

# Rewire it part III

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The selection of tools, *pictured last issue*, provides you with most of the items we will require to start our wiring. The only missing item is some form of wire stripping tool, be it a proprietary tool designed for such a purpose or a simple knife once armed with these items we can then think about starting to rewire that's assuming that we have completed the first stage which is the removal of the old wiring which is to be replaced.

Once again this can help us with what follows. If its original wiring then it is likely to have been installed on the most straight forward route and does not impede other equipment so we are already being shown where to run the new wires, if it is a like for like replacement we can use the old wire as an indication of the size of the new wiring and of course there may be old conduits or boards fitted to the superstructure that may be reused for clipping or running the new wiring on.

So even the old wiring can give us clues as to where we go next.

But what of the new wiring how do we decide what we need? For the DC systems we generally follow what is done in the auto trade and a boat although on water very much mimics what can be found in such things as motor homes etc. Therefore for most of our wiring we should be looking at using auto cable being multi-stranded conductor with a single PVC sheath. This can be bought in small reels from most auto shops and in a variety of colours.

For our wiring we would normally use black for neutral and red for the live and electronic shops such as RS and Maplins will sell this in larger drums. Bearing in mind the quantities we will be using this will be the best way of buying your cables. However if its ease of identification you are looking for then there is no reason why the multi coloured cable can't be used with a different colour of wire being used for each circuit. In either case we need to record which wire goes to which piece of equipment and which fuse controls it with multi coloured cables this is easy as we can use the colour system to identify the cables but with a red and black system all the wires will look the same so we need to mark the ends of the cables.

Fortunately the same shops will sell wire-numbering kits, which provide you with a set of numbered rings, which can be slipped onto the end of the cable to give it an ID.

By putting the same number on each end of the wire we can soon identify what goes where.

## Ferrule Numbers



But how do we decide on the size of the wire? Well we need to work out how much current the connected appliances are going to take and then we need to select a cable that is larger than this so that it can carry the current without damage or overheating. At the same time we must also consider the fusing and protection of this circuit.

Lets use a lighting circuit for example.

We have 3 lights connected and each is 60w that gives a total power rating of 180w.

If the system is 12v then the current can be worked out using the following formulae.

$W$  (Power in watts) = Volts x Amps (Current)

Therefore Current = Watts divided by volts or in the case above the current =  $180/12 = 15$ amp

This is the current we need to cater for. So it could be possible to run this, of a 15 amp rated cable but this would leave no margin of safety and there would be no room to extend the circuit at a later date.

However we could build a factor of safety into the wire of say 50% and go for a cable that would supply 22.5 amps. We would then know that the cable would not overheat when the lights are on. However it is likely that when we go to buy our cable it could be rated 20, 25 or 30 amp as a standard size. Therefore the 25amp in this case would be the best option. However we know that the circuit only needs to supply 15amp and so we would fuse the circuit at this level this would guarantee that the fuse doesn't blow for normal load but protects against cable or equipment failure.

From our calculations for each circuit we will end up with a cable current rating, and equipment rating and a fuse rating. These might turn out to be a myriad of sizes with 20-amp wire 25-amp wire and 30-amp wire being required, with fuses of different sizes.

This would mean that we would need lots of different wiring equipment. However when you look at wiring diagrams you find that the cables are pretty standard in size that is because the circuits are balanced up to achieve a more standard loading. For example it may be that you have five lights on one circuit and three on another, but it may be just as easier to wire them both as sets of 4 and end up with the same fuses and wire type sizes say 25amp. If another circuit is only needing 20amp but it is the only one of this type. In the long run it would be easier to wire this with the same 25amp cable as in the other circuits. Cable is always cheaper when bought in larger volumes so the larger size may offer a saving against buying a special drum for one circuit.

Of course whatever your decision is on the cable the one thing that should not be increased is the fuse ratings wherever possible an exact match would be preferred. However it might be necessary to buy a slightly larger size because there isn't an exact match in this case it should always be the smallest option and never exceed the cable rating. And remember where equipment comes fitted with its own local fuse such as instruments then these fuses should always be at the manufacturers stated value. These protect the equipment the ones at the main fuse board protect the cables.

So we now have our circuits planned our cable sizes and what fuses each circuit is going to be protected by. This forms our main wiring for the boat and will normally all start from a main distribution point and travel along the superstructure branching of to the equipment. To get to the points we run the wires either clipped to timber supports or as with many modern layouts through pipes or conduits when clipping we should think about a clip every 20cm and if many cables are running together we could bundle them and bind them into neat runs using the old faithful tie strap again using one about every 20cm. The joy of using tie straps is that if you add further wires to the bundle you use new straps to bind in the additional cable and remove the old one as you progress along so always maintaining a neat appearance. This is especially useful when wiring near the engine where the wiring is not always easy to clip or conduit or when all the cables converge into the main distribution chamber.

So eventually we end up with a multitude of circuits all wired from lights, instruments, fridges, navigation, engines etc. and they all end up at one central point the distribution board.

Again we have to work out how we get the battery supply to these circuits and send it out into our boat. What we don't do is connect 30 or 40 wires to the live and neutral of the battery but instead we bring one large neutral and one large live cable from our battery via a master cut off switch and a master fuse to our distribution board which on most Moonraker's is set at the steering position in the wheelhouse.

This supply is then connected to each circuit by a fuse panel, which splits our one large live circuit into many fused outlets. This can be done with pre fabricated boards which are obtainable from chandlers, fuse boards and for the brave-hearted can be constructed using terminal blocks, fuse carriers and mounted on such items as DIN rails.

An example of this is DELTA MOON shown below.

In every case we need to decide how we spread the load out are they all fed from one battery two batteries one on port and one on starboard etc. I prefer to use two batteries port and starboard and spread the wiring across the two with important circuits on one battery i.e. navigation, bilge pumps and instruments with domestic light, fridge TV etc on the other with a bit of cross pollination such as some lights on the navigation battery and a bilge pump, second GPS on the domestic battery.

The only reason for this is so that not all our eggs are in one basket and we don't get caught out when the battery fails. For added security we might even install a battery change over switch which allows the circuits to be fed from one or another battery.

Once we have the batteries feeding each fuse board we can connect our wiring but remember the biggest error could now occur if we connect a live feed to a starboard fuse carrier we also must ensure that we connect its neutral to the same board. If we muddle up port and starboard connections and cross neutrals there could be a distinct possibility of stray current flowing from one battery to another, on some occasions you might get away with it and only spot the error when things don't work right, but on others you might start an engine and find that some of your wiring disappears in a cloud of smoke as the starting current tries to find another route back to the battery.

SO REMEMBER EACH CIRCUIT LIVE AND NEUTRAL SHOULD BE CONNECTED TO THE SAME BATTERY AND IF YOU DO LINK SYSTEMS TOGETHER THEN YOU NEED DIODES TO STOP INCORRECT CURRENT PATHS OCCURING.

Also it is normal practice to place fuses in the live wire at the beginning of the circuit and not after this will ensure that if a fault occurs all the circuit is protected. The fundamentals of getting the DC wiring in have now been covered and I shall endeavour to cover the engine, 24 volt system including getting a 12v supply from 24v set ups, how to connect 12v car instruments to a 24v system, 240volt wiring, connectors, fuse types, two way wiring of navigation lights so that you can control them from upper and lower stations, NMEA connections and any other item I can think of.

For those of you that have specific questions please send them to Dave Beet and I will try to research them and give a hopefully simple solution and where it can be done cheaper an alternative way of doing things.

# Rep's Meeting

**Just a reminder to all area representatives!**

THE MEETING TO DISCUSS THIS YEARS CRUISING ITINERARY ETC. IS TO BE HELD ON JANUARY THE 27<sup>TH</sup> AT MORVYN'S HOME ADDRESS. ANYONE WISHING TO MAKE SUGGESTIONS RE, EITHER THE AFOREMENTIONED, OR ANYTHING ELSE TO DO WITH CLUB ACTIVITIES SHOULD DROP MORVYN A LINE ON  
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# Moonraker Memorabilia

**SWEAT SHIRTS, T. SHIRTS, AND CLUB BURGEES,  
IN FACT  
ANYTHING APPERTAINING TO MOONRAKER MEMORABILIA  
IS ALSO OBTAINABLE  
FROM  
01235 200403**

PLEASE DON'T FORGET TO VISIT THE WEBSITE FOR PICTURES OF MEMBERS MOONRAKERS, NEW AND USED CHANDLEREY, MOONRAKERS FOR SALE, HOLIDAY IDEAS, ROUTES / GUIDES, LETTERS, ARTICLES AND IF YOU MISSED AN ARTICLE IN A BACK ISSUE, IT IS PROBABLY THERE READY FOR YOU TO DOWNLOAD, AS IS THE MANUAL.THERES MUCH MORE BESIDES, INCLUDING DIRECT LINKS TO GARMIN, PERKINS, FURUNO ETC. GIVE IT A BROWSE IT'S ALL ABOUT MOONRAKING. JUST TYPE IN: -

<http://web.ukonline.co.uk/david.beet>

It would be nice to have the word 'Moonraker' in the title but the cost is kept down by keeping the address above. There are sites that will allow the use of the word 'Moonraker' at no cost, but these only allow up to about 20 Meg of space. We are currently running at about double that. However, should anyone hear of a site that will give us the name for free then please, let me know? DB.