Fisher and Paykel Generators/Alternators.

When you get an unmodified smart drive it is capable of generating from 0 to 300 Volts depending on the speed and is wired to produce 3 phase AC in a star configuration. Below we'll find out what all this means and how to change it to produce what we require.

So lets look at some key points on how it is originally. It has 42 coils of wire around the edge of the stator. If you trace the wiring you will notice that there are two "ends". At one end three wires are join together and at the other end the three wires come out separately. This is what is know as wiring in a star configuration (the other option being a delta configuration which we will get into later). So there three wires going in, each wire connects 14 coils in parallel to the end point where all the wires join together. Each of these groupings of 14 provide different current flows at different times, each providing AC power but each one out of sinc (or phase), thus it is described as 300 volt, 3 phase AC generator.

fisher paykel Wiring Diagram 3

First of all we need to decide what voltage we want to convert it to. Most people either want to 12 or 24 volts. If you have a look at at the above diagram you can see that there are 3 sets of 14 individual coils. Each individual coil is capable of producing about 21 volts at full speed so 14 wired in series are capable of producing about 300 volts (14*21). So for a 12 volt system it is a good idea to join them in sets of two, producing up to 40 volts, because we can get at least 12 volts at lower speeds. Then, wire these in parallel to increase the amps. (have a look at our electricity basics page for the effects of wiring in parallel or series).

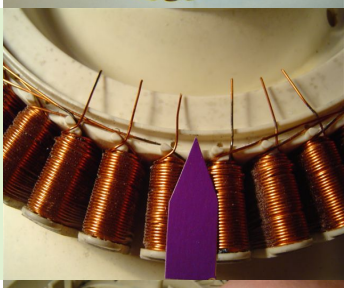
fisher paykel Wiring Diagram 4

So that's the theory. Let's do it to a real one. Click on any of the images for a larger version.

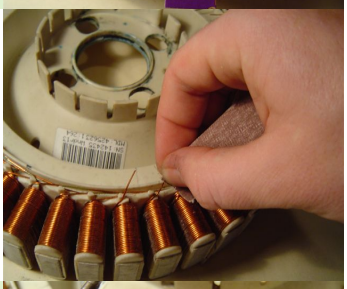
Ok, we start with a blank slate, an unmodified smart drive motor.

Now starting from the first "end" (where the three wires are joined together already) we need to identify 7 groupings of 6 coils. So at every 6 coils mark your stator.

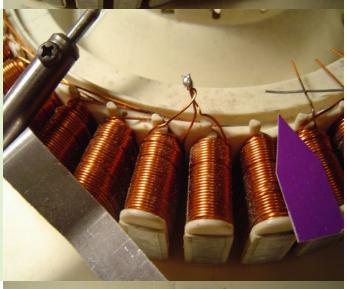
At each mark we need to cut through each of the three wires there. Make sure that you trace the wires to either side and cut as close to the middle as you can so you get even length wires coming out. Do this at each mark. (Note: Between the first and last group of six it should already be done for you so don't mess with these.)



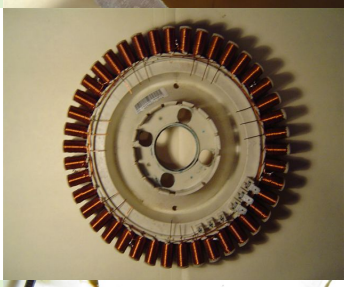
On each of these cut ends, sand the enamel off the outside to expose the raw copper. That way they can conduct electricity.



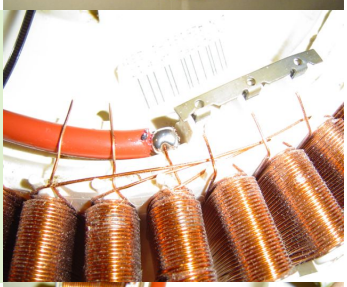
Now we are going to join the centers of our "star" configuration. The first one should be done for us as the original larger star center. After that miss three wires and join the next three. Twist them together and the solder them.



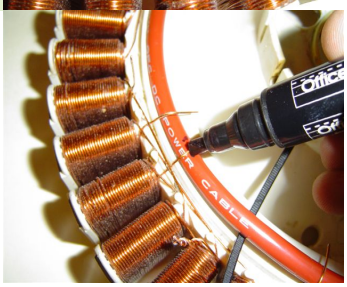
Miss the next three wires, join the next three all the way round your stator. We should be left with six soldered groups and the seventh the original center and six groups of three wires sticking up and the seventh joined to the original three wire outputs.



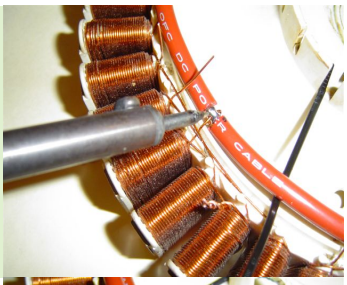
In the next stage we are going to be wire the three series together. The wire we use should at will support at least 15 amps to do this. We will need three 1 meter lengths. Start with the first wire and strip 5-10mm off the end and solder it to the wire closest to the center of the original star configuration.



Next lay the wire along the rim and at the next wire mark where the first of the next group of three wires crosses the main wire. Cut the insulation from that sport to expose the wire below.

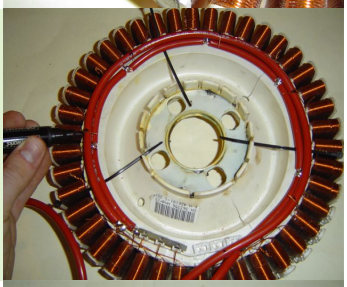


And solder the first wire of the second group to the main wire, making sure to put a cable tie under (left open) so at the end you can leave all your wires tidy. Do this all the way round joining the first wires of all the groups, leaving the excess wire as your first ouput.

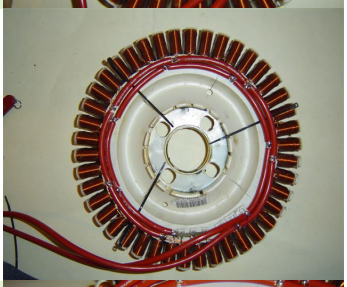


Once that is done start with the second wire. Strip a bit off the end and solder it to the second wire of the first group.

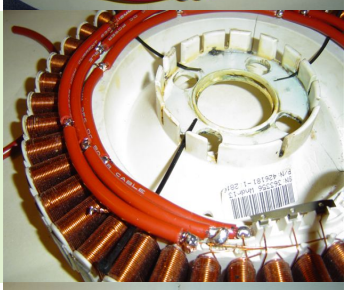
And then again, lay the second wire along the rim and mark out where all the second wires cross it. And again cut off the insulation at those spots.



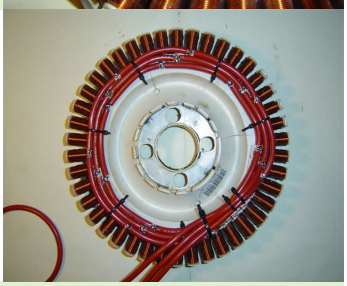
And solder the second wire into place, leaving the excess wire as your second output.



Wire the last wire onto all the remaining wires with the same method and with the excess as your third and final output.



Do up the wire ties and trim of the excess so it is left neatly.



Finally, to protect it coat all the exposed wires in a layer of varnish to protect them from the weather and each other. And there you go! Done!

On the next page we will look at a few wiring options.

Fisher and Paykel Generators/Alternators.

On the previous page we mentioned that we were wiring in star configuration, which basically looks like this

Star Configuration

But you may also want to wire in it a delta configuration which looks something like this

Delta Configuration

Or if we were wiring the Fisher and Paykel motor it would look like this.

Fisher and Paykel Delta Configuration

Why would you choose one over the other though? At higher speeds the delta works better and at lower the star. To take advantage of this several systems wire the motor as such

Fisher and Paykel Dual Configuration

Wiring it is looks messy but once you get your head around it it's not to hard at all. Previously we joined all the first wires to one central wire (output A), all the second wires to one central wire (output B) and all the third wires to one central wire (output C). Then the fourth,fifth and six in each set we join together for the center of the star configuration. Now instead of making star centers we are going to join all the forth wires to one central wire (output D), all the fifth wires to one central wire (output E) and finally all the sixth wires to one central wire (output F). Then with it wired like this, you can build a switch between the two configurations. If you join (d), (e) and (f) together then your outputs are (a), (b) and (c) in a star configuration. If you join (a) and (f) to one output, (b) and (d) to one output and (c) and (e) to one output then you have a delta configuration. The wiring diagram below has taken each of the outputs (A-F) above and put in switches in a circuit. with the switches flicked to the left it's in star configuration, to the right it's in a delta configuration.

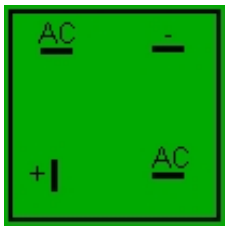
Delta or Star Switch

You can do this manually or if you are clever enough you build a circuit to monitor the speed and swap between them automatically. Good Luck!

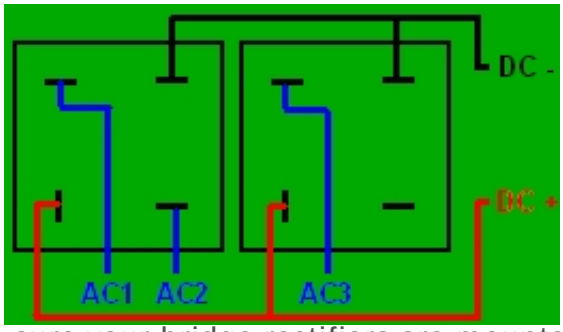
To Fisher and Paykel Forum or Onto AC to DC conversion page.

ReWiring a Fisher and Paykel Generators/Alternators.

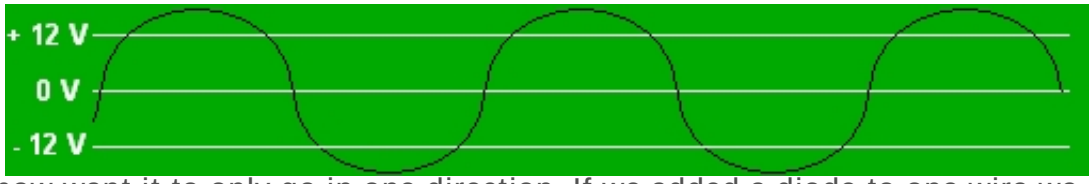
So now we have our output coming out successfully from our rewire generators but it's 3-phase AC power, which most of the time, at 12 volts, you want as DC. So how do we convert it from AC to DC? With Bridge rectifiers. So grab yourself two bridge rectifiers that can support at least 15 amps. This is a 35 Amp one that we picked up for about $5 each.



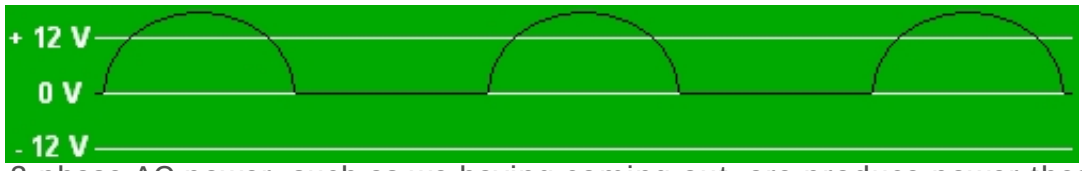
First we'll learn how to wire it so that those that don't care how it works can drop out. Then we'll explain how it works. Attach the three AC outputs to the rectifiers. Then we want to wire the positives together and to an DC positive output wire and attach to the rectifiers. Then wire the negatives together and to a DC negative output wire and attach to the rectifiers. Like so...



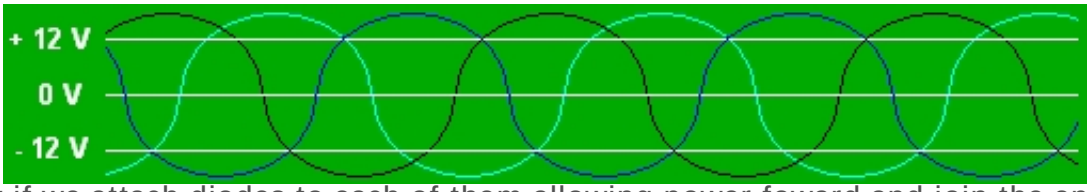
It's that easy but make sure your bridge rectifiers are mounted to a heat sinc and greased with a heat sinc compound to protect them. But how and why does it work. Bridge rectifiers are basically a bunch of diodes strung together. Diodes only allow current to pass in one direction. So where AC power has current passing in one direction and then the other like so...



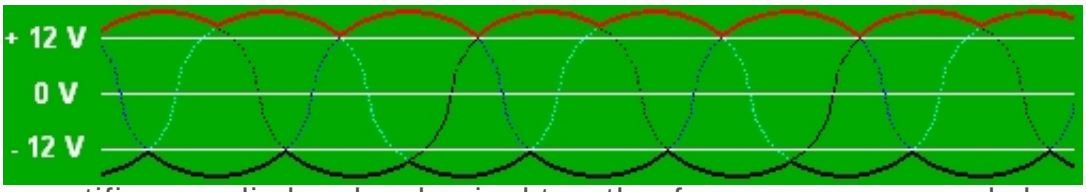
We now want it to only go in one direction. If we added a diode to one wire we would only get the forward (positive) power coming through. Which would look something like this and would look like us turning DC power on and off continuously...



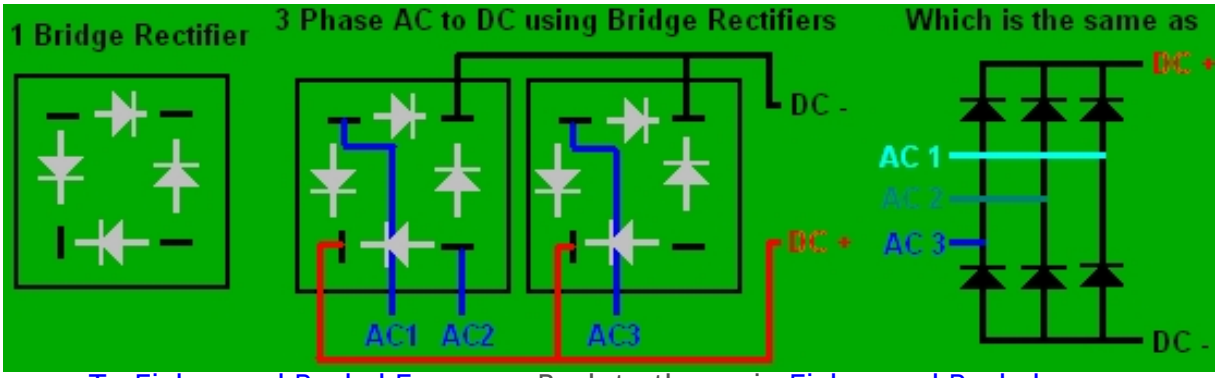
Now 3 phase AC power, such as we having coming out, are produce power these AC currents like above but they are perfectly out of time with each other, as one is going negative the other is going positive like so...



Now if we attach diodes to each of them allowing power foward and join the ends of the diodes together, we get an output of the peaks of all the AC power waves (the red line below). And if we attach diodes again to each but this time in the reverse direction we get an output of all the troughs of the AC power waves (the black line below). So at the end if we have a look at the red and black lines we can see two DC outputs positive and negetive....



Bridge rectifiers are diodes already wired together for us as you can see below. And, Yes you can by 3 phase ones but for some reason the are really expensive, so these are a much better option.



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