In depth Tech – Wiring/Electrics x…… to finish

TECH ARTICLES ON WIRING AND ELECTRICS

Working on this still

Questions on electrics and fault finding crop up from time to time. Electrics are really easy when you know what to do but if you don't – it's one hell of a complicated mine field.

When I first saw Jeppo's Gp headset top removed and saw the mass of wires I thought Jesus complicated or what, I was 15. By the time I was 16 I was making one off wiring looms and Jeppo said 'that will be fun on Scarboroughs sea front when you break down!' I didn't break down and all these years later I still do electrics and make loom's!

Where does one start with electrics?

People ask 'I've got a brake light but nothing else'……..or 'I have a dip main light but no dazzle light and no side lights', some say the horn works, the brake light works but no back light! It could be anything really!

There are two sides to the electrical system.

1. The ignition side
2. The energy / lighting side

So there are different ways to fault finding.

How do you find a fault? Well read on I will try to make it easy so you can understand.

PLUMBING

First thing I say to people who don't have a clue is this;

Think of your water system in your house. You take it for granted that when you open a tap or flush the toilet water comes out and does it's job. When it doesn't then you go shit! Wheres my water gone? But at least you have an idea where to start. So if no water comes out you would first check to see if you have a water supply! Is there water from the mains or in a header tank in the roof? You could have a leak before one of the taps, so no water comes out or very little comes out but other taps work perfect.

Electrics work in the same way, you need a power supply, this is the mains water. The mains supply feeds all the taps, toilet, bath, shower, dish washer and washing machine etc. These can be the lights, horn, brake lights etc. If one stops working but others work then you have very quickly found the fault, that's easy but repairing it may not be. It could be a stuck valve with a bit

of a hit or wiggle of the tap it may free and water comes out. This could be a loose wire or poor connection, you could wiggle a wire and everything suddenly works. But if a hit and fiddle on the tap doesn't work then it may need a new tap, its the same for a switch. Loose or dry connections are the most common problem, next would be a faulty switch which could be intermittent or a total fail.

The main part of the water system for me is the toilet, that's not clean water you don't want a leak there do you, not bad going into the toilet but very bad afterwards. The water supply into the toilet could be the ignition system, power from the stator plate to the coil is low voltage so no harm…… (clean water going into the toilet) power after the coil is hi voltage so could be dangerous……. Hi Tension voltage is in it's thousands of volts so be careful! This could be your soiled water you don't want to touch it! The toilet could be your coil, you know clean water goes in, you flush the toilet and bam a mass of water and suddenly a clean quiet toilet, but you don't know how the flushing system really works, it's the same for the coil, you don't need to know how the electronics of the coil works, just that it works or it doesn't!

Let's say the cold water side of your plumbing is AC electrical power. AC meaning 'alternating current' it's of low voltage and no dangerous power comes of it. No harm normally comes off the cold water side of your water system!

Let's think of the hot water side as DC electrical 'Direct Current', the hot water side means danger! If too hot you would handle it with care. This is the same with DC power, connect it in the wrong place and you can start a fire!

Once water comes from the main feed it goes off in different directions, it supplies a heater and then hot water, it also supplies the central heating system and more hot water, it supplies toilets, showers, baths, dish/clothes washer and the tap in your garden. This water supply branches out through pipes, joints and taps etc. The water has to flow without leaks, electricity is the same you don't want a leak so as with water you want electricity to flow not down pipes but wires, this is why they are covered in plastic to stop a leak which would be called a short (a short circuit before it gets to it's destination). These joints and taps on an electrical system are switches and junction boxes. This supply will hit a junction box or two which could be water T joints, it then will hit a tap or switch which you can open and divert supply where you want it to go. And it goes on and on, a small house will have a simple pumping system and mansion will have a very complicated system, both has to start somewhere with a feed!

A simple electrical system in a Lambretta would be the AC Electronic system using the simple MB loom which I designed in 1985 and now is considered the standard loom to most bikes. This supplies the least amount of power to cover the basics by law, lights, horn and brake light.

A complicated loom would be a AC and DC system combined together or just a DC battery system which requires the same basics for the MOT but you can add fog

lights, spot lights, high powered horns, indicators, gadgets and requires a battery or capacitor with extra switches or rewired switches, fuses and maybe relays!

SO BACK TO ELECTRICS……

For a bike to work it needs to produce a power supply. You need two sides of the electrical supply. 1) one for ignition and spark and 2) the other for lights etc. So for fault finding we need to look at two areas.

- The Ignition system
- The lighting and ancillary circuit

If the ignition circuit fails then the bike won't start, if it doesn't start you won't get power to lights, obvious really, so the ignition has to work. An ignition as you know will work no problem or it will stop working or it will work intermittently!

IGNITION CIRCUIT BASICS

If we are talking Lambretta engines, there has been a number of systems constantly altered from the 4 pole Li Series one's to the Series three 6 pole system. Most produced were the points type of system but later types used the electronic system. I'm only interested in the Electronic systems as these should be fitted to tuned bikes as the ignition side is much more stable and reliable. Points tend to bounce which leads to miss firing on high revving bikes and have less power out put for lights and again can be unstable. To understand the ignition circuit you need to know how the spark is produced, I'll only touch on the basics.

Poles refer to number of magnets in the flywheel and how the windings are on the stator plate. As the flywheel turns it generates power from the magnets passing over the stator poles which have wound coils fitted and power is produced. On Electronic systems of which we are talking the Innocenti Electronic ignition and the further developments of this system – the SIL version, bgm version and my old Vespa conversions. And there are now more Electronic systems but are not as common so I'll talk about the Lambretta system only.

But first back to the points system. As stated the flywheel turns generating power, half the stator is wound to supply the lights and the other is to supply the ignition circuit. The ignition is fed from a Low Tension coil which is one coil wound on the stator, next to this is the points which open and shut from a cam on the flywheel at a given point to produce the spark in the correct place. The other coils are wound to produce power for lights, brake light and horn. The same system can be wired to produce more power for DC and a battery. The low tension circuit produces power to the coil and the points tell the coil when to fire, the low tension circuit turns to high tension through the coil, this then gives the big blue spark at the plug.

Electronic systems work in a similar way, except the points are removed for a device called the pick up. This is a little black box which replaces the

points. The low tension coil is basically the same it produces power up to the coil (now a Electronic coil which is different to a points coil but does the same job) and the pick up is the switch and tells the coil when to fire and is controlled by a split in two magnets in the flywheel. The lighting side is similar but all four coils are wired together to produce more power which goes to the regulator or rectifier.

A regulator turns unregulated power from the stator and flywheel to a stable AC (Alternating) current and uses no battery, this is the simple system and the most common.

A rectifier converts the unregulated supply from the stator into DC (Direct Current) which powers a battery and the full system, this is stable but always requires a battery or capacitor.

WHAT FAILS AND HOW TO TEST THE IGNITION SIDE

Anything can fail! It could be the electronics side of the system or a parts failure, or break down, which could be a natural failure. The most common major failure would be the crankshaft spinning out of line which if bad enough the flywheel and stator will be a right off.

FLYWHEELS

There are a number of Electronic flywheels – all have good and bad points.

Innocenti

This was the first of the electronic ignitions and was fitted to the very late GP200 coming out of Innocenti. It used a GP flywheel from the points system but is different – it has two cross over magnets inside the flywheel to trigger the pickup! These are usually made without a points cam but I've seen points cams on some. These are very good, a little heavy maybe and suits lower powered or standard bikes, it's difficult to machine these to get rid of weight. They can crack around the flywheel view holes. These are now very rare and often collected by the anoraks!

Vespa P200E conversions

I first did this system in 1985 when I first saw a Vespa PX engine in pieces. I looked at the stator and thought, that looks similar to a Lambretta, if I swapped the lighting coils onto a Lambretta stator I could get better regulated 12 volt lights and as the Vespa ignition was considered more reliable I could swap the LT coil and the points where similar. And it worked with a Ducati Lambretta stator, I just swapped the regulator and coil for a Vespa and it worked great, but still had points!

When I saw the P200 engine it had the Electronic system and every thing swapped over and hey presto we had new Electronic system! This was done in different ways. You could undo all the coils and swap and re-solder them or you could drill out the rivets and bolt the Vespa stator onto a Lambretta one. If available we used the GP Electronic flywheel, if not I started drilling cams out and bolting a Lambretta cam into a Vespa flywheel, I then

turned the flywheel down and fitted plastic fins. Now that was a lot of work and wasn't an easy job and I hatted doing them. When AF brought their version of the Innocenti Electronic out it was a god send!

AF Flywheel

There are two types, the early 80's Italian version and the later Indian version. Both types have not been designed right and both need a few little tweaks to make them right. The flywheel hits on the pick up, if really bad and fitted and turned over the flywheel will rub on the pick up and burn it out and damage the fine copper windings in the pick up. To get around this you can either machine the mag housing where the stator bolts down, but don't go too far the mag housing can distort and leak so only machine 0.5 – 1.00mm off, machining too much can put the pick up out of line with the pick ups on the magnets and you get a miss fire.

You can machine this difference off the flywheel inner face but this is already a weak area and can crack in high revving engines, machining the inner face just weakens it even more. If you use normal bolts to hold down the stator they will lock up on the lower part of the flywheel, machined down bolts were needed or domed allen cap type screws. Or you can machine this face of the flywheel by 1mm. When assembling this flywheel using a MB crank which is slightly wider than standard, at 41mm none of these conversions need doing. The later Indian version identified by brass rivets holding the magnets together has it's faults, it's thought the brass rivets causes miss fires and some stators don't give the best. Magnets have been known to come loose and wears on the stator. The earlier type stills needs the mods doing as mentioned, the later version had a plate added between the flywheel and cam to space it away from the stator!

SIL and Indian Flywheels

These have taken over as the most common flywheel around, they are made by SIL and Elemec. These are made with multi pieces of steel and bolted and rivetted together. To be honest they are crap, when I put them in a lathe the run out is stupid on most and they are all over the place!

These rivets tend to shear so the cam departs from the flywheel. The cam is machined wrong from the factory and can also shear! To get round this we weld the cam to the flywheel but because of the differences in steels it's only really a short term fix!

Sometimes these flywheels modified last forever and others do not. These flywheels are very heavy! We were the first to say this and started machining them down to around 2kg and others have followed and it's now a standard conversion.

These flywheels came from the factory with longer fins to suit the 3 wheelers. You can either fit the fatter cowl to suit or machine the fins down and use the standard cowl. You don't need to do the mods as on the AF flywheel.

It has been known that cams rivets were drilled in the wrong place or the woodruff key is machined in the wrong place and to top it all the timing marks are stamped in the wrong place!

So always do timing marks and strobe these flywheels. Elemec flywheels have problems with cams, you can set them up and they look better made than a SIL version but the SIL version is more reliable.

BGM Flywheel

BGM made a new Electronic flywheel, made by PVL in Germany. Unlike the others it is made in one piece to eliminate rivets shearing. They are made to suit the BGM stator or any other Electronic stators. The fins blow more air and has been machined down to be as light as possible but still have tick over inertia and have had a lot of input from yours truly.

STATORS

All Electronic stators will work with all the flywheels mentioned, you do get the odd one which just doesn't work so beware.

There are various types

- Original GP 200 6volt Electronic type, these work fine but can be temperamental, as they are so rare it's not worth covering
- Vespa conversions. These can be from old or new stators either P200 or T5, these can be modified to strip all the coils and swap them onto a donor Lambretta stators. Or drill out the rivets on both stators and bolt the Vespa stator coils and plates to the alloy mounting plate. This is a very tedious job, don't cut corners doing any of the various ways to swap the stator. Make sure the soldered parts are done correctly and make sure bolts are loctited and are high tensile
- SIL and pattern Indian stators, these are very rough looking but are cheap. Some are good and will last as long as they do, some last longer than others but you never know so always carry a spare and the tools to swap one over
- AF stators, the old remade Italian stator of the 80's was very good. I always turned over the copper LT coil plate at the bottom as standard as the LT would loosen and break the very fine earth wire. I would also Arildite around the earth point and wires from the pick up to the earth point
- Early BGM stators came in two types, 80 watt and 120 watt. They have both been phased out for a more powerful one thanks to yours truly and have been strengthened and improved over time. They now also do a DC version at my request!

As mentioned there are two sides to the stator plate the ignition and the lighting circuit. You can test the low tension coil and pick up box using a Ohms meter. This test is not the be all and end all of testing the ignition circuit but its a good start if you have a miss fire or no spark.

The LT coil should read around 520 Ohms on a BGM, Vespa or early AF stators.

Indian can read much lower even down to 380 Ohms. The pick up should read around 110 Ohms but can read as low as 90 Ohms, just because the readings are down doesn't mean the ignition will not work BUT if they read perfect and you have a miss fire or no spark and you have chased back from the spark plug then just swap the stator. This used to happen on AF stators, perfect readings but didn't work. When an Electronic ignition has failed it has failed – it won't repair it's self! Some time it's just old age that takes over but mostly it's vibration.

The most common failure is the simplest to check and replace is the spark plug so we will start fault finding here and work back to the more expensive stator and flywheel.

SPARK PLUGS

These usually fail from over jetted carbs which blacken and soot up the plug so the spark won't pass across the electrodes.

There's no point in trying to clean a plug, just change it for a new one.

The usual symptom of a plug going off is – the bike won't start or you get a miss fire under load and at revs, they can pack in and the bike can just stop.

What ever the case and you're not sure, remove the plug, check the thin electrode is not loose and touching the earth electrode. Check that the gap has not increased through burning and wear. If all is fine to the eye then connect it to the suppressor cap mount the side of the plug to bare metal, to earth it and with the ignition turned on kick over the engine. This should be done in a dark shaded area to see the spark. The spark should be a nice fat blue spark and should light at every revolution. A really good one will crack as it fires.

If the spark is weak and yellow then just change the plug.

SUPPRESSOR CAP

If there is no spark and you have fitted a new plug and still no spark then unscrew the suppressor cap. You can either swap it for a new one and test the plug or you can trim 5mm off the HT lead to find fresh wire then hold the HT lead 5 – 6mm a way from bare metal and kick over the bike a few times. This simple test tells you if the plug or suppressor cap has failed.

HT LEAD

If there is no spark at the end on the HT lead then replace the HT lead, it's cheap and easy to do, HT leads can break down but usually it's the copper wire at each end which screws to the suppressor or into the coil.

If you have no spark still then there are some more simple steps to check

COIL WIRES

Check the connectors on the wires from the stator plate, these should all be tight with no broken or corroded parts, check that they are in the correct place if its a new rebuild. Check the earth wire isn't broken or loose.

IGNITION SWITCH

If there is still no spark then simply remove the green wire that goes into the coil which feeds the loom up to the ignition switch or cut out button. This eliminates a faulty switch or short to earth which is very common. If a spark suddenly appears then remove the headset top and check the wires from the switch, the ignition wires are green. Check either of the two green wires in the junction box to see if they have fallen out, if so replace them.

Check there are no bare wires touching any of the green wire terminals, and check at the back of the ignition switch to see if the green terminal is tight. If all looks ok then remove the the two green wires and hold them together as you kick over the engine, if there's a spark it tells you the connector is faulty or dirty. I always solder the back of the connector block on the terminals to make sure there is a circuit. If you have removed the green wire from the loom to the coil and found the spark at the plug and you have checked everything in the headset then it's the switch, change it they are hard to repair. Today there are good cheap switches. We sell MB fit all AC/DC switches.

CDI COIL

If theres still no luck, swap the coil, again easy to do and quite cheap. As you replace it, just make sure you replace the wires in the correct place, these are colour coded. Again at each point kick over the engine and check for a spark.

STATOR

If still no joy then check the wires from the stator and signs of cuts or rubbing in the outer wire. Any wire from the pick up or LT coil which breaks will stop a spark. One last check before you change the stator is remove the flywheel and check for continuity from the connectors going into the coil and back to the stator.

For this, use a multi meter, set it to Ohms or buzzer, connect the two leads together it should read zero or buzz, then connect one end to the connector and the other end to the area it is soldered on the stator. This should show continuity so you know there is no broken wire! If there are no broken wires then check the LT Ohms and pick up OHMS reading and change the stator.

MOVING ONTO THE ENERGY SIDE OF ELECTRICS

That covers the ignition side of the circuit, but remember the ignition side and the energy side of an ignition are separate and they should never effect each other unless you have put the wires in the wrong place or bare wires are touching. If your energy side of the ignition stops for some reason you can always get home if it's day light, as the ignition will work but you wont

have lights. At night you can always strap a torch to your headset if needs be, you do carry a torch in your toolbox don't you? That or a AA card!

Too many people confuse the two sides ……. they are always separate! I've seen questions asked 'my bike won't start if I change the regulator will it start'…… NO ITS GOT NOTHING TO DO WITH IT, you can remove all the lighting coils off the stator including the posts on the stator and only use the LT, pick up and coil and the bike starts and runs no problem, racers have done this for years! But you can not remove the ignition side and expect the lights to work unless you are kicking the engine over like mad.

Right, ignition is separate to lighting, so if your bike runs and runs reliably the chances are at some point you will have a problem with part of the energy circuit, either main, dip, side or speedo lights, brake light or horn.

Where do you start? Ok there's going to be a few scenarios, all easy to find if you know what you are doing.

TOOLS OF THE TRADE

I use two tools to set up a new bike rebuild of test a bike for faults, do it this way and anyone can work the system.

- Multimeter/Ohms meter, available from any tool supplier and very cheap to buy, you need the cheapest available nothing special they all come with a Ohms meter setting and a AC and DC setting. This finds all the faults
- A 6/12 volt Battery or I prefer a battery charger which switches to both. This is your power supply, it's easier to test a bike without it running. If you are testing for faults with your engine running the bike vibrates, you put tools on the seat and they fall off. Ok there's maybe times at the side of the road where you may have to remove the headset top, start your engine and have a fiddle! Believe me it's much easier and less stress full to add a power feed to test without running the engine

Back to the water works, you need a supply, in the case of older Lambrettas that would have been 6 volts from both AC or DC power depending on the model. I'm only going to refer to the 12 volt Electronic version which is the most commonly fitted and used in tuned bikes. There are various ignitions as mentioned which will use various wiring looms depending on where they came from.

Identifying what type of loom you have could be difficult especially if it's an Indian or Spanish bike or a bit and pieces bike, some of these are wiring night mares. Any one who has our simple Electronic loom of copies of it will find fault finding much easier. If in doubt change the loom they are cheap and any one can fit one. For wiring diagrams check out the Spanner manual which can help identification.

MAIN POWER SUPPLY. THE MAGNETO

Back to the mains supply, the power source, this comes from the stator plate and flywheel, most ignitions are the AC type (Alternating current) which means as the engine revs up more power will come out of the stator plate, if this power is not controlled the output will just get higher and higher and something will have to blow. If you've ever run an AC 6 volt bike then you will know bulbs tend to blow! The Electronic system uses a regulator to control this power and limits it to around 12 volts, this is why the bulbs need to be 12 volts. If the regulator fails it won't dump the extra power to earth and will blow everything.

So you need this power source, this power source needs controlling, once controlled the regulated power can feed bulbs and horn any part of this system can fail.

To get power to the loom the unregulated power from the stator plate goes to the regulator from one yellow wire for AC and two yellow wires if you have a modified DC conversion. Lets talk about the AC version first, this has one wire from the stator which comes off 4 of the coils. At one end the coils are earthed to the stator and the other end has this yellow wire, it could be any colour, regulators are coloured yellow on the regulated side so stators have been colour coded to suit. It's rare that the lighting windings side of a stator packs in but they do. To test the circuit set the multi meter to Ohms, as before touch the two probes together and the meter will zero, ok the meter checks out now touch one probe to bare metal on the stator plate then to the connector at the end of the yellow wire. The meter should zero, you can do this without stripping the bike, fit one probe to the engine on bare metal and the other on the yellow terminal. If the meter zeros then you have continuity through the wire and around all the windings – this is good. But IF the meter doesn't zero then there is a break in the system – this is bad! You will have to inspect the stators coils for any obvious signs of joints broken or discoloring of a coil or two, or damage which can come from miss use of a flywheel holding tool or a magnet or rivet or screw coming loose. Also check for continuity from the yellow connector to where the yellow wire is soldered to the coils this will eliminate if the wire is broken. If it is you can renew the wire and do the check again. Occasionally you can check for continuity and everything looks fine but a coil winding could be broken, in test it works in practice with vibration and heat it doesn't, the only cure is replacing a coil or all coils, today for the price just swap the stator.

If you have done a 12 volt DC conversion then it's the same check test by putting the probes from one yellow wire to the other. Doing a 12 volt DC conversion is very easy all that is required is to un solder the earth wire from the 4 coils on the stator plate then solder a yellow wire to the removed coil wire, this yellow wire needs wrapping around the coils to keep them tight and taking up to where the regulator is. More on that as the regulator needs removing and a rectifier will replace it.

FLYWHEEL

The flywheel hardly ever goes wrong in terms of functionality, in the old days a flywheel could loose magnetism, this is rare these days and I never bother to check Electronic flywheels. Check all the magnets are tight and not

broken or cracked. Check the condition of the flywheels taper and woodruff key area and check around the cam for cracking and check the rivets are not loose, this goes for all types of flywheels. What you should look out for is signs of rubbing which is very common, this looks like burnt black marks on the magnets and will correspond with burnt black marks on the stators outer poles. If you see this it probably means the crank has spun out of line so you will need to dig deeper. There can also be black scrub lines on the outside of the flywheel also tell tail signs worth digging deeper.

SCENARIOS

It's hard to know where to start, I could start with a bulb not working and work back to the stator area. I've given you an idea how the stator produces power for ignition and now for the energy circuits. If you have a problem with lights or a horn lets presume the stator and flywheel are ok but before I send you off checking around with a voltmeter lets just explain about the regulator as the regulator comes in for a bad wrap but it hardly ever packs in.

REGULATOR AND RECTIFIER

A regulator does exactly as it says, it regulates power from the AC side of the stator plate. It caps the wild side of the current coming out of the stator. We don't need to know how this happens we need to know wild power goes into the regulator and safe regulated constant power comes out. Without it been stable everything will blow. A regulator is different to a rectifier, we are constantly asked for rectifiers when people mean regulators!

A rectifier again does exactly as it says, it rectify's AC power from the stator and turns it into DC power which will charge a battery and then all power consumption comes from a battery at 12 volt DC which is very stable.

The difference between a regulated powered bike and rectified bike is……. Regulated AC lights will be dim or flicker at low revs, as the revs increase these will stablise and become constant……. DC lights will be the same at tick over and at high revs, the beauty of a DC system is every thing will work without the engine running unless you are using a capacitor instead of a battery. A capacitor will store DC power for a brief time without the engine running, so the engine has to run to have lights, the capacitor keeps the DC power stable.

The most common regulator in a Lambretta system these days is the Vespa PX 3 spade regulator, there are many different types genuine and pattern and are made all over the world, but all work, some are suppose to give more power like the Cosa version. There are 3 spade terminals, the left hand and middle are usually marked in yellow, the yellow wire from the stator goes on either one, the other yellow is the main power FEED into the loom to power every thing. The right hand terminal is earth, make sure it earths to bare metal of the regulator AND always run a earth wire from the regulator to the coil earth and to the rear light earth and one back to the engine casing so the rear light, regulator, coil and stator are all connected. I've never blown a regulator, coil or bulbs doing this method.

DC conversions have become popular in the last few years, this is nothing new Innocenti did 6 volt DC systems in the 60's and 70's we had DC conversions, Motoplat, SIL and some of my one off Jap conversions were DC, I had been doing simple DC conversions as mentioned before for many years. At the time of writing BGM have my design for a AC/DC conversion for their stator plate, time will tell if it goes to production.

Rectifiers are different for the 12 volt DC systems, they come in many sizes and shapes. Basically the two yellow wires go to two terminals, these can go either way round the will be an earth and there will be a terminal which is DC power and will go direct to a battery. From the battery positive side + all power is supplied into the loom. (There is an older type Innocenti and SIL DC version which is positive earth, so be aware when you are assembling and a fault finding) As with regulators, rectifiers hardly ever fail so just presume they work when fault finding.

So now you know how power comes from the magneto to the regulator/rectifier and now we have the very important POWER FEED we can start basic fault finding as asked by most customers with problems.

FAULT FINDING

Now things get simple, he says…….

When building a new bike or fault finding the easy way to test the electrical circuit is from a remote power feed. This can be a battery if you have one (batteries can be dangerous and causes fires) or a battery charger (these are safer they have a trip if shorted out) most people have one or can borrow one or are cheap to buy. By using this remote power supply it saves starting your bike, keeping it ticking over and making a noise. If you do fault finding with the bike running, it usually fowls the plug, fills the exhaust with unburnt fuel and causes problems that you don't need. So I suggest a battery charger, it's safe and easy and gives you an idea if there is a fault.

To do a test with a battery charger you need to remove the yellow wire which fixes to the regulator that goes to the loom, this is the main power feed to every where. Some of the older AF system designs would take the yellow wire down to a old UK style round junction box where the cluster of old style Innocenti wiring loom wires would all plug into the junction box, but this junction box was different as the terminals at the back where all connected except the ignition side, remember you can not mix ignition with lighting it doesn't work.

Either way you need to remove this wire which feeds the loom, clip the positive wire off the battery charger which is RED to the main loom feed, clip the other wire black which is earth to the engine casing. Make sure the red clip does not touch bare metal as it will cause a short and nothing will work, this is very important.

It's back to your water works I'm afraid, remember water needs to flow down pipes to feed your house, this is the same with electrics, we have a power feed and it feeds the important parts of the bike through the looms wires.

You have to think what ever part of the electrics need a power feed to work. This feed can sit there as long as it needs until say you press or turn a switch. This is how the brake light works, this is how the horn works, this is how the lights work.

Lets take a simple circuit which they all are and spit them up

- Brake light
- Horn
- Side lights
- Main lights

SIMPLE CIRCUITS

This is simple pay attention, power comes down the loom from the power feed, it goes to the brake light switch and just sits there until you put your foot on the pedal, when you do this a spring loaded pin moves and connects two metal parts and the power feed crosses over to the wire on the other side of the switch to the rear light bulb and to earth.

It’s the same for the horn but in two ways, 1, power to a switch, press the switch this connects two metal terminals which sends the power down to the horn and to earth. 2, power to the horn on one side and the other wire goes up to a switch, this is live all the time, press the horn button and the circuits crosses over to earth fulfilling the circuit.

Everything goes to earth to fulfill a circuit.

So what can go wrong? And how do we test?

Brake light

The brake light stops working, so what do we do and where do we suspect there is a problem? First off ALWAYS check the bulb, bulbs always go on Lambrettas, they vibrate you know! Lambrettas use two types of brake light bulbs 1, the stop/tail bulb 2, the festoon type these are the sausage shaped bulbs. To check how a bulb works, use the multimeter, set to Ohms or buzzer, use one probe to earth and the other to the terminal on the bottom of the stop/tail bulb, try both terminals as one is the brake light and the other is the rear light, if one is out change it. With a festoon, one probe to one side and the other to the other side.

If you have continuity, check the copper terminals for been green damage from damp, clean them up whilst you are there it won’t hurt and re bend them so they are tighter on the bulb, refit the bulb. Next you need to check the brake light switch as these break down, they are so close to the road and it’s not really a good design. There are various ways to test, either remove the switch and run a probe on either side and operate the switch. Or connect the battery charger as previously described, this will power the loom, set the multimeter to DC volts, fit one probe to earth and start using the other probe to see if there is power. First to the wire from the loom to feed the switch, if ok, go to the other side and press the pedal does it get power? If yes go to the back light, remove it and go on the terminal and bullet to see

if it’s live, by now the circuit should be live all the way through. If not it will be either a broken bullet terminal or the switch, just change it if for a good one it’s gone, give it a good oiling up and a bit of grease and make sure the wires are covered up by the rubber cover.

Horn

As with brake lights it’s the same idea to find a fault. The problem is most bikes are AC bikes and they are known to have crap horns. So you have different scenarios, does the horn work at all? Or does it just make a duck noise? The best horn is a DC horn powered from a battery which I will come to. An AC horn does not work if you feed it DC power and a DC horn will not work fed with AC power. What you will get is a little vibration noise. Ideally you need to test a AC circuit horn with AC ie with the bike running. A DC horn is easy set up the battery charger or battery and fault find with the multimeter set to DC. To eliminate the horn you need to chase power, remove the horncasting, with the battery charger set up with 12 volt DC on the power feed, with the probes set to check to see if there is power going to the horn out of the loom, if yes

LIGHTS

Lights are different and a bit complicated as complicated switches are involved.

This needs doing on nearly all junction boxes, works a treat to cure dodgy on off lights


The speedo bulb is so important, let that go and the rest of the lights will go, all because the earth point is crap so do this conversion and no more blown lights

Ask Mark mark@mbscooters.co.uk