MODEL SIGNAL ENGINEERING
MSE
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SCALE	CODE	
10 mm	G1/KM1	

LMS/LNER/ BR UPPER QUADRANT TUBULAR POST SIGNAL KIT

Complete kit to build a working (un-motorised) home or distant signal in any height up to 20'. Some marking out, cutting and shaping of parts is required.

Although upper quadrant arms had been in use since shortly after the Grouping, the tubular post signal dates from the mid-1930s. It was used for new installations and renewals until the end of the Big Four period, and by the London Midland, Eastern and North Eastern Regions of British Rail (ways). The design does not appear to have been common in Scotland, probably because most pre-grouping signals had lattice posts, which would have remained in better condition than the timber posts used south of the border. Many examples are still in use today, and new ones are still being installed where replacement by colour lights is inappropriate.

Parts supplied:
G1/12 arm etc. fret
G1/09 ladder fret
SC106 lamp casting
SC119 post cap casting
SC141 balance lever & weights castings
12" x 3/16" brass tube (post)
4" x 7/32" brass tube (inner butt)
4" x 1/4" brass tube (outer butt)
1" x 1/16" brass rod (arm spindle)
2cm x 2.0mm brass tube (arm bearing)
3cm x 0.9mm brass rod (balance lever axle)
0.6m x 24swg ladder rung wire (coiled)
30cm x 0.7mm nickel silver wire (operating wire)
10cm x 0.5mm brass wire (arm bolts)
Red, yellow, green and blue-green glazing
Baseplate

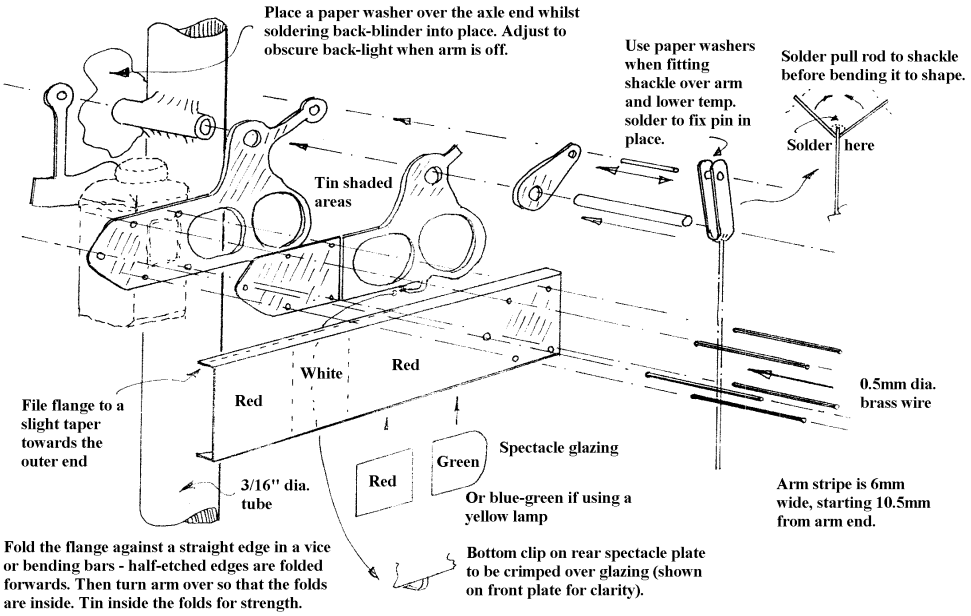
ASSEMBLY INSTRUCTIONS

You will need an adjustable temperature 25-50W soldering iron, 188°, 145° and 70° solders and liquid fluxes, minidrill and slitting disc, various files, pliers, drills etc., and tinsnips and small scissors for cutting out the frets. In these instructions left- and right-hand mean as viewed from the front of the signal. A selection of prototype photographs will help assembly.

Obtain a balsa wood block to pin the job to whilst working; a piece 30cm x 5cm x 1cm should suffice.

The Signal Arm:

Use 188° solder for the start of this section.



If modelling a distant signal, scribe and notch the end of the blade - the apex of the notch is 6¼mm from the end, on the centre line. Fold the half-etched edges of the blade over a steel block to get a crisp edge. The folded edges face the rear of the signal. Open out the group of five bolt holes in the blade and spectacle plates to clear the 0.5mm wire. Open out the large holes in the spectacle plates and the separate operating arm to 1/16" to suit the arm spindle, and the operating lever holes to 0.7mm. Tin the shaded areas on the components.

Lay the spectacle plate with the half-etched portion face up on the balsa block. Insert five short lengths of the 0.5mm wire into the holes and push them into the balsa block. They will represent bolt heads later, and the next step is made easier if you trim the wires to be different lengths. Drop the blade onto the wires with the edges pointing towards the balsa block and sweat it to the spectacle plate.

Now switch to 145° solder.

Turn the assembly over and push it into the balsa block. Push the arm spindle through its hole and into the block. Drop on the second spectacle plate and push a piece of paper between the two plates in the area of the spectacles so they don't become soldered together. Sweat the second spectacle plate in place, and ensure the spindle is firmly soldered to the arm.

Remove the arm from the balsa block and shorten the five wires on both sides so they look like bolt heads. Add the separate operating lever to the front face with the half-etched holes facing outwards, and ensure that the operating rod holes are aligned. File the front of the spindle almost flush with the front face of the arm.

The Post and its Fittings:

Use 188° solder, for this section, except where stated.

Tubular posts were made in two parts, the post and the butt. They usually came in one of a range of standard heights, chosen to give adequate sighting, as shown in the first column of the table overleaf. The height given is the height of the arm centre line above rail level, so the post cutting length given in the second column includes an allowance of 22mm and 11mm at the top and bottom of the post respectively. These figures include 2mm for the recess inside the post cap and 1mm to go into the baseplate. Non-standard cutting heights can thus be

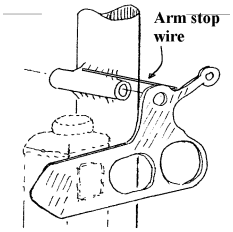
calculated from the table - don't forget to make allowance for any signal not mounted on the ground. Note that a platform starter is typically 16' high, and that lattice posts were used above 30' (35' from January 1944). The post and ladder as supplied will build into a signal up to 20' tall. Heights above this will require an extra G1/09 ladder to be purchased and joined, and above 26' you will not be able to have the post inside the full length of the butt.

Height (ft/ins)	Post cutting length (mm)	Butt cutting length (mm)	Post to ladder distance (mm)
16.0	193	70	25
20.0	233	70	29
22.6	258	100	31
25.0	283	100	33
27.6	No cut	100	35
30.0	No cut	100	37
32.6	No cut	100	39
35.0	No cut	100	41

Having chosen your post height, cut the 3/16" post and 7/32" inner butt brass tubes to the lengths shown in the second and third columns of the table. Ensure that the ends are square. If not mounting the signal on the baseplate, remember to add sufficient length (the same to both tubes) for your chosen fixing method. The 1/4" outer butt tube should be cut slightly shorter than the inner butt to assist in forming the bevel seen on the prototype at the post/butt join.

Attach the 2mm bearing tube to the post at right angles 12mm below the post top – a hole drilled in the balsa block will help keep things square. Use the minidrill and slitting disc to trim the bearing so it projects 2mm beyond both the front and rear of the post (the post faces, not its centre line). Solder the post tube inside the butt tubes, leaving 1mm of the post projecting at the bottom if using the baseplate. File the characteristic bevel to the butt top.

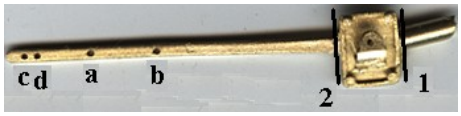
If using the baseplate, scribe a longitudinal centre line along it, then drill a 3/16" hole on the line around 20mm from one end. Solder the post/butt assembly to the baseplate, ensuring squareness in all three planes.



Temporarily fit the arm spindle into its bearing, and solder (145°) a 0.5mm wire stop in the crook of the bearing/post joint, as shown. This will prevent the arm falling below the horizontal. You may need to file down the top of the spectacle plate or the underside of the wire to give a free motion.

Fabricate an L-shaped lamp bracket from a 5mm wide x 20mm piece of scrap etch, folding it so the two parts of the L are of equal length. Add a triangular support from a piece of scrap wire as shown in the photo. Using Blu-Tak or similar to hold the arm horizontal and to fix the lamp to the bracket, offer up the bracket to the left-hand side of the post, moving it vertically so the lamp lens falls exactly behind the “on” spectacle aperture. You may need to adjust the position of the lamp on the bracket to achieve this. When satisfied, solder (145°) the bracket to the post and the lamp (70°) to the bracket.

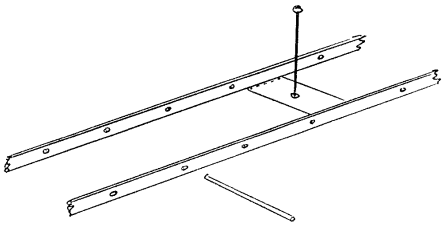
Add the post cap (70° solder) to the post top.



Remove the casting sprue from the balance lever parts by making two cuts with a piercing saw or slitting disc as shown. Tidy up the cuts and any mould lines with files, and file flat the rear face of the bracket. Open out axle hole (a) with a 0.9mm drill, then use broaches if necessary to make it a good clearance fit on the 0.9mm brass rod. Treat the holes in the bracket similarly. Open out pull rod hole (d) to 0.7mm, and signal box wire hole (c) to suit your operating wire. Solder (70°) the two weight halves together, then solder the resulting weight to the arm, leaving around 2mm of arm projecting through the weight. Hole (b) should be filled with solder.

Solder (188°) the bracket to the right-hand side of the butt. The bearing hole should be 40mm above the baseplate/ground level, unless the signal is in a public area, when it should be 40mm below the arm centre line. Using the bracket bearing holes as a guide, drill 0.90mm right through the butt. Insert the 0.9mm brass bearing wire, trapping the balance weight arm in the bracket such that the weight is to the rear of the signal. Oil the balance weight arm bearing, then solder (145°)the wire at the butt and bracket hole outer faces. Remove excess wire and tidy up the joints.

The Ladder:

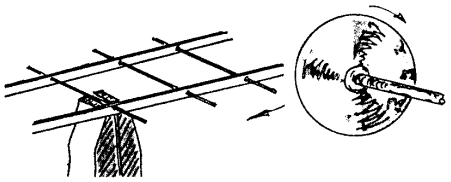


Use 188° solder for this section.

The jig incorporated in the ladder fret helps to keep the ladder aligned whilst the rungs are being soldered in place. Before removing the ladder and jig from the fret, clear the rung holes to suit the 24swg wire supplied. The holes are deliberately etched undersize to prevent failure in production and to give a fine fit to the wire.

Fold up the two side stiles with the half-etched lines on the inside, and pin down the whole assembly on the balsa block, using the holes in the five jig spacers.

The first rungs to be soldered in should be those adjacent to the jig spacers. Straighten some wire between finger and thumb and insert it through two stile holes. Brush on some liquid flux, and apply the smallest amount of solder straight from the iron. Always approach from the edge of the stile furthest from the jig to minimise the possibility of soldering the two together; some solder mask will help here. Once soldered in place, cut off the excess wire, and move to the next pair of holes. Don’t cut the rungs to length before soldering in place – a long length of wire is much easier to work with. Once the rungs near the spacers are soldered in, work alternately from the two ends towards the centre, and from the centre towards the ends. Gently push in the stiles as you proceed.

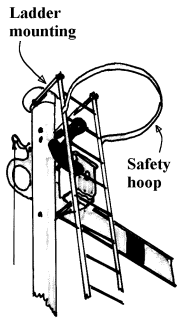


Remove the ladder and jig from the balsa block, and tidy up the rung ends using a minidrill and slitting disc. Hold the rungs in pliers as shown to avoid damage. The vibration from the drill is most useful, as it will shake apart any poorly soldered joints! Do not discard the strips in the middle of the jig; these are used in the next section.

Fixing the Ladder:

Use 145° solder for this section.

Use the minidrill and slitting disc to form a 12mm long channel in the baseplate, perpendicular to the centre line. The distance from the butt depends on the post height - see the last column of the height table. If not using the baseplate, solder pieces of scrap wire either side of the butt which are long enough to reach the ladder end. For non-standard post heights, take the post cutting length in millimetres, subtract 7, divide by 12, add 10, and the result is the distance of the ladder foot from the rear of the post.



Using one of the ladder jig strips, form a square cornered U-shaped ladder mounting strap, wide enough to just fit over the ladder, and with the arms 8mm long. Solder it to the rear of the post, 6mm below the post top. Offer up the ladder to the post, so its bottom end fits in the baseplate channel or can be soldered to the fixing wires, and its top end fits into the strap. Solder the ladder top and bottom and remove any excess length from the top.

Add pairs of ladder bracing struts from the ladder jig. Solder them to the ladder and post, joggling them to account for the width difference. Check their height and number with photographs. The ladder end joints should be on the outside of the stiles, and never exactly level with a rung.

Form the safety hoop from one of the jig strips. Wrap it round something around 18mm diameter; the natural spring of the brass will open it to the correct 20mm diameter. Bend 5mm of each end to the ladder width and solder them to the outside of the ladder stiles, 10mm below the arm bearing centre line. Bend the hoop so it is parallel to the ground, and not perpendicular to the ladder.

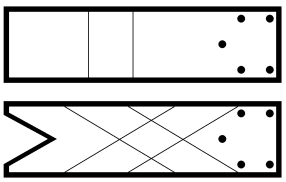
Painting:

Degrease the post and arm assemblies by washing in detergent water and leaving to dry. Spray overall with white car primer,

mounting the arm in its bearing to avoid painting the spindle and inside of the bearing tube. Detail paint as follows (but check with photographs as there is a lot of prototype variation):

Black (some parts pale grey in later BR days): – butt to just above and including the balance weight assembly; ladder above the level of black on the butt and any bracing struts above this, but not the mounting struts; safety hoop; lamp, but not the lamp bracket; arm bearing; arm spectacle plate including the V-shape on its reverse; arm rear band/ chevron; front chevron on a distant arm.

Red or Yellow: front and edges of the arm except the home's white band or distant's black chevron. Here is a full-size template for marking out:



Silver: lamp lenses front and rear.

Glaze the spectacles; use red (home) or yellow (distant) in the left-hand aperture, and blue-green or green in the right-hand one. (The green material is supplied to give a better colour if you intend to light the signal with a white source; use the blue-green if using a yellowish source.) Trap the glazing between the spectacle plates and secure it in place with gloss varnish. Coat the front of the glazing with gloss varnish to give a better glass effect.

Fixing the Arm to the Post:

Use 145° solder for this section.

Ensure the spindle moves freely in its bearing – clean off any paint that might have crept in. Remove any excess spindle length with the slitting disc, but leave enough protruding through the bearing to solder the back-blinder on. Open out the hole in the back-blinder to 1/16" an oiled paper washer over the spindle end, then solder on the back-blinder as shown in the arm assembly sketch. Adjust its position so it just clears the lamp rear lens when the arm is horizontal, and push it sufficiently far on to the spindle to remove any fore and aft spindle motion. Wash off any surplus flux, then prime and paint black or light grey as detailed above.

The Operating Wire:

The arm end attachment may be made either by: forming a small hook in the top of the 0.7mm wire with the wire entering from the rear; or using the etched shackle as shown in the arm assembly sketch, fixing it to the arm with a (very) carefully soldered 0.5mm wire pin. Once the top of the wire is fixed to the arm, measure the distance between the arm hole (arm horizontal) and the right-hand balance lever hole (lever around 30° below the horizontal). Bend the bottom of the wire 90° to the front at the measured distance, then trim the bent portion to 6mm in length. Push it through the balance lever hole from the rear, forming a hook to retain it. You may need to joggle the wire to give clearance for it to pass behind the spectacle plate. Prime the wire and paint it black, or to avoid the risk of gumming up the works with paint, use a permanent marker pen instead.

The signal may now be installed on the layout and connected to your chosen means of operation.