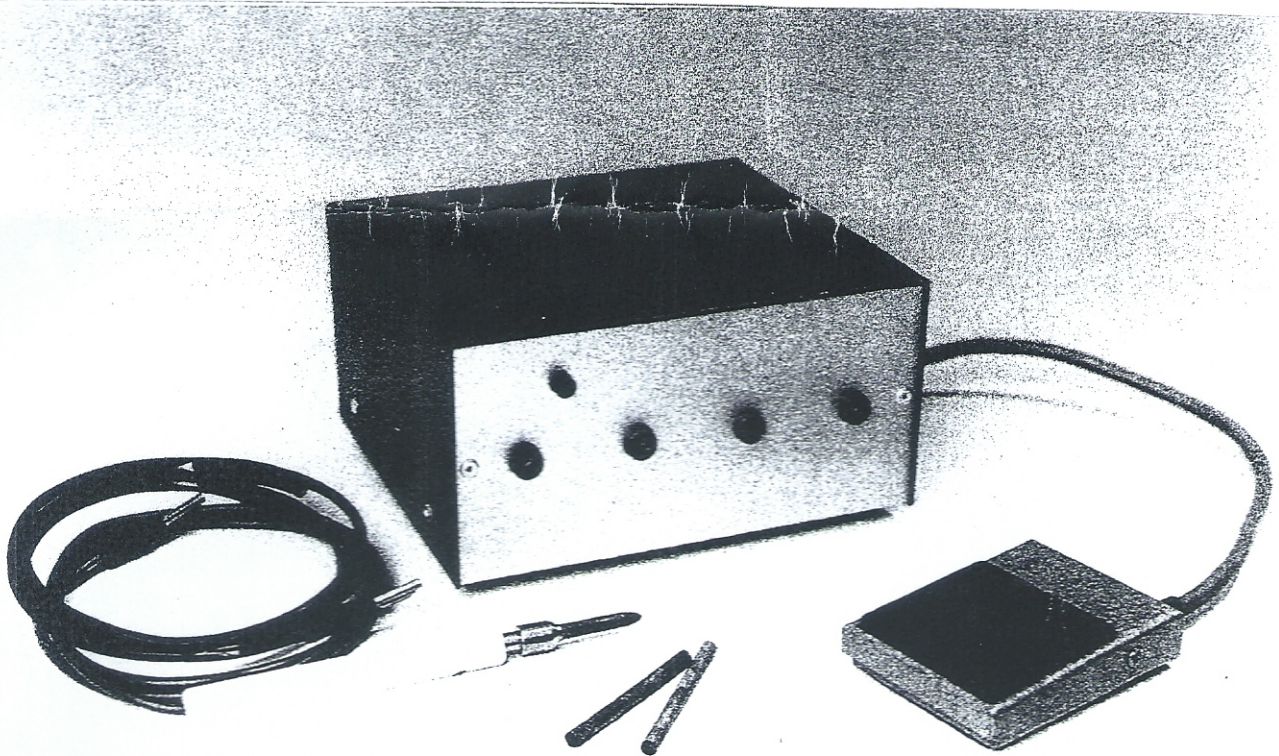


LONDON ROAD MODELS

“RESISTANCE SOLDERING UNIT”



London Road Models

Resistance Soldering Unit

Health and Safety considerations

The London Road Models RSU is designed for resistance soldering of brass and nickel silver small-scale model kits only.

At the end of the units' serviceable life, it can be returned to the manufacture for disposal. Alternatively your Local Authority may provide disposal facilities (we have been advised that it can be treated as a household appliance).

The unit contains no user serviceable parts and should be returned to the manufacturer for repair in the unlikely event of component failure. The RSU 240V mains input is controlled by the footswitch. Therefore the unit is live when connected to the mains supply. Disconnect the RSU from the 240V mains supply or switch off at the supply socket when not in use.

The probe holder and handle can become very hot if used for excessive periods. To avoid this, the RSU should only be used for a maximum of 10 seconds, followed by a cooling down period of 3 minutes. Pre-tin components to be soldered to minimise the period the RSU is used. Use of a soldering iron holder for the probe (such as the Antex ST4) will help keep the probe handle cool

All soldering materials should be treated with respect and used only in well-ventilated rooms. When using the RSU with liquid or paste flux avoid inhaling any fumes given off by the flux. Phosphoric acid fumes can be highly irritating to their nose and lungs. If flux comes into contact with your skin, wash off immediately with large amounts of water. Wash hands after handling any lead product (solders, white-metal, etc.). Inhaling Cadmium (contained in some fluxes) fumes is linked to throat cancers.

Don't forget that most modelling solders melt between 145°C and 245°C, so allow the model to cool before handling. Should you sustain a burn, cool the affected area with cold water. Apply a sterile plaster or dressing to guard against infection. Minor burns may respond to proprietary antiseptic creams.

If using a fibre glass pen or stick the clean the model's surface, avoid contact with pieces of broken off fibre strands.

If in doubt, seek medical help.

The theory of Resistance Soldering.

The principle of resistance soldering uses the heat generated by passing a relatively large alternating current between two surfaces to be joined - usually brass or nickel silver - having introduced some form of solder between the two halves of the joint. As the current passes through the joint a high temperature is developed at the joint and this is sufficient to melt the solder there. On cooling the joint is made.

The advantage of the technique are that:

- A) The work is held in position for the whole operation, i.e. until the solder has solidified
- B) The amount of solder applied is restricted to the joint area by pre-tinning.

The main application of the RSU is to add detail to etched metal kits where an excess of solder would spoil the detail. As the heat generated is localised it does not interfere with other detail nearby. The electrode is made of copper plated carbon which lasts a long time in modelling use and can be sharpened with a good pencil sharpener or with a coarse file.

In the London Road Models RSU, the high currents required are provided by a specially-wound mains transformer providing three secondary voltages at nominally, 2, 3, and 4.5 volts. By choosing different combinations of output connections, voltages of 1.0, 1.5, 2.0, 2.5, 3.0 and 4.5 can be achieved. The current supplied is in the order of 40A depending on the total resistance of the circuit. The joint to be soldered is included in this resistance and should be the highest value in the circuit so that most of the heat generated is concentrated at the joint.

A mains rated footswitch is used to switch the primary (mains) winding of the transformer current to the transformer. This has two advantages.

- A) The current to be switched is about 0.5A (rather than the 40A plus of the secondary windings)
- B) The transformer is off most of the time thus keeping it cooler.

What's in the box?

A base station with a mains input and footswitch attached. On the front of the unit are four sockets, one black and three red delivering from 1.0 volt to 4.5 volts according to the connections selected.

A probe holder and handle attached to the red cable fitted with a plug.

A length of 5.0 mm carbon electrode.

A black cable fitted with a plug and a "free" end for connection to the model.

Getting a good return

The objective is to minimise resistance around the RSU low voltage circuit, so that the maximum current is available at the solder joint. It is therefore important to ensure good electrical contact between the model (the work piece) and the black return lead. When RSU's were first written about in the UK modelling magazines, small crocodile clips were recommended for attaching the return lead to the model. However, it was soon found that this just provides several small high resistance points and didn't provide a good enough connection. So;

- Crimp/solder an eyelet to the black cable conductor. Bolt/screw this to the model.

- Solder the black cable conductor to the model (in a location that will not be visible when the model is finished). Like the "eyelet" approach this works better with larger models e.g. 0 or 1 gauge, as the weight/size of the model tends to hold it in place while working on it.
- Solder/bolt the black cable conductor to a "return plate". This provides the most flexible option, especially on 4mm or smaller scales.

A return plate should be big enough to hold the model being worked on (in 4 mm a 10" plate will take a 60' coach side) and is best made from a piece of flat steel plate (2 – 6mm thick), as small magnets can be used to hold the model in place. A piece of steel (or brass) angle fitted to the main plate will provide a 90° "fence" to work against when fitting coach ends, etc.

If a suitable piece of steel plate is not available, then a piece of brass plate will suffice. Eileen's Emporium and stockist of K&S metals can supply 1.6mm thick brass sheet. This can be mounted on a flat piece of mdf, chipboard or similar, using double sided sticky tape or Evostick. The return cable can be bolted or soldered to the plate.

Aluminium sheet is not recommended as it is too easily corroded by flux. However, a piece of aluminium kitchen foil provides a good conductor between the model and return plate, protects the plate from flux and is easily replaced (just throw it away and use a new piece).

The probe and holder.

The copper coated carbon probe can be "sharpened" in a variety of shapes according to the need for a good contact on the part being fitted. The usual shape for most purposes is a cone, rather like the end on a pencil. Other useful shapes are a flat chisel (described by Mike Grey in MRJ 82 for use in "offset soldering" when using an RSU to make rivet and ply track work) and the "flat end with dimple" for fitting handrail knobs. The variety is as great as your imagination, dependant only on getting good electrical contact between the probe and the item being soldered.

The carbon probe should be a very snug fit in the probe holder, for a minimum depth of 10 – 12mm. It is a good idea to polish the copper plating with some fine emery, to ensure a smooth surface for good contact. Keep the length of carbon projecting from the collet holder to a minimum as a shorter probe has less resistance, I find that 20mm is about right although it sometimes needs to be longer to get at the work piece.

Getting down to it.

Don't forget that the normal laws of soldering apply. Mechanical cleanliness, the appropriate solder and flux and sufficient heat at a high enough (but not excessive) temperature.

To use the RSU we recommend that the component to be soldered is pre-tinned on the joint surface, using 145° solder. The model should be held in place on the work bench/return plate. The location for the part to be fitted should be cleaned and flux applied. The part being fitted should be located in place, the probe applied and the footswitch depressed. The flux should melt/boil, followed by the solder which should "flash" around the edges of the joint. Release the footswitch but continue holding the probe in place until the solder has solidified.

It is best to start on a lower voltage setting, increasing it until the joint is made quickly but without overheating the probe end or the model where they are in contact. It's a good idea to practise on some off cuts (the surround from etches are good for this) to get the hang of things. The point of the carbon rod will get hot but if readily glows red hot, reduce the voltage. Some fluxes appear to condense onto the carbon and make it difficult to get good contact. If this happens just rub the end of the probe on a piece of paper (I keep a small piece of card on the bench next to the return plate). Do not move the probe about when current is flowing (unless you wish to etch your name on the metal!).

With small components it is easy to lose sight of them under the carbon probe. Hold them down with a scribe and apply the probe alongside and let the heat flow by conduction.

When soldering overlays in place, too much localised heat can cause distortion. Solder the overlay at one corner, followed by the opposite corner one and then work around diagonally (a bit like tightening down a cylinder head).

Brass has greater heat conductivity than nickel silver, so it may take a higher setting/longer power application when working on brass. Etched or turned parts are smooth and will provide a good contact with the probe. Cast brass or n/s parts have, by comparison, a rough surface. As a result localised arcing and pitting can occur at the probe contact point. If possible, polish any brass or n/s castings before using the RSU to solder them in place.

If you are using a return plate for fitting parts (e.g. ventilator hoods) onto flat items such as coach sides, use a piece of thin card to provide heat insulation between the work piece and the plate at one end and a piece of foil to provide good electrical contact at the other end (see drawing).

When using the RSU to solder parts onto larger models (e.g. Gauge O or 1) the electrical path between the return connection and the part being fitted should be as short as possible. A second probe can be used for the return and enables the current path to be kept as short as possible (see drawing).

References

MRJ Issue 74.	Resistance Soldering – What, how, why.	Jol Wilkinson
MRJ Issue 82.	How to use an RSU to make track.	Mike Grey

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London Road Models Resistance Soldering Unit



A



B



C



D

1.0 v

1.5 v

2.0 v

2.5 v

3.0 v

4.5 v

B - C

C - D

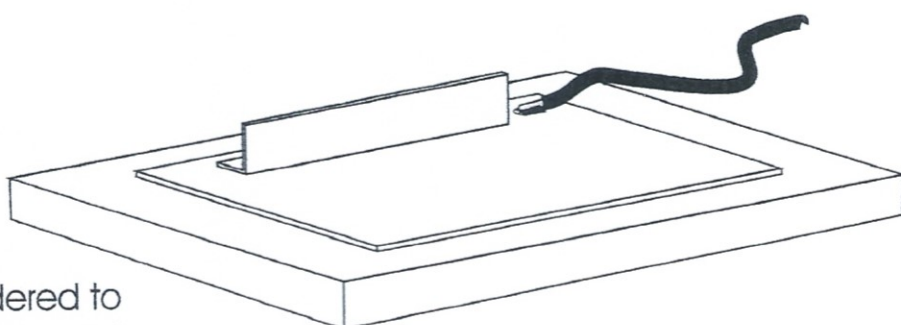
A - B

B - D

A - C

A - D

Return plate



Return lead soldered to steel or brass return plate mounted on board with 90 degree "fence".

Aluminium foil

Detail

Probe

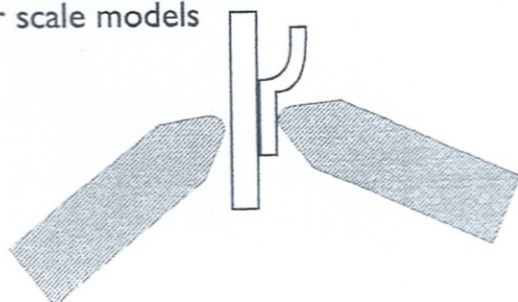
Thin card

Workpiece

Return plate

Using foil to improve electrical conductivity and card to reduce heat conduction when adding detail parts to the main workpiece

Using two carbon probes
For larger scale models



Soldering overlays

1	9	6	12	4
7				8
3	11	5	10	2