

PART 3: SIGNAL WIRE & INSULATING CONNECTORS

# Understanding electrical connections

Oliver Ballam and Pat Manley demystify boat electrics and explain various types of electrical connectors and their uses on board

**S**ignal wire connectors make a permanent joint between two or three small diameter signal wires. Use 'Eton 23' or 'Scotchlok' type connectors that are gel-filled and seal automatically when the joint is made.

Signal wire connectors are readily attainable from specialist suppliers online. They have the advantage that they're designed especially for small-diameter signal wire, such as that used for instrument connections, and are light enough not to need direct support. They are also very easy to fit but not removable.



Scotchlok connector

## INSULATING CONNECTIONS

### Heat shrinking

As we have shown previously, using heat-shrinking tubing is an effective way of insulating a connection.

Some heat-shrink tubing is coated internally with adhesive, which melts when heated. This makes a very corrosion-proof joint.

### Insulating awkward joints

Where it's difficult to apply conventional insulation, such as a sleeve, liquid insulation is a very convenient alternative. This is painted on and the required thickness is built up in layers. This is very convenient on the connections at the back of small plugs and sockets.

### CONNECTIONS AT THE BASE OF THE MAST

To allow a mast to be unstepped, cables running down it must have connectors at its base. These connectors are often a cause of problems due to corrosion, but there are ways of minimising this.



RIGHT Liquid electrical tape



Waterproof deck plug and socket

### Waterproof deck plugs & sockets

These are available in a number of different forms. The plug and socket have a 'waterproof' joint which, in time, will probably allow water to enter the pins and cables. Annual cleaning of the contacts is a good idea, as is some form of physical protection from damage to the cables.

This method is the quickest to connect/disconnect and so is suitable for places that would need to be disconnected regularly (for example, on a trailer-sailer mast).

### Waterproof through-deck glands

An alternative to a deck plug is to lead the cables through the deck, using waterproof deck glands. The connections are



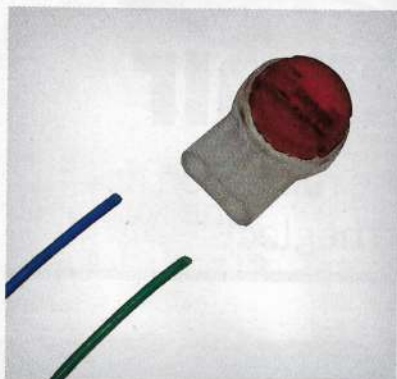
Heat-shrink tubing is put over the joint and heated using an electric hot air gun (a hairdryer is too cool)

The tube shrinks to tightly grip wire and joint

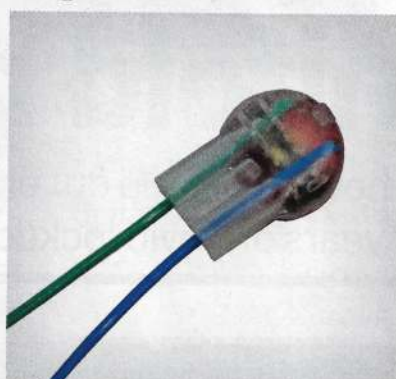


## STEP BY STEP

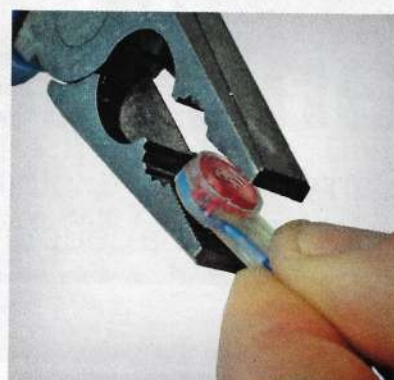
## How to make a signal wire connection



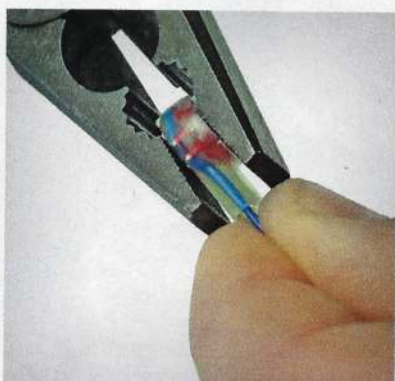
**1** Gather the wires and the connector. Don't strip the wires.



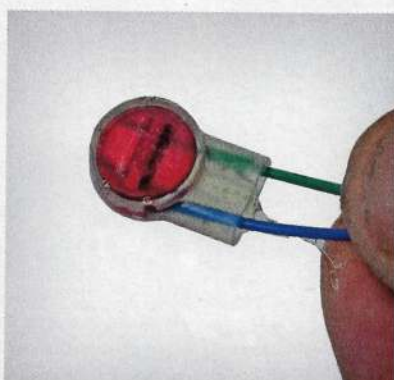
**2** Insert the wires into the connector as far as they'll go.



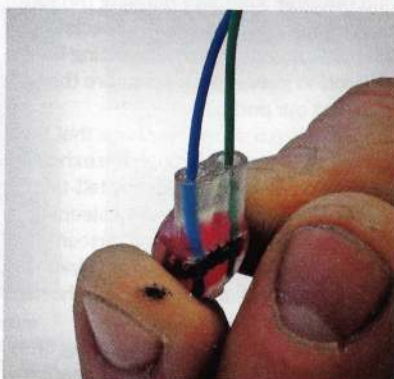
**3** Put the connector into the jaws of the pliers.



**4** Squeeze the pliers: the connector will pierce the wires' insulation to make a good connection and seal the joint automatically with grease.



**5** The closed connector...



**6** ... with grease sealing it.

then made inside the boat using some form of terminal.

This method keeps the connections in a far less corrosive atmosphere, with more space for spare cable to be kept and connections to be made.

### Swan-neck deck pipe

In this set-up, a curved large-diameter pipe passes through the deck. All the cables are run through the pipe so that connections may be made inside the cabin. While not absolutely waterproof, only large quantities of 'green water' passing over the foredeck will allow any to leak below. If this occurs the pipe can be sealed with temporary sealant or a cloth.



Through-deck gland



Swan-neck deck pipe

The advantage is that it's very easy to thread the cables through the deck, and nothing needs to be undone. If there are lots of cables this uses the least space on deck and, if correctly fitted, gives the best physical protection to the cables.

### Keel-stepped masts

No deck joints are needed for keel-stepped masts, as the cables exit the mast below the deck. However, it is common for water to leak through the wiring in keel-stepped masts. Careful sealing at the top entry of the wires and/or a drip loop inside the mast above decks are possible cures for this.

## ABOUT THE BOOK



The third edition of *Essential Boat Electrics* (Fernhurst Books, £16.99) is available at [fernhurstbooks.com](http://fernhurstbooks.com).

Written by

Oliver Ballam and the late Pat Manley, it's a practical guide – with simple language and clear diagrams – to allow owners to tackle electrical jobs on board. There are tutorials, from wiring a circuit, to troubleshooting electrical faults, all using easy-to-follow photo sequences. The book also looks at tasks such as choosing solar panels and batteries and connecting navigational instruments.