with a Silcone remover (PRE All (£14 a gallon e-bay) is a good product

Grind out the crack/s on both side to about 30 digress on both side. Then sand it with 80 grit paper a few inches beyond the crack

At this point we cut up a few pieces of fibreglass mat into sizes to fit our hole and grind out bevel. I\'d like to get two pieces on the back and one on the front side of the hole. They are next to be saturated in Fibreglass Resin , usually just called a polyester resin, the resin must first be activated with a liquid hardener and stirred. Mix up enough for one cloth on the cosmetic side and get one piece of cloth soaked in resin, place it over the hole and let it tack up. Depress into the hole and form a bit of a saucer indent, it should tie to your grinding bevel and dip into the hole. Mix up a bit more resin, soak some more cloth and apply a few pieces of cloth/resin to the backside, brush on a bit more rein and bring it out into your 80 scratches. You may need to sand the front side of the fibreglass car part before the next step, you want to mix up just resin and fill your depression with it to level the surface. Once dry, just block sand with some 120-180 and your repair is done.



SOMETHING VIBRATING THROUGH YOUR BACKSIDE AND IT'S NOT THE PHONE?

Own a car long enough and there's a good chance you'll develop problems of some nature. And one of the most common and most bothersome problems is vibration. What's more, it often creeps up on you gradually and subtly -- until one day you find yourself wondering how you ever put up with such an annoyance.

Perhaps then you asked yourself, what does it mean if my car is vibrating? While there's no substitute for the assessment of someone with an extensive automotive background, you can develop a good feel yourself for diagnosing car problems that are relatively common, such as vibrations that do not come from sitting on your phone.

The fix could be something relatively cheap and simple, like a tyre rotation or balance. Or it could signal more serious auto problems -- something more costly, like steering or suspension issues.

Diagnosing car trouble in its early stages may seem like a hassle at first, but you have to remember that it can often save you from bigger car trouble (and bigger repair bills) down the road.

If your vehicle shakes, shimmies or vibrates out of the ordinary, or if you're just interested in preventing those conditions in the first place, keep reading. This article will take a look at the top 5 reasons behind a vibrating car.

5 Engine Problems

There are times when a strange vibration might be a sign of engine trouble.

Sometimes a shake or shudder will emanate from the engine compartment, because the engine isn't getting enough air, fuel or spark that it needs to run smoothly.

Symptoms that might indicate such an engine-related case of the shakes include the following:

- Shudder or jerking occurs during acceleration
- Staccato shaking, as if over a highway "rumble strip," within a specific speed range
- Car starts and drives fine for a while, but later begins to shake
- These symptoms could be signalling that it's time for a new set of spark plugs. If the plugs are fine, it could be that the spark plug wires need to be checked (are they connected in the proper order?) or replacing.
- Lastly, a dirty air filter or clogged fuel filter can starve the engine of needed oxygen or fuel, respectively. So be sure to replace them at the manufacturer's recommended intervals.

4 Axle Problems

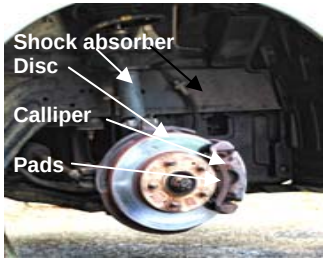
Our vehicles are full of reciprocating, rotating parts that have to fall within certain measurements, or tolerances, in order to perform properly.

If an axle gets bent -- which is actually quite easy to do in a collision or other mishap -- it will create a jostle of a ride afterward. With this problem, the vibrating often picks up in intensity the faster you drive.

A related problem would be that the driveshaft also needs inspection. This rapidly spinning part transfer’s engine power to the rear axles and wheels in rear-wheel drive vehicles. If it's bent, shaking may result.

Worn-out constant velocity (CV) joints fall under the same category. If the "boots” -- that rubber are intact, clamps are secure, and no lubricant is seeping out, chances are they're not the problem. But if the boots are torn, that means dirt and dust and road filth is getting in and damaging the joints. For front-wheel drive cars, toasted CV joints mean you'll be buying new drive axles, too.

"Axles of unevenness" could be giving your vehicle the shakes, but what if those bad vibrations come on only when you apply the brakes?



3 Brake trouble.
Do those bad vibrations appear or intensify when you apply the brakes? If so, there's a strong possibility that your car is tooling about with a warped brake rotor, or rotors. The **rotor** is the shiny, silver disc-shaped component on vehicles with a disc brake system. The rotor can get bent out of shape due to heavy wear and tear -- basically, overheating from more stopping than that particular rotor can handle. Instead of being uniformly flat all the way across, a deformed rotor is raised or lowered on part of its surface. The **callipers** and **brake pads**, which squeeze the brake rotors to make the car stop, can't get an even grip on a warped rotor. Hence, vibration. If you're not handy with a spanner, it's a good idea to see a brake specialist who can tell you the condition of your vehicle's rotors or brake drums (on cars with rear drum brakes).

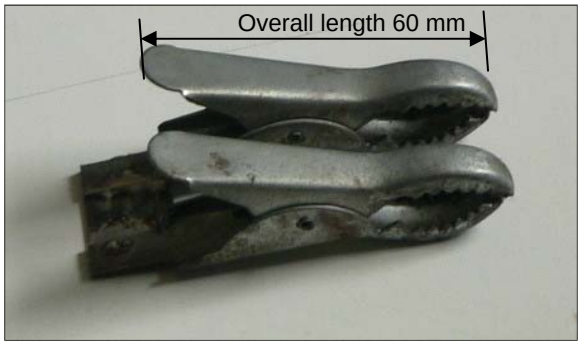
2 Wobbly Wheels
Often, you'll feel your car vibrating directly through your steering wheel. And one seemingly logical thing to guess is that an alignment issue might be the culprit. But car experts often advise otherwise. One or more wheels may suffer from excessive "play," or wobbliness, at the hub itself. The diagnosis and cure for this is pretty involved, as it could point to any of a number of issues. First, let's just assume that each wheel is fastened securely to its hub with properly torqued lug nuts.
With that out of the way, the solution to a shaky wheel might entail replacing the wheel bearings. On most modern vehicles, wheel bearings are meant to last the life of the car or truck. But as you may already know, if you subject your vehicle to worse-than-typical wear-and-tear (off-roading, extremely hard driving, high mileage), it's not unheard-of for bearings to wear out.
Another thing to look for is "run out." This is the term that describes how much a wheel deviates from a perfectly circular rotation when it is spun. Wheel technicians use precision instruments to determine if run out on any particular wheel exceeds half an inch. Much of the time, but not all the time, the solution is a new wheel.
Other sources of wiggly wobbly wheels include the tie-rod ends or ball joints. If they're worn out, they'll allow too much play in the wheel. At driving speeds, this translates to annoying vibration.
Wheels prove to be a common culprit when tracking down reasons for why a car is vibrating.

1 Tyre
We listed tyres last, and made them reason 1, since they are so frequently the source of your car's moving vibrations.
The full list of ways in which tyre issues can contribute to your vehicular shake, rattle and roll is a long one. But here are just some of the major ones:

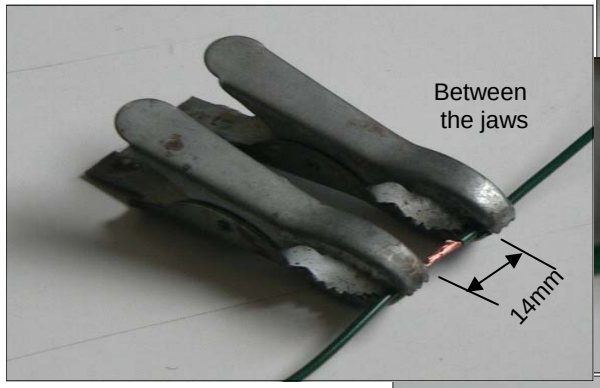
- Car vibrates at certain speeds -- requires tyre balance
- Tyres have separated tread -- requires tyre replacement
- Uneven tyre wear -- requires tyre rotation
- Tyres are "out of round" and roll unevenly - requires tyre replacement

Sometimes it isn't the tyres, but rather the wheels they're wrapped around that cause your car to vibrate when driven. Watch out for potholes and sloppy road repairs which can both be equally hazardous to your wheels so watch out for bent rims.
Also, keep in mind that these five reasons your car is vibrating aren't the only possible culprits. When in doubt, it's always a good idea to get a garage to check it out but it may just be the wife trying to get out of the boot.

SOLDERING WIRES WITH A THIRD HAND



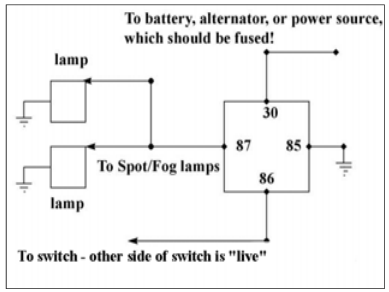
I mentioned earlier the alligator clip assembly I made in order to solder wires together. I wondered if the description was clear enough
Above are the two alligator clips soldered together and on the right showing a 20mm strip of steel soldered to the two clips leaving a gap between the jaws to hold the wires side by side as below,



The 20mm width makes it a handy size to hold as you can operate both or individually the alligator clip. It is also light enough not to drag wires vertically or cause to much sag in the wires. I also found that the old method of holding the wire reminded me sharply that the coefficient of heat expansion is quite quick up wire and that the insulation tend to melt round the finger tips so this is a good idea that worked for once –first time.

Up-Rated Headlamps

If you up-rate your headlamps from the normal 55 watts to say, 75 watt lamps, you increase the current drawn from 8.3 amps to 12.5 amps, which is quite an increase. Time to consider fitting a relay. This will save your headlamp switch contacts which may already be suffering (probably from 30 years + of old age!). If you use a relay , the existing switch contacts will only have to handle about 0.15 amps (12 volts divided by the resistance of the relay coil say 85 ohms = 0.14 amps). Also, Ford probably chose the thinnest wire they could reliably use for the wiring loom to save costs. That means that your wiring loom may be quite happy to work with 8 amps, but will complain (by heating up) when you push 12.5 amps through it. Push any more through it and you could end up with a fire, bearing in mind that there are no fuses to protect the circuits on the original car.



So, we have "thin" wires, old switches, and probably a lot of bad contacts where bullet connectors have 30 years of dirt and corrosion on them. We also take power from the battery, all the way to the dashboard switch, then all the way back again to the headlamps - double the necessary journey.

Time to fit relays!

Hopefully I have given you enough information to get those extra lamps fitted and working safely. Remember, use the correct cable and connections. You don't want a fire. Run cables neatly, make up a bundle and wrap with insulating tape. You can buy grey tape and make up your new wiring loom and after "weathering" for a few months will look as though it was always part of your wiring.

Good luck, and remember its "relay" not too difficult.

Tech tips

When wiring anything in your vehicle that draws heavy current such as high powered offroad lights or audio amplifiers, there are a few things to consider. Number one, make sure you use wire that is rated for the amperage that the accessories is going to pull. It is always better to have wire that is OVER rated rather than wire that is not rated high enough. If wire is used that is not rated to handle the current that your accessory will pull, the result could be overheated wires that could melt the insulation or the electrical plugs found throughout your vehicle (see image below), causing a short or worse yet it could result in a fire.

Any time that a tap is made off of a power source (battery, fuse block, distribution block...), you MUST put a fuse inline as close to the source as possible. Another thing to keep in mind is that you must insert a fuse inline anytime that the wire size is reduced, such as a tap off of the main power wire for an amplifier, head unit, equalizer... The fuse must be rated to open (blow) well before the wire starts to overheat. A secondary but very important consideration is environment. Is the temperature going to be extreme, hot or cold? Is there anything like oil, grease or solvents that will come in contact with the wire's insulation? All of these things have to be considered when selecting the wire if you want to build a reliable, well designed system

Wire Connections and Resistance:

Whenever making connections, make sure that they are tight. If you're making crimp connections, try to pull the wire out of the connector. If you can pull the wire out of the connector, it wasn't crimped good enough. If you are inserting the wire into a terminal block, tighten the screw down tight. If there is a bad connection and a sufficient amount of current flow through the junction (wire to terminal block), the block will heat up and possibly do irreparable damage to the terminal block or the printed circuit board (if the terminal block is on your amp).

COOLING THE WILDCATS ENGINE. AN ANORAKS GUIDE. PT 1

Because of the small opening at the mouth of the Wildcat/E type bonnet some cars may suffer from cooling problems. Of course the ultimate way to reduce heat is remove the bonnet to allow air to circulate completely round the engine. Although this does somewhat destroy the overall appearance of the car unless you want to impress the nurd who is into engines.

This may help cooling but not looks

Big Red Car without bonnet

Some members may consider up-rating the engine from say the 2.litre Ford to the 4.0 litre Rover V8 or even 3.5i BMW or 3.0 Datsun power. If you do carry out this mod then you will definitely need to understand the thermo dynamics of the cooling system before you decide on a new radiator. While you might think this is an easy task to change the cooling system, it is not. There are factors other than the core size of the radiator and in this two part article I will look at the mechanics of the flow system and the ways you can improve cooling. So this is split into 'Why and how cooling works for the more tech amongst us and 'Changing the parts that will accommodate better engine performance and managing engine temperatures.

Part 1 thermodynamics of the cooling system

Effect on the Cooling System of Increasing Engine Horsepower

It's helpful to understand that, during operation, internal combustion engines convert the energy of fuel into mechanical work and heat. Approximately one-third of the fuel energy goes into the mechanical work of the moving vehicle, one-third into exhaust heat, and one-third into heat transferred by the engine cooling system to the ambient air.

This means that heat load to the cooling system at rated power (Usually expressed in BTUs per minute) is approximately equal to the rated power of the engine expressed in BTUs per minute (HP X 42.4 = BTU/minute). From this we can see that if an engine is modified to increase its horsepower, the load to the cooling system will also increase.

In fact, the heat load to the cooling system will increase by about the same percentage as the increase in engine horsepower. So, if we increase the engine horsepower by 20 percent, we can expect an increase of about 20 percent in the heat load to the cooling system.

The Major Factor Governing Cooling System Heat Transfer

System heat transfer is governed by a single major factor-*The heat load to the cooling system.* Under "steady-state" conditions, the heat load to the cooling system (the heat rejected by the engine to the cooling system) will be transferred to the cooling air by the radiator no matter how good or how poor the radiator. So, if both a "poor" radiator and a "good" radiator will both transfer the same heat load to the cooling air, how can we say that one radiator has better heat transfer performance than the other? The answer is that, under "steady-state" conditions, with a "good" radiator in the cooling system, the radiator inlet temperature (Radiator top tank temperature) will stabilize at a lower temperature than a "poor radiator" in place. The "poor radiator may be so poor that its coolant temperature may rise to the boiling point resulting in engine overheating. Fig 1

Temperature Differential

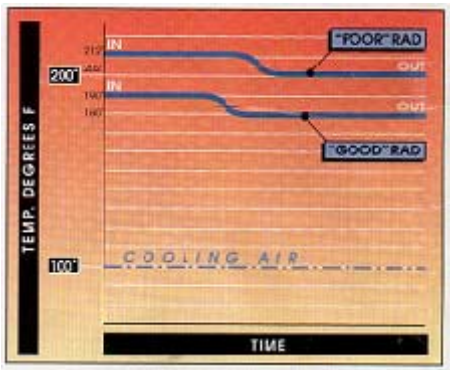


Fig 1 temperature differentials

The difference between the radiator average core temperature and the temperature of the cooling air is the driving force behind the transfer of heat from the coolant to the cooling air. When an engine starts and is run up to rated load, the coolant begins to heat up. When there is no thermostat in the system, the coolant flows from the engine through the radiator and back to the engine. Initially, the coolant and metal in the engine absorb the heat being produced and continue to do so until the temperature of these parts exceeds the cooling air temperature. At this point, heat transfer to the cooling air commences. The coolant temperature continues to rise until it reaches a temperature at which the difference between the radiator average core temperature and the incoming cooling air is great enough to transfer the entire heat load to the air. This then becomes a "steady-state" condition.

Anorak time. Heat Load to the Cooling System

The heat load to the cooling system is related to the flow through the radiator and the temperature drop through the radiator by the following expression: (See Fig 2)

Q = M * cp *dT

Where Q is the heat load BTU/min., M is the mass flow rate of the coolant in BTU per pound per degree F, dT is the temperature drop through the radiator in degrees F, and * indicates multiplication. Since a gallon of coolant weighs about 8.3 pounds, we can replace M in the expression by 8.3 times the coolant flow in gallons per minute, or GPM. The resulting expression is as follows:

30 and 87 in more detail

Contacts 30 and 87 are used to switch the load, such as spot lamps. One contact goes to the lamps, the other to the power source (e.g. the battery). When the relay operates, the circuit is from the battery, through the relay contacts, 30 and 87, to the lamps and hence to earth. The circuit is complete and the lamps will light. This will continue until the switch controlling the relay is opened. Current will stop flowing and the coil will release the contacts in the relay.

Use a maximum of 2 lamps per relay (so as not to exceed the capacity of the relay – a normal relay would be rated at 30 amps.) You should always mount relays with the contacts pointing down, to prevent water collecting, entering and damaging the relay contacts.

Some relays have fuses, which are used to protect the circuit being switched (in our case the spot lamps). If a short-circuit develops in the circuit, for example the "live" main cable may short onto the chassis, the fuse in the relay will blow. The fuse size should be close to, but more than, the current drawn by the load. (Watts divided by Volts = Amps) So, for example 130Watt Lamps, 130/12 = 10.8, so use a 12.5A or 15A fuse. (Note:- Always use "12" volts to calculate your amperage. The voltage of your battery should be nearer to 13.2 volts, but it can be lower so this gives you a safety margin when calculating wire sizes and fuse capacities). A fused relay is going to cost around £8 but gives you peace of mind and saves you having to install extra fusing in the lamp circuit.

Wiring sizes

For loads up to about 17.5 amps you will need 28/030mm, 2 sq mm cable which will cost around 35-40 pence per metre. This translates as 28 strands of copper, each strand being 0.30mm diameter. The cross-sectional area of the cable is 2 sq mm, which guides you towards fitting the correct terminal. The load quoted for this cable, 17.5 amps, is a continuous load of 17.5 amps. If you think you need a higher capacity cable, you'll have to move up to a thicker cable, the next one being 44/0.30mm 3sq mm and 27.5 amps.

If in doubt, ask!

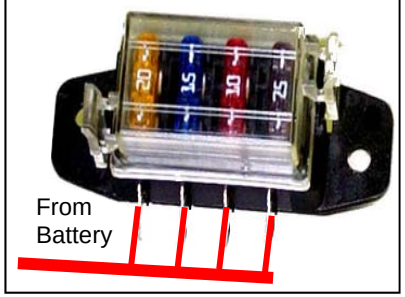
Terminal colours

You've all seen the nice coloured packets of pre-insulated terminals for sale in shops and at auto-jumbles. But what do the colours mean? Aha, you thought they were just decorative! The colour indicates the cable size which will fit the connector. So Red is up to 1.5 sq mm, Blue is 1.5 to 2.5 sq mm, and Yellow is 3 to 6 sq mm. From this, we will probably be using Blue insulated connectors. However, I would always solder my terminals now, so we need to look at non-insulated terminals and buy the insulations separately.

Five connector or change-over relays

Some relays have an extra contact, numbered 87a. This is used where a change-over is required. For example, two-speed fan motors, electric aerials up/down, or what used to be known as town and country horns. In this type of relay connections 30 and 87a are NORMALLY CONNECTED. When the relay is operated (energised) the changeover switch disconnects terminal 87a from terminal 30 and connects terminal 87. The load on terminals 87a should not exceed 20 amps. Refer to the specification when buying.

Battery bus bar and fuse box

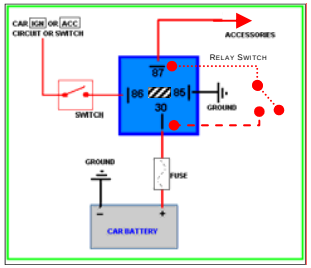


Fuse box

Its important that a fuse be put into any high voltage circuit, in fact any circuit on the car that you add. Failure of the unit can cause a fire and for the price of a fuse holder it protects the circuit and your car. It may help to put a positive fuse carrying bus-bar in the car so you can take a feed off this to your relay without lots of wires coming off main battery spurs and protect the circuits.

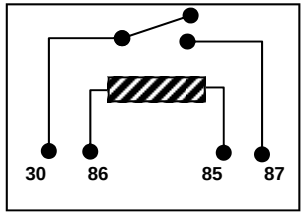
RELAYS -- IT'S "RELAY" NOT TOO DIFFICULT !

If you're one of those people mystified by electrical relays, who can't tell their Ohms from their Amps, the following may prove useful.
A relay is an electrical switch which allows a low-current circuit to control a high-current circuit. For example you want a pair of spot lamps on the car (high current) to be turned on and off by a dashboard switch (the low current circuit). The relay allows a thin cable to be used on the control side, and a (hopefully!) shorter but thicker cable on the load side. This helps to preserve your on/off switch from arcing, and reduces voltage drop in thin, tired old cables.
A basic relay for this purpose will cost between £2 and £4 each, be rated at 12 volts and either 30 amps or 40 amps. You probably want the kind with a mounting bracket to allow a self tapping screw to mount the relay on the inner wing or wherever.
Most 12 volt relays have four terminals, each with a number. (We'll look at five terminal relays later). The numbers are normally 30, 85, 86 and 87; not winning lottery numbers, but an indication of what should be connected where. (The numbers originated from a German specification). The problem is, I could never find the information I needed to tell me how to connect a relay. I hope this will help:-



The coil side (the circuit with the on/off switch) is connected as follows:-

- 86 is one connector on the control or coil side .
- 85 is the other connector of the control or coil side. It is normally connected to earth/ground. It does not matter which way "round" the relay is connected. You could connect 86 to earth and the relay will work quite happily. *Convention* says we use 85 connected to earth (in our case, the vehicle bodywork). The electrical symbol for a coil is a 4-sided box with a diagonal line. So the following sketch is not "correct" but you should get the idea!



The load, which could be spot-lamps, etc are connected as follows:-

- 30 is the power input.
- 87 is the power output to the load.

When you supply power to the coil (terminals 85 and 86) it becomes an electromagnet. The coil (electromagnet) then pulls on and that closes the connection between the contacts 30 and 87 which are NORMALLY OPEN). Now power can flow through the relay to your lamps etc.

85 and 86 in more detail
Connections 85 and 86 are to the magnetic COIL inside the relay. Think of it this way, the coil pulls the switch contacts 30 and 87 together. Remove the power from the coil and the coil releases the switch contacts and the load circuit is broken.
One contact is probably going to be connected to an on/off switch. The other side of the switch will be connected to power (that is the battery). The other relay contact will be earthed. When the switch is operated, current flows from the battery, through the switch, through the coil in the relay and then to earth, which is in effect the other side of the battery. The circuit is complete and the relay will "click" and operate. You can create this simple circuit with a few bits of spare wire and try it out for yourself! It is a very satisfying click!

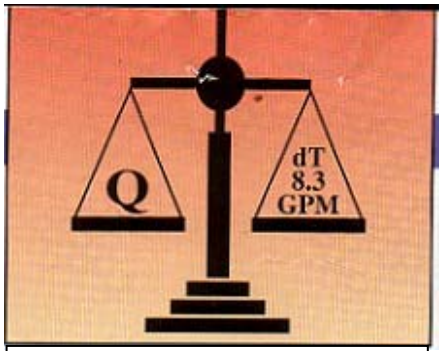


Fig 2 radiator heat loading

Q = .3 * GPM * cp * dT

Since the specific heat of the coolant is essentially constant and the coolant flow rate is constant at rated engine speed, the expression tells us something that surprises most people. That is, for a given heat load and coolant flow rate, the coolant temperature drop through the radiator will be constant, and nothing anyone can do to the design of the radiator can change that. Adding rows or fins or face area or whatever will not change the temperature drop through the radiator.
As a general rule, cooling systems are designed to operate with a coolant temperature of about 190 degrees F at the radiator inlet and have about a 10 degree F temperature drop through the radiator at rated power and rated coolant flow. This will result in a bottom tank temperature of 180 degrees F. Note that the coolant temperature drop through the radiator must be specified in degrees F or degrees C, not percent. Taking a percentage of the radiator inlet temperature will yield different results depending on whether the inlet temperature is given in degrees F or degrees C. (See Fig 3)

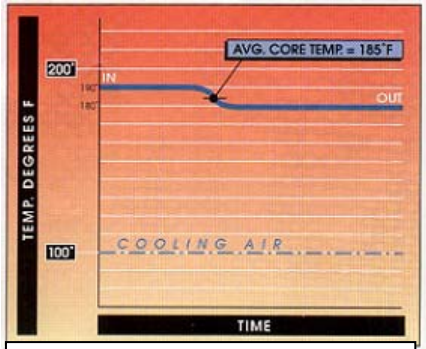


Fig 3 Radiator core temp

<u>Effects of Radiator Design on the Cooling System</u>

A cooling system whose heat load and coolant flow rate results in a 10 degree F coolant temperature drop through the radiator will have that same coolant temperature drop whether the radiator has a very small face area and flat fins or a very large face area and louvered fins.
The difference is that the large louvered fin radiator will be more effective than the small radiator at transferring heat to the cooling air, meaning that it can do it with a much lower difference in temperature between the core and cooling air. The small radiator may require such a high difference in temperature between the core and the cooling air and the core that the coolant may reach boiling temperature before the core is able to transfer the entire heat load to the cooling air.

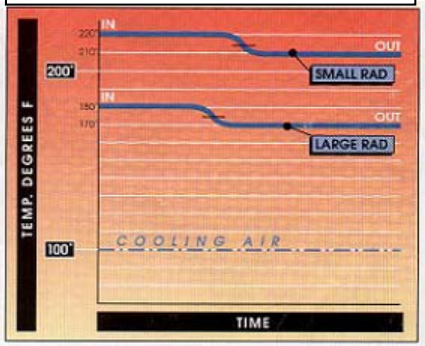


Fig 4 Small v large rad temp

While both radiators would have the same coolant temperature drop through the radiator, we would say that the larger radiator had better heat transfer performance if its top tank temperature (Inlet coolant temperature) stabilized at, say, 180 degrees F while the smaller radiator stabilized at 220 degrees F. (See Fig 4)

Improving an Overheated Cooling System

With this understanding of how a cooling system works what recommendations should we make for a cooling system that is overheating? Suppose we have an engine and cooling system that, in stock condition, produced a rated 200 hp and ran at rated ambient temperature with a top tank temperature of 190 degrees F and a 10 degree F temperature drop through the radiator.

Now suppose the engine were modified to produce 240 hp, a 20 percent increase. We would find that at 240 hp the core temperature drop had increased by 20 percent to 12 degrees F and the top tank temperature had increased, let's say to the point where it was just overheating.

Now suppose we take this system and reduce the power to the point where the radiator inlet, or top tank temperature is steady at 190 degrees F. (Guess what? It'll be producing 200 hp! (Funny, how that works).

So we check coolant temperature drop and find it is back to 10 degrees F, as we would expect, meaning the average core temperature is 185 degrees Fanon we want to make improvements to the system in order to lower the top tank temperature to the point where we can then go back to 240 hp without the engine overheating.

Understanding the **Coolant Flow Rate**

At the previous expression, we can see that slowing the coolant down is the wrong way to go. If the heat load is constant, lowering the flow will increase the temperature drop through the radiator, making the bottom tank, or radiator outlet, temperature less than before. If the bottom tank temperature goes down, the top tank temperature must go up to maintain approximately the same average core temperature so that the heat load may be transferred to the cooling air. At the reduced power setting it would rise above 190 degrees F and at 240 hp the engine would be overheating worse than before. In fact, because the lower flow rate results in lower coolant velocity and less "scrubbing action" in the tubes, the average coolant temperature must rise slightly in order to transfer the heat load from the coolant to the cooling air, making matters even worse.

What would happen if we increase the coolant flow? Will it go through the radiator so fast that there won't be time for cooling to take place? Not at all, from the expression, we can see that if the heat load is constant, increasing the coolant flow rate will reduce the coolant temperature drop through the radiator, resulting in a higher bottom tank temperature. If the bottom tank temperature is increased, the top tank temperature must go down to maintain approximately the same average core temperature. This is what we were hoping to achieve.

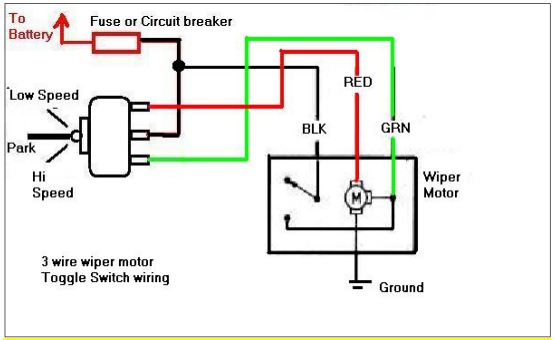
With the top tank temperature now less that 190 degrees F at the reduced power point, we can expect that the system will be better able to run at 240 hp without overheating, In fact, because the increased coolant flow rate results in a higher coolant flow velocity and better "scrubbing action" in the tubes, the average coolant temperature decreases slightly while transferring the same heat load to the cooling air, further lowering the top tank temperature, resulting in better cooling performance.

From this we see that increasing the coolant flow rate will result in better heat transfer performance. There are some cautions to be observed in increasing coolant flow rate, however. Going too far may result in aeration and foaming of the coolant, possible damage to the radiator by overpressure, cavitation of the pump, due to excessive pressure drop through the radiator, and erosion of the radiator tubes. The ideal coolant flow rate is one that will provide optimum coolant flow velocity through the radiator tubes in the range of 6 to 8 feet per second. Flow velocities above 10 feet per second should be avoided.

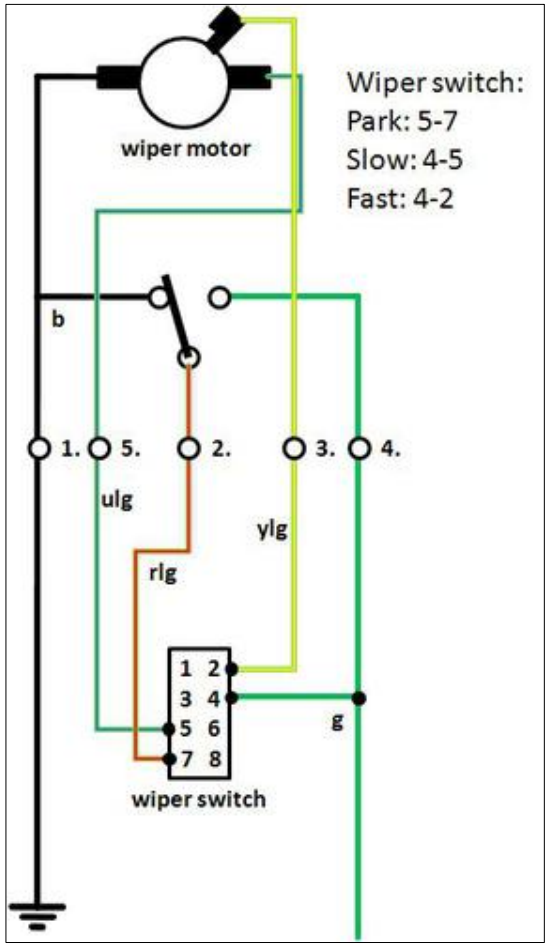
I had some mail from TK in the states who had two Wildcats and a XK120 kit, he said

'A couple of other factors I learned with the XK 120 was that the original blade original fan blades was a four blade job and I was informed that each extra blade increased cooling by 5%. It really did change the when I got a seven blade Mustang fan.

ONE PUSH - ONE WIPE



Above is the usual wiring of a windscreen wiper circuit and below Derek Argyles new circuit



I don't mind driving my E through a rainy day. However, I became fed up with the wiper switch, which can only switch the wipers "on" or "off". I wanted a new switch, somewhere, which I could press once for one wipe, a switch like the washer switch.

So here is what I did. For the washer switch (an on-off switch), I installed a new switch which is on-off-on. I bought Lucas switch 30380 (new old stock), pried off the cap and replaced it with the existing cap of the wiper switch (that required some cutting in the cap). At rest, the new switch is in the middle position. Pressing down activates the washer. Pressing up activates my wipers, just once. Sweet!

That took some thinking, though. With the new switch, you want to connect the blue - light green wire to +12v, but in rest this ulg wire is connected with the rlg wire through the existing wiper switch. The parking switch in the wiper motor connects the rlg wire to ground. So, just splitting the ulg wire and feeding 12V will blow fuse no. 7 (the one with all the green wire attached to). See the attached pic for a wiring diagram. The small numbers are the numbers on the terminals of the plug that plugs into the wiper motor. and here is the modified wiring diagram. When the new switch is "off", the ulg wire of the wiper motor connects through the relay and the uw whire to connection 5 on the wiper switch. That is the same situation as in the original wiring diagram. Pressing the new switch activates the relay and disconnects the ulg wire first from the wiper switch and connects it to an extra feed wire (the gr wire), which comes from the green wire (green is always +12V). The rather strange colour coding on my diagram is because of the wires I had available... you choose what you want.

The result: press the button once - the wiper go once. Nice!

Vehicles with Smiths voltage stabilisers can easily be identified. If the fuel gauge needle "jumps" off the empty position when the ignition is switched on, the vehicle is NOT equipped with a voltage stabiliser. Fast responding gas gauges are based on the "balance magnet" principle and do not require the voltage stabiliser. If, however, the fuel or temperature gauges slowly drift up when the ignition is switched on, the car uses a voltage stabiliser and gauges based on bimetallic heating elements. The voltage stabiliser can be mounted any number of places. Consult your service manual to determine its location. If you suspect there are problems with a vehicle known to have a voltage stabiliser there are a few quick tests that can be made to determine the source of problems.

High Gauge Readings:

1) While the stabiliser is in the vehicle, remove the wires from the "I" terminal and connect a volt meter between the "I" terminal and chassis ground.

2) Switch on the ignition. If you measure full battery voltage AND it remains there without changing for more than 20 seconds it is likely that the points in the stabiliser are not opening. Failure of the points to open does not necessarily mean the stabiliser has failed.

3) Remove the stabiliser, clean all its spade lug terminals AND clean its mounting tab. Remove any rust and corrosion on the stabiliser AND where it mounts to the vehicle. If the ground or earth contact is poor the stabiliser points will never "open".

4) Remount the stabiliser, connect the "B" wire(s) and repeat the test. If the voltage is still high consider replacing the stabiliser.

Low Gauge Readings:

1) Consistently low gauge readings can be the result of bad sending units, bad ground connections, or a failed stabiliser. First confirm that low readings are not the result of disconnected wires or an empty gas tank.

2) Disconnect the "hot" lead from the fuel sending unit (typically this is the green/black wire on the sender).

3) Switch on the ignition and have an assistant touch the "hot" lead to a good, clean, bare metal point on chassis ground.

4) If the fuel gauge climbs to full, the problem is in the sending unit or its ground connection.

5) If the fuel gauge reading is still low, this could indicate low output voltage from the stabiliser or a defective wire (See "No Gauge Readings" below).

6) Before replacing the stabiliser clean all of its spade terminals, its mounting tab, and its mounting spot on the car. After cleaning, repeat the test above and if there is no improvement replace the stabiliser.

No Gauge Readings:

1) Mark and disconnect all the wires going to the voltage stabiliser so you can replace them later.
2) Clean all the terminals on the wires connected to the stabiliser.
3) Connect a volt meter between chassis ground and the wire(s) that were on the "B" terminal. Switch on the ignition and observe the volt meter reading.

4) If the reading is not the same as battery voltage, look for a fault in the supply wire to the stabiliser. 5) If full battery voltage is measure on the "B" wires, switch off the ignition and use the use the volt-ohm meter to
measure the resistance of each wire (that was connected to the "I" terminal) from end to end. If the wires show more than a few ohm of resistance there is a fault in the wiring.

6) If no problems are found with the wires and if the problem is with the fuel gauge, reconnect the voltage stabiliser. Repeat the "Low Gauge Reading" test above where the "hot" wire on the fuel sender is shorted to ground. If the gauge shows "full" with the ignition on, carefully check the ground connection of the sending unit AND the resistance of the sending unit itself. (Reference: With a volt-ohm meter connected directly across the fuel sending unit terminals (no wires attached) the sender should measure between 0-20 ohms full (float up) and near 270 ohms when empty (float down))

Also if you run the water through the radiator too fast it will not cool. I gad a V8 Ford that I rebuilt and left the two thermostats (old flat head) thinking it would run cooler. Wrong it ran hot until I put some thermostats in. I really couldn't figure it out until some old timer told me water was going through too fast to cool.'

Of course you may have noticed the omission I made at the start of this piece. The ultimate way to keep the engine cool is to keep water in the radiator and cooling system. If you're always low on water you are losing it somewhere so check all the piping and clamps. Remember Water is one material you can not destroy.

Can we improve the rad performance? Yes we can and this will be in the next issue of Cat Chat. In the mean while keep calm and cool and carry on.

COOLING THE WILDCATS ENGINE. AN ANORAKS GUIDE. PT 2

In the last issue of Cat Chat we looked at radiator performance so that we could understand the thermodynamics of cooling related to engine improvement or exchange. So what are the changes we can make to improve cooling?

IMPROVEMENT RULE 1 –

- ***Anything you can do to increase the coolant flow rate, within limits described, will improve heat transfer and cooling performance.***

Cooling Airflow

Cooling air becomes heated as it passes through the radiator. It enters the radiator at ambient temperature and exits the radiator at some increased temperature. It is the difference between the average core, or coolant temperature and the average of these two cooling air temperatures that creates the ability of the radiator to transfer heat to the air. The slower the air passes through the radiator, the higher will be its exit temperature and the higher will be the average cooling air temperature. The higher the average cooling air temperature, the less heat will be transferred from the coolant to the air. On the contrary, the faster the air flows through the core, the less it will increase in temperature on its way through, making the exit temperature and the average cooling air temperature lower. This increases the differential between the average core temperature and the average air temperature, increasing the heat transfer. Increasing airflow by speeding up the fan, by providing an improved fan, by providing or improving the fan shroud, by reducing air restrictions in the grille or engine compartment, or by providing recirculation shields to prevent air from bypassing the core, will all improve heat transfer and cooling.

Radiator Face Area

•Improvement Rule 2

- ***Anything you can do to improve airflow through the radiator core will help.***
- ***Anything that blocks or slows airflow, either before or after the radiator, will hurt.***

As we have seen, cooling air becomes warmer as it passes through the radiator. Coolant in the back row of a radiator is cooled by warmer cooling air that coolant in the front row of a radiator. Increasing the face area of a radiator exposes more coolant to the coolest ambient cooling air, increasing the radiator heat transfer capability.

Increasing the radiator face area may not be practical in all cased because of space limitations. However, similar improvement may be obtained by relocating any air conditioning condenser, or oil cooler which may be in front of the radiator, thereby exposing more of the face area of the radiator to the coolest ambient cooling air.

Radiator Fins

Improvement Rule- 3

- ***Increasing the face area of the radiator by making the radiator larger will help.***
- ***Relocating other heat exchangers that were in front of the radiator in order to expose more radiator face area to ambient cooling air will also help.***

Increasing the radiator fin count, or number of fins per inch, provides more surface area for the transfer of heat to the cooling air. However, increasing the fin count increases the restriction of the radiator to cooling airflow. Lower cooling airflows result in lower heat transfer. In every installation there is an optimum combination of fin performance and core restriction that will produce maximum heat transfer. Increasing the core restriction from this optimum point by increasing fin count will reduce the heat transfer performance of the radiator.

On the other hand, if the original radiator has a very low fin count, increasing will improve heat transfer. In general, for high performance applications, fin counts from 12 fins per inch to 16 fins per inch are optimum. Increasing the fin count above 16 fins per inch will almost always result in reduced heat transfer performance. Since, as we have seen, in a given installation under "steady-state" conditions the radiator must transfer the given heat load no matter what, the reduced heat transfer performance resulting

Radiator fins, whether plated or serpentine types, may be louvered or non-louvered. Louvered fins turbulate the air passing through the radiator to increase the "scrubbing action" of the cooling air, providing greatly improved heat transfer with some increase in air restriction. Louvered fins also tend to become clogged with dust and debris more readily than non-louvered fins, but for high performance applications are the only way to go. Non-louvered fins are typically used on farm and construction equipment, operating in dirty environments. Non-louvered fins may be made with patterns of dimples, waves, or bumps in order to provide turbulation without clogging.

IMPROVEMENT RULE- 4

- ***Increasing the fin count may help, but it may hurt.***
- ***Increasing the count above 16 fins per inch will almost always hurt.***

IMPROVEMENT RULE- 5

- ***A plate fin radiator and a serpentine fin radiator of the same fin count, tube size, tube rows, face area, core depth, etc., will have the same heat transfer performance.***

IMPROVEMENT RULE-6

- *·Louvered fins provide greatly improved heat transfer with some increase in cooling air restriction.*
- *Changing from a non-louvered radiator to a louvered radiator core almost always improves heat transfer performance.*

As we have discussed, cooling air becomes warmer as it travels through the radiator core. Each successive row of tubes becomes cooled by warmer and warmer cooling air until at some point little or no heat transfer takes place. As was discussed regarding fin count, in every installation there is an optimum combination of fan performance and core restriction that will produce maximum heat transfer performance.

VOLTAGE STABILISER WIRING

I had a problem trying to find out how to wire the Smiths voltage stabiliser into the Jag dial panel Here is some info on it. (Refer to Figure 1)

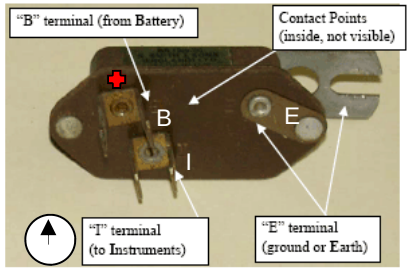


Figure 1 – Voltage Stabilizer Terminals

"E" terminal. The "E" terminal (if marked) is the electrical connection common to the chassis of the vehicle (ground or Earth). It may be positive or negative depending on which battery terminal is connected to the body of the vehicle. The stabiliser's case (even if unmarked) is also terminal "E"

Contact Points. These are electrical contacts inside the stabiliser. The points act as a switch.

"B" terminal. This is the Battery connection to the voltage stabiliser. It is typically a switched connection that is "hot" only when the ignition switch is on.

"I" terminal. This is the Instrument or gauge connection to the voltage stabiliser.

Early British cars (prior to the mid-1960s) did not always utilize a voltage stabiliser and their instruments operated at full battery potential. The voltage of the car's electrical system would change according to the operation of the charging system and what loads were put on it. This changing voltage allowed the instruments to behave erratically or inaccurately.

The Smiths voltage stabiliser is a mechanical voltage regulator that reduces and maintains the instrument operating voltage at 10v dc. Inside the stabiliser is a bimetallic strip, an insulated heating wire coil, and contact points. (See Figure 2a & 2b)

1.The contact points are located inside the stabiliser housing. One side of the points is on the "B" terminal, the other side is on one end of the bimetallic strip attached to the "I" terminal.

2.The bimetallic strip carries current between the contact points and the "I" terminal.

3. The heating wire coil is wound around the bimetallic strip. It is connected between the contact point on the bimetallic strip and chassis ground.

When the ignition switch is turned on, the "B" terminal sees full battery voltage. Initially the stabiliser points are closed. Current is carried across the contact points, through the bimetallic strip, and provided to the "I" terminal. Thus, when the ignition is first turned on, full battery voltage appears on the "I" terminal of the stabiliser. Remember that one end of the heating wire is also attached to the contact point on the bimetallic strip. Thus, when the ignition is switched on, current also begins to flow through the heating wire to chassis ground. The resulting heat causes the bimetallic strip to change shape and "open" the points. This breaks the current flowing to the "I" terminal and through the heating wire. The voltage on the "I" terminal drops to zero (0) volts when the points open and the heating wire cools. Without heat the bimetallic strip returns to its original shape closing the points. This restores current flow to the "I" terminal and the heating wire. The cycle repeats several times a second. The result of this on-off cycling produces a reduced "average" voltage on the "I" terminal. The voltage is not a steady 10v, but switching occurs with a frequency that approximates 10v. Because of this fast switching, it is virtually impossible to measure the operating voltage of a stabiliser directly using a volt-ohm meter.

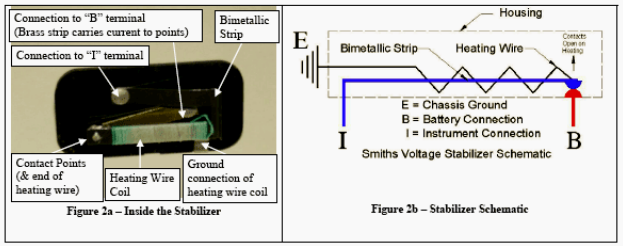
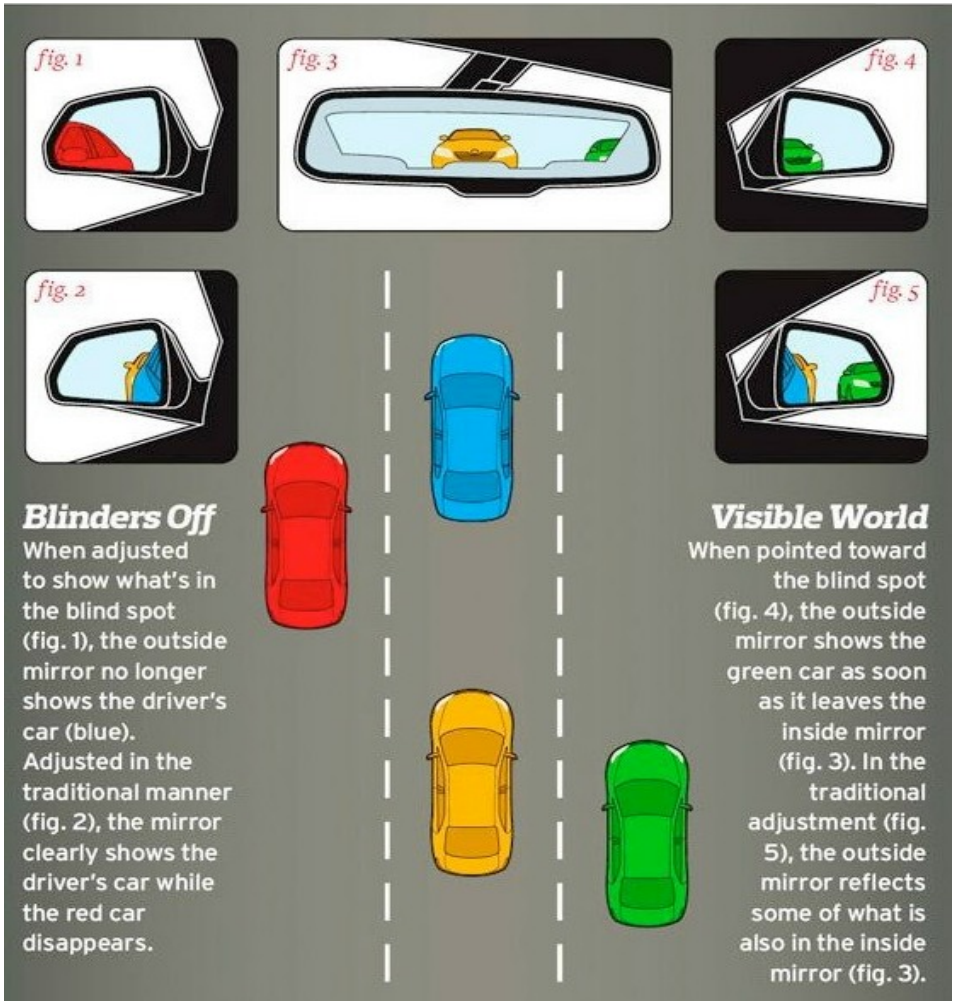


Figure 2a – Inside the Stabilizer

Figure 2b – Stabilizer Schematic

ON A WING (MIRROR) AND A PRAYER

For the past few years, various carmakers have been offering blind-spot detection systems for their cars' side mirrors. Often complex, these systems employ cameras or radar to scan the adjoining lanes for vehicles that may have disappeared from view. The Society of Automotive Engineers (SAE) published a paper in 1995 suggesting how outside mirrors could be adjusted to eliminate blind spots. The paper advocates adjusting the mirrors so far outward that the viewing angle of the side mirrors just overlaps that of the cabin's rear view mirror. This can be disorienting for drivers used to seeing the flanks of their own car in the side mirrors. But when correctly positioned, the mirrors negate a car's blind spots. This obviates the need to glance over your shoulder to safely change lanes as well as the need for an expensive blind-spot warning system. The only problem is getting used to the SAE-recommended mirror positions. The cabin's rear view mirror is used to keep an eye on what is coming up from behind, while the outside mirrors reflect the area outside the view of the inside rear view mirror. Seems like a good idea to me.



Increasing the core restriction from this point by increasing the number of rows of tubes will reduce the heat transfer performance of the radiator. However, if there is a high rate of cooling airflow through the core, adding a row of tubes will probably provide some improvement. In high performance applications with louvered fins, three rows or a maximum of four rows will probably provide best performance. Increasing beyond four rows in a louvered core will provide little or no improvement and may even result in reduced performance.

Adding another row of tubes has other effects. It provides another path for the coolant, resulting in lower coolant flow velocities through the tubes. Optimum coolant flow velocity through the radiator tubes is about 6 to 8 feet per second. If the flow rate becomes low enough, laminar flow occurs, creating a boundary layer of coolant along the walls of the tubes. This boundary layer, or very slowly moving layer of coolant, acts as an insulator and retards heat transfer. Going to a smaller tube size when adding a row of tubes is one way to keep the coolant flow rates up in the tubes to help prevent the formation of a boundary layer. Another way is to use dimpled tubes, which are commonly used in low flow applications.

Contrary to popular opinion, dimpled tubes do not slow the coolant down in order to make it stay in the tubes longer. The dimples increase the length of the coolant flow path by making the coolant twist and turn as it passes through the tube. This actually speeds up the coolant flow along the tube wall, increasing its "scrubbing action," preventing the formation of a boundary layer, and improving heat transfer. On the other hand, using dimpled tubes when they are not needed can hurt heat transfer performance by increasing tube restriction, which reduces coolant flow and can cause cavitation at the coolant pump.

IMPROVEMENT RULE 7

- *Adding a row of tubes may help, but it may hurt by increasing cooling air restriction and reducing the coolant flow rate in the tubes.*
- *·If the cooling airflow has been increased over the original installation, adding a row or two will probably help in this situation.*
- *Increasing the number of rows beyond 4 in a louvered fin core will almost always hurt.*

IMPROVEMENT RULE- 8

- *·Adding two rows of tubes without increasing the coolant flow rate (Bigger pump or turning the old pump faster) will probably reduce performance because of low coolant flow rate in the tubes.*
- *·Reducing the tube size or going to dimple tubes may help. Increasing the coolant flow rate will surely help.*

Coolant Selection

Water has a higher specific heat than an ethylene glycol or propylene glycol coolant mix. Therefore, it provides the best heat transfer performance in a cooling system. If a cooling system is marginal, that is, it only overheats on the hottest of days, then running with water as a coolant in the summer and an ethylene glycol or propylene glycol coolant solution during the rest of the year will probably solve the problem. Commercial coolant solutions provide cooling, anti-freeze protection, corrosion inhibitors to protect the metals in the cooling system, and a lubricant for the water pump. When running water as a coolant for maximum heat transfer, a product that provides a corrosion inhibitor and water pump lubricant should be added to the water.

In terms of the relative heat transfer performance of ethylene glycol versus propylene glycol coolant bases, they are pretty much equal when mixes according to the manufacturers' recommendations, usually a 50/50 water to glycol mix. Ethylene glycol coolant solutions provide slightly higher heat transfer performance over propylene glycol solutions at low coolant flow rates.

IMPROVEMENT RULE- 9

- *For maximum heat transfer performance in warm climates, use water as a coolant with an additive to provide a corrosion inhibitor and water pump lubricant.*
- *For winter service, use a 50/50 water to ethylene glycol coolant solution that includes corrosion inhibitors and a pump lubricant.*

Aluminum vs. Copper/Brass Radiators

Copper is a better conductor of heat than aluminum. Copper/brass radiators usually have copper fins, but brass tubes (70% copper, 30% zinc). The bond between the fins and the tubes may be made with soldier (A tin/lead alloy, or high-tin alloy) or with a braze material (mostly copper). Don't forget that engine coolant is a vital necessity to protect your engine. Frozen water expands and splits hoses. Pot holes in the road are caused by water seeping through the ashfelt, freezing and expanding breaking up the ashfelt

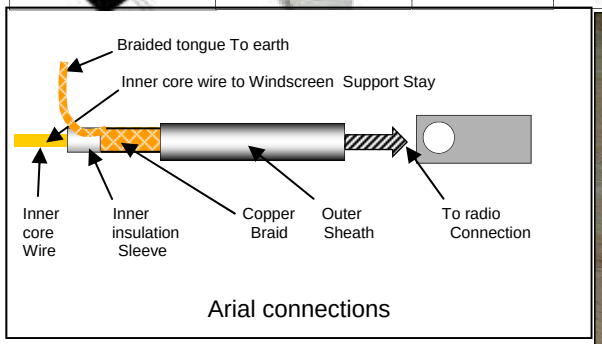
Coolants

The most appropriate fluid selection for the purpose of removing heat from the automotive engine is one which possesses a number of characteristics. Ideally, and most importantly, the fluid should have a high heat capacity and low viscosity – meaning that it can absorb the heat in the engine and flow fast, away to the radiator whereupon it is cooled by airflow. The simplest such fluid is water. Water possesses a very high heat capacity, is readily available and cheap, and is therefore one of the most effective cooling substances known to man.
Water does present problems though. Water freezes at 0°C (32°F) and boils at 100°C (212° F), which is a narrow range for the operating engine, particularly in colder climates where freezing temperatures are common. Another significant problem with the use of water alone in a cooling system, is that it is corrosive by nature, and this corrosive influence of water needs to be addressed.

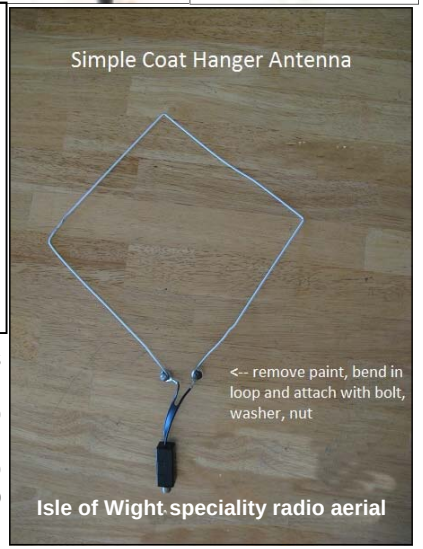
1

The addition of other base fluids to water can significantly alter its boiling and freezing temperatures. Monoethylene Glycol (MEG, or otherwise simply known as "Glycol") has been known to have such an effect on water for many years. The addition of varying quantities of MEG has a profound impact on the freezing point of water. Therefore, it is possible to blend a base fluid comprised of parts of water (which enhance cooling effect, and reduce cost), with MEG (to enhance freezing point depression and boiling point elevation performance), to produce a fluid that is effectively in liquid state throughout all temperatures expected in the normal operation of an automotive engine, even in cold climates.

Radio aerial options seem limitless, but they all do the same job. The best is the electric aerial which disappears when the radio is off and is vandal proof. So, If your thinking of put-



Arial connections

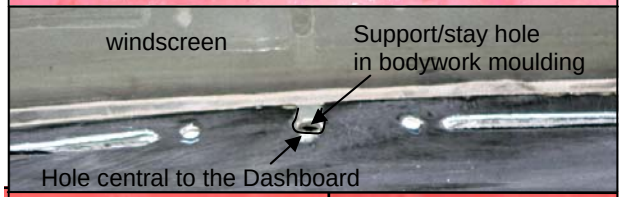


ting a radio aerial on the car there are several options on the market that would suit your car including the Isle of Wight coat hanger model. However all need to be earthed to the chassis and the central core wire attached to the antennae. It's a relatively easy job to turn your windscreen surround and support stay into an invisible aerial. Strip back the insulation as you would for wiring in a TV connector and wind the copper mesh into a flying tongue. Solder the tongue to a piece of black wire, cover the joint with heat shrink sleeving (HSS) and attaché it to an Earthing point on the chassis. Solder the inner core wire to another piece of wire, cover it with HSS, solder the other end of the wire to a 2BA washer. (The stay has a 2BA thread). Assemble the stay and place the washer onto the underside of the stay and do up the lock nut.

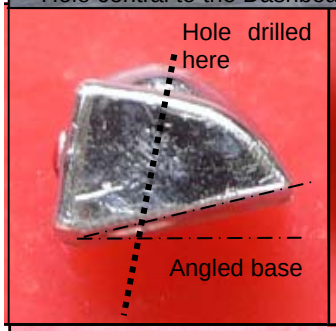
TURNING THE WINDSCREEN INTO THE RADIO AERIAL

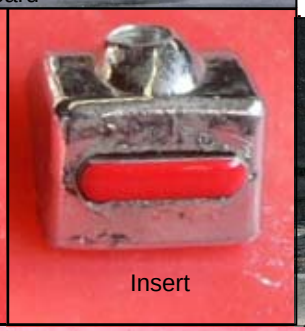
At last I can spend a few hours on the Spanish Flyer after spending a couple of days sorting out the workshop from paint tins left over from decorating and water damage from the leaking roof onto tools and benches. It was time to fit the windscreen support /stay and I decided to make it my car aerial. Before that I needed something to hold the dash central and lock it in position centrally and would use the windscreen support stay to it.

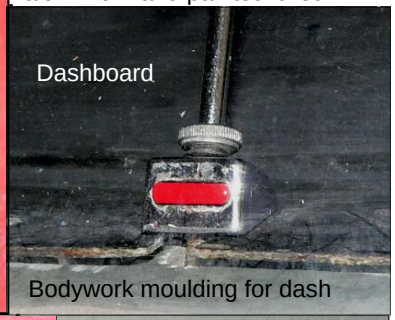
I found an old chain lock and took out the slide and detached its chain from the front which left a slot in the slide casting which I was going to use as the downward 'washer' where the screen support bar passed through the windscreen attachment point.

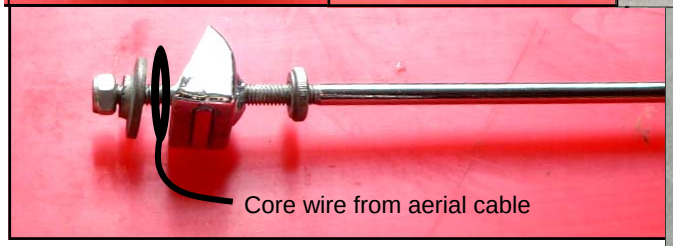


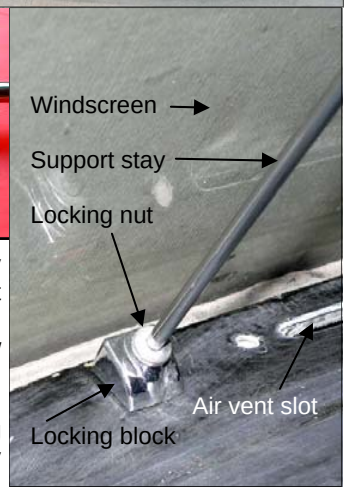
Because of the angle of the windscreen stay I angled the base of the casting and drilled through its original fixing point to allow the windscreen stay to be used as a lock down point on the dash. I filled the chain slot with a piece of aluminium and painted it red.



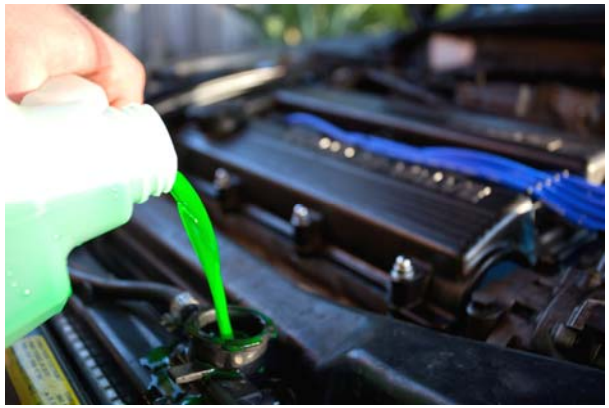








It was then a simple job of putting the casting onto the stay and passing it through the bodywork to be attached by a nut under both the dash and the body moulding. The red aluminium insert finishes the chromed casting. It was now ready to accept the aerial to be placed under the locking washer on the stay. Making the aerial is not a problem however there are options on the market rather than making one, but you need to put a hole in the bodywork. This way you don't and its vandal proof.



A good quality, well maintained, integrous cooling system with a good quality radiator cap will apply sufficient pressure to elevate the boiling point of a cooling solution to over 139°C.

There are two varieties of glycol: monoethylene glycol (MEG) and propylene glycol (PG). Both can be used in automotive or heavy-duty engine coolants or heat transfer fluids, although it is generally accepted that ethylene glycol based fluids, when used as directed, offer the greatest performance advantage.

Compared to glycol and water content, the corrosion inhibitor packages form a small percentage in the overall composition of coolant. The function of the inhibitor package is absolutely critical to the performance of the fluid. The combination of water, glycol and heat forms a potent mixture that is able to attack any unprotected metal and component surfaces. Such corrosion can take a variety of forms. The most common form of corrosion is Oxidation (otherwise simply known as rust) which can be widespread over entire metal surfaces.

Other forms of corrosion are also possible in common engine cooling systems including:

a) Cavitation corrosion; caused by the implosion of air bubbles in the cooling fluid.

b) Pitting corrosion; caused by aeration of the coolant fluid.

c) Galvanic/ electrolytic corrosion; caused by a temporary voltage difference between two disparate metals in the coolant hardware.

Properly formulated coolants will contain inhibitors which suppress and limit the development of each of these corrosion mechanisms.

Any form of corrosion can liberate particulates in the fluid, which can be very abrasive (leading to further wear), and if accumulated over time, can clog vital ducts within the radiator, reducing the radiator's efficiency. This can subsequently reduce engine performance or in severe cases cause engine breakdown.

Other Minor Coolant Ingredients

Coolant formulators add a number of other minor ingredients which all perform significant and important roles in the performance of the fluid, although may be unrelated to heat transfer or corrosion protection.

Some of these minor performance additives are:

- -Scale inhibitors which prevent and remove the formation of scale (which can be common where poor quality water is used).
- Antifoam ingredients which prevent the formation of bubbles and aeration and which is key to minimising pitting corrosion.
- Dyes to differentiate coolant types. There are a number of conventions of coolant dyes based on the technology types.
- Bitterant (or denaturing fluids) which limit the likelihood of accidental ingestion of the coolant fluid.

E TYPE SERIES 1STAINLESS STEEL HARRINGTON BUMPERS

We have long talked about Harrington bumpers and now Ian Clayton has some more definitive information on these items. It will take some space but its well worth it as it answers most of your questions about replacement or new bumpers for the Wildcat.

Hi Alan

I have just received a long Email from Harrington

It would appear thanks to your write up in Cat Chat that several of our members have bought these bumpers. Hope this reaches you and is of interest. Doesn't say if there is an extra charge for the Over-riders. I have asked and am awaiting a reply. I will attempt to forward it to you for perhaps inclusion in our magazine…..Ian

From Group Carrington

Dear Ian,

For your interest in our products.

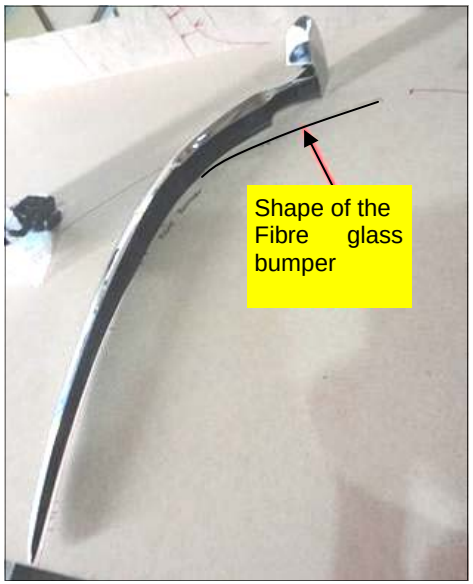
name is Christoph Joebstl, I am the Sales & Marketing Director of Group Harrington- we talked on the phone yesterday.

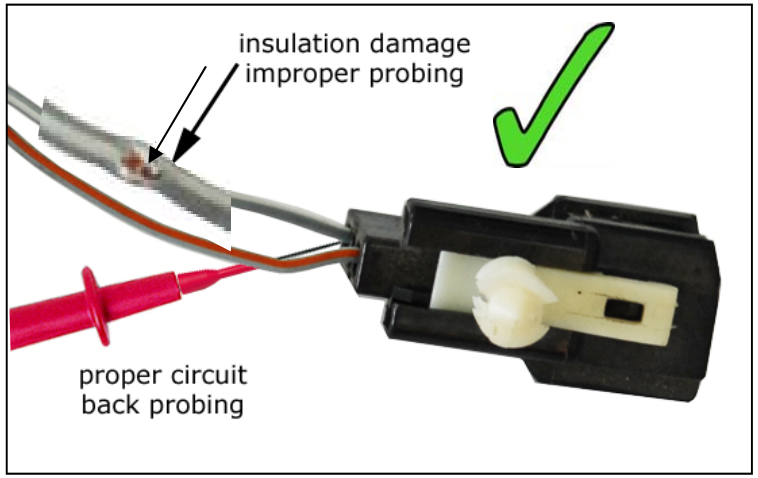
, we have indeed been provided with original JPR Wildcat rear bumpers to use as patterns for reproduction. The front bumpers for the JPR Wildcat are the same as the standard XKE S1 bumpers we already supply.

The price for a set of JPR Wildcat bumpers is ***£928 including shipping****. These bumpers are made to order, production of the new set will take about 25-30 working days from the day we received payment. Our payment methods are at the bottom of this email- kindly let me know which method you prefer in case you decide to go ahead with an order.*

When ordering, please also advise about questions below:

Our bumpers will be produced according to the shape of the original JPR bumpers we have here at our workshop- the bumpers are quite a bit longer and of different shape than the standards E-Type bumpers (see first photo below). Also, the over-rider design is different to the standard E-type bumpers- we use the standard over-riders as patterns! ***Please have a look at photos below and confirm!***





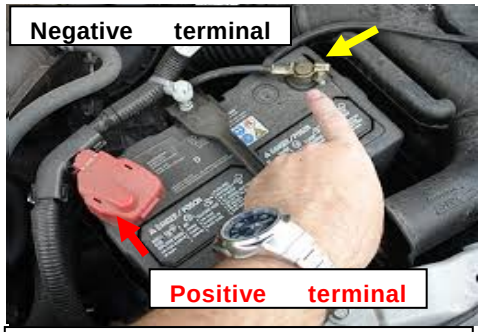
So, you replace the wire. Problem solved; at least until you go around front to check the lights. Now they're both the same color. Perking up the dim one suddenly makes you realize they're both less than brilliant--which is what I'd expect when I meter 11 volts at the bulb socket instead of the 14 I'd expect when the engine is running. There's still a resistance in the circuit, but this time it's between the battery and bulb. Back to the DMM.

Meter between the battery positive post and the clamp. You should see very little voltage there. With the lights up, the total draw on the battery is 15 amps or more. Any resistance between the clamp and the post will cause a measurable voltage drop. It shouldn't be more than a few millivolts. Chase the circuit toward the lamp, one metal-to-metal junction at a time. Probing between the input and output of the headlamp relay shows a drop of nearly a volt. Popping in a new relay puts that reading down to a few millivolts. And both headlamps are blazing.

Problem solved.

Warning: Math Alert

- Your 55-watt headlamp bulb draws 4 to 5 amps from the car's electrical system, and we can calculate that it has a resistance of about 3 ohms.
- Our cheapo trouble light has a resistance of 10 to 12 ohms, meaning that if we poke the trouble-light probe into a circuit, it becomes part of the circuit, changing the values we're trying to diagnose.
- Our DMM has a resistance of over 10 million ohms, eliminating the possibility that attaching the meter probe will change the voltage in a circuit.
- It's important to do this testing with the circuit turned on and operating when you're troubleshooting. Imagine that our corroded wire was in the positive side of the headlamp circuit, not the ground side
- And the battery is a little low, so you just pop the connector off the bulb and meter the socket. If the wiring is fine, you'll see full system voltage on the meter, so everything must be peachy, right?
- But there's our damaged wire in there, with an internal resistance of an ohm or three. You'd expect the meter to show reduced voltage, and you'd be wrong.
- It's the current flowing in the circuit that produces the voltage drop.
- The DMM, with its megohm impedance, draws no current--and you'll read full system voltage until the circuit is loaded down.
- I'm not happy with more than a few hundred millivolts of drop across any connector.
- The total drop in any circuit shouldn't be more than 1 volt, whether it's a dome light drawing 500 milliamps or a starter drawing 200.

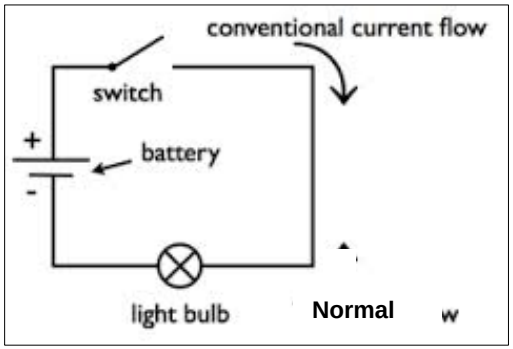


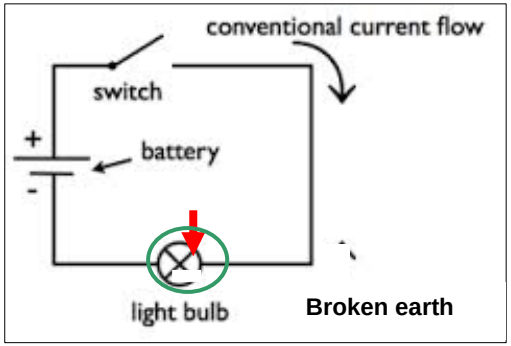
Check the battery connections are

As you're metering the ground side, suddenly the voltage on the meter jumps up. And it doesn't jump to the 11 volts we saw before--it jumps right up to 12.5 volts, exactly what we can meter at the battery. The bulb goes out at the same instant. Now what?

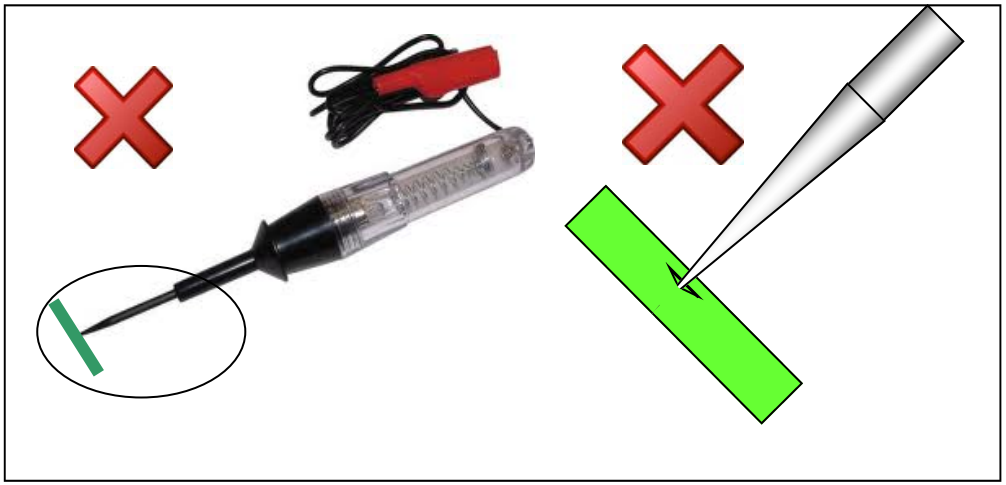
You're metering full battery voltage. That means there is lack of continuity--an "open" in the circuit somewhere between the DMM positive probe and the battery ground.

If the open resulted from a burned-out filament or a broken wire on the hot side, you'd see zero volts. The open is on the ground side for sure. What used to be a resistance, around 1 ohm, in that ground circuit has suddenly become an open, with essentially infinite resistance. Culprit?

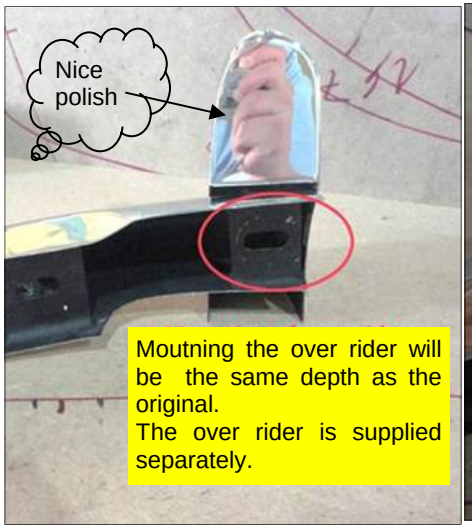




It's a broken ground wire, probably caused by someone poking a pointy test light or meter probe through the wiring to examine a problem years ago. The hole in the insulation has admitted water to the wire inside, turning it into green, high-resistance corrosion--eventually causing the wire to fail. Which brings up another lesson: Never poke a hole into a wire to check a circuit.

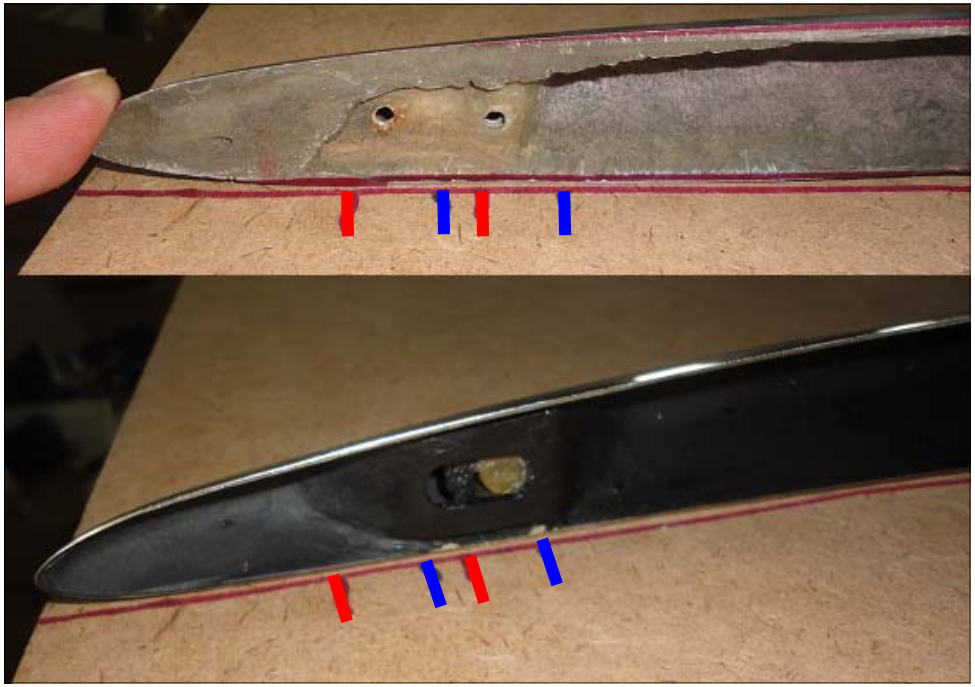


*2. As mentioned above, we won't be able to change the design of the over-riders – they will be the same as the standards Jaguar XKE S1 over-riders and will be supplied **SEPARATELY from the bumper**. Also the mounting for the over-riders will the same as it is for the original E-Type bumpers. **Please have a look at photos below and confirm!***



*3. The standard E-Type rear bumpers have an indent in the top surface of the bumpers, **please see photo below and let me know whether this indent is required** (the JPR bumpers DO NOT have the indent and other JPR owners ordered the bumpers without these indents). Also, the standard XKE rear bumpers have cut outs at the bottom which the JPR bumpers do not have (other JPR owners ordered the bumpers without these indents). **Please advise whether we should produce your bumpers with or without these cut outs?***

4. For other JPR owners we produced the bumpers with captive nuts at the same locations as they are located on the standard E-Type S1 bumpers. ***When ordering, please confirm that this will also be ok for you!***
Please see photos below – the blue lines represent the range of the captive nuts in our E-Type bumper, the red lines show the location of the mounting holes of the JPR bumpers we were supplied with. Also, while the JPR Wildcat bumpers have 4 wooden pieces to use as brackets, the standard XKE S1 bumpers only have 3 captive nuts.



FINDING A SHORT CIRCUIT WITH VOLTAGE DROP

In the last issue we looked at tracing short circuits using the good old probe and light system and continuity of a circuit. . However there is an alternative method called Voltage drop.
The road ahead looks like a black hole. It's so dark and so dreary, even the bravest Saturday mechanic would prefer to be off the highway and safe at home. Unfortunately, you're still hours away from your destination. You can't see anything except the small puddle of light cast by your headlights. And that puddle seems to be getting smaller. And yellower. A quick stop for petrol and a litre of carrot juice reveals the cause--one of your headlights is as yellow as Satan's toenails You've got a voltage drop.

Back to Basics

Electricity shouldn't be daunting, especially when it comes to automotive wiring. It's simple direct current (DC), and it doesn't pack enough punch to make your toes tingle--even if you're standing in wet plimsoles. I will grant you, working on an electrical system just isn't as intuitive as a mechanical system is. Imagine the linkage to a carburetor. Remember carburetors? Carbs are easy to understand. If one end of the throttle linkage moves when you wiggle it and the other end doesn't, it's broken. If you wiggle one end and neither end moves, it's stuck.

And if it's hard to move, it needs to be oiled. Electrical-system diagnosis, on the other hand, is one step removed--you can't see the electricity in the wire like you can see the linkage wiggling. Sure, you can do simple electrical diagnosis with nothing more than a trouble light. I have a couple of trouble lights, and I use them all the time. But diagnosing anything more complicated than a burned-out bulb calls for bigger guns. You need a voltmeter. Or, more technically, a Digital Multi-Meter, or DMM. You can get a decent one for about the price of a couple of pepperoni pizzas.

Meeting With Resistance

Back to your dim headlight. There's resistance in the circuit, reducing the voltage available at the headlamp. You can use the DMM's ohmmeter scale to find the extra resistance, right? Wrong. We're chasing very small resistances, often smaller than a single ohm. The resistance (ohm) scale on your DMM probably bottoms out at 200 ohms, making measurement of single-digit values tricky. Instead, use the voltage scale, which on most DMMs is accurate down to several milli-volts. Let's dig in.
Back-probe the connector on the dim headlight. The black lead on your DMM should go to a good ground--preferably to the battery negative post. The voltage you meter at the low-beam lug, as it turns out, is about 11 volts. That's lower than our system voltage at about 12.5--but not low enough to explain the severe dim-out. Now probe the ground lug at the bulb connector. Surprise! The meter reads nearly 4 volts--it should read zero. This indicates a resistance in the ground side of the wiring, leaving only 7 volts for the filament.
First lesson: Electricity always runs in a circle, and the ground side (earth or negative side)is just as important as the hot side (positive side of battery).
Second lesson: Use a little systems analysis. Only one headlamp is dim, so you can skip troubleshooting any part of the circuit that's shared with the one that's working.

I am looking forward to hearing from you again. Any questions, please don't hesitate to let me know. Best regards,

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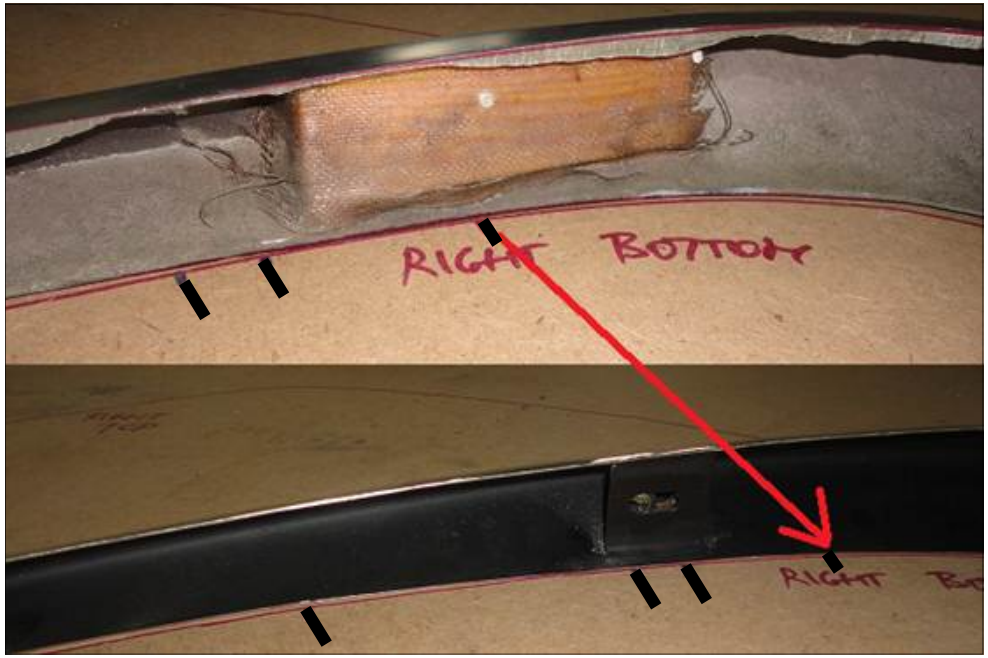
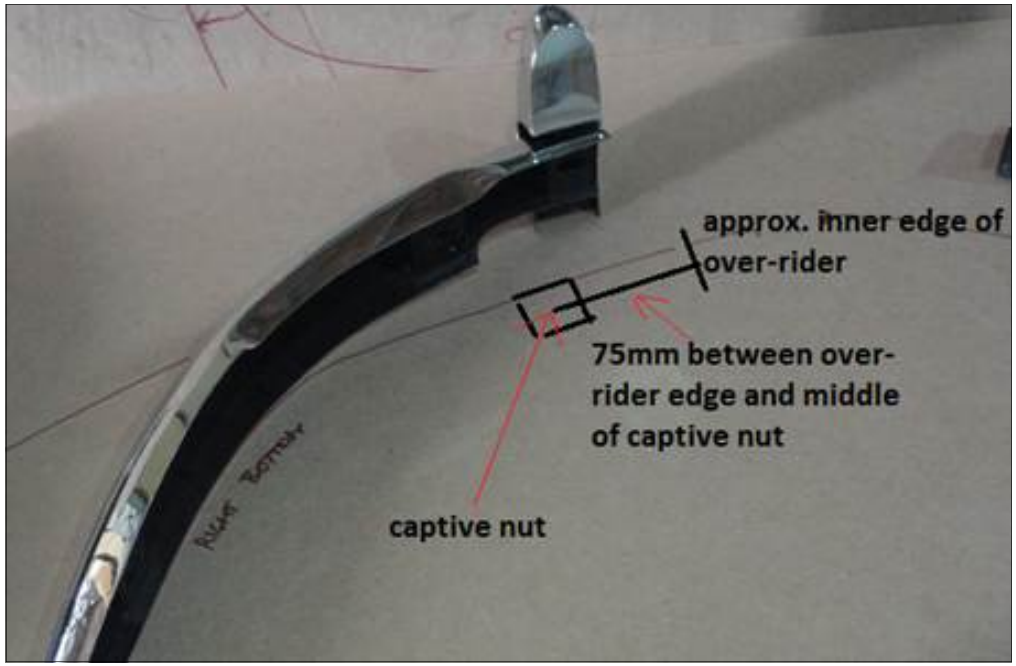
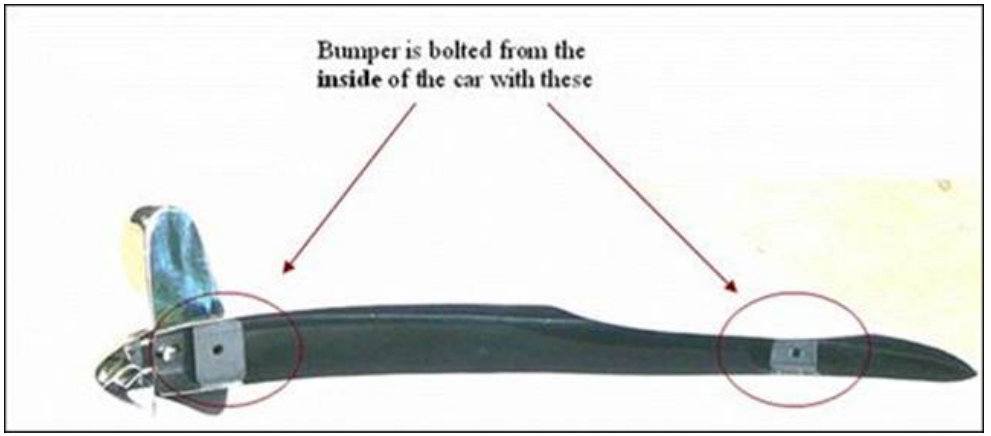
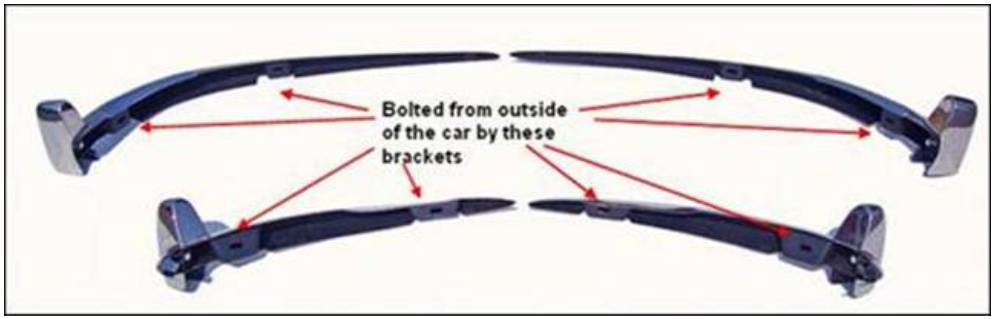


Only the last bracket location was slightly adjusted as shown in photo below (75mm from the inner edge of the over-rider).



With regards to the front bumpers- they will be produced according to the original E-Type Series 1 bumpers. There are two types of mounting: ***bolted from the inside of the car or outside of the car****- please see photos below and advise which type you require. Just so you know-* ***other JPR owners ordered the front bumpers mounted from the inside!*** *Also, when ordering please confirm that the front bumpers are required* ***WITH extensions*** *as shown in photos below.* ***Photo of the bumper bolted from inside of the car:***





Below
Jaguar E-type bumpers – with over-rider extensions (for motif bar):

Below.
Jaguar E-type S1 bumpers – without over-rider extension: