



**This is not a complete kit.** To build a complete signal you will need a post, lamp, finial and ladder.

The LMS, LNER and SR introduced upper quadrant signal arms soon after the 1923 Grouping. At first, the arms were of the corrugated steel pattern, but this changed around 1936 to the plain type. These signal arms were used for all new installations from the mid-1920s, and also gradually replaced the lower quadrant arms on signals inherited from the relevant pre-group companies (a process that is still not complete!). The design was adopted by BR and Railtrack, and new semaphore signals are still being installed today, where replacement by colour lights is inappropriate. All three companies began by installing the arms on wooden (*S06, S017, S028*) and lattice steel (*S7/02, S7/02/2, S7/22, S7/41, S7/42*) posts and dolls. Concrete posts were also used, particularly on the LNER. In the 1930s, the LMS and LNER switched to tubular steel posts (*T18, T532*), whilst the SR began making posts from bolted lengths of scrap rail (*S032*). BR continued these designs.

Identification of components on fret:

1. Plain home arm
2. Plain distant arm
3. Spectacle plate
4. Ladder mounting block (tubular posts)
5. Balance lever (5a for SR/BR(S))
6. Balance weights (6a for SR/BR(S))
7. Balance lever bracket
8. Crank bracket
9. Signal wire cranks
10. Signal wire pulleys
11. Lamp bracket
12. Lamp bracket strut
13. Rule 55 exemption plate
14. Lampman's safety hoop
15. Lampman's platform
16. Platform handrail
17. Ladder bracing struts
18. Back blinder

Not all parts will be used on any given signal.

ASSEMBLY INSTRUCTIONS

General:

The test signals were built using 50W and 25W (low temperature) soldering irons, 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 fret. In these instructions left- and right-hand mean as viewed from the front of the signal. Burnish both sides of the frets before removing any parts. It will help to tin some of the smaller parts before removal. Grip the etched parts in smooth pliers when filing off tags to avoid bending them.

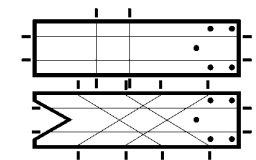
Because of the number of prototype designs, these notes are only general. More specific instructions for particular types can be found on the web site. A selection of prototype photographs will help assembly.

The Signal Arm:

Use 188° solder for this section.

Open out the spindle hole in the spectacle plate (3) to no.61 (1.0mm).

Using the vertical half-etched lines as a guide, scribe painting lines on both sides of the appropriate signal arm – home (1) or distant (2). To do the rear side, use a scriber to punch guide pips through from the front marks.



If you wish to model the earlier corrugated pattern of arm (fitted prior to 1936), deeply scribe the corrugations on to the front of the arm, using the horizontal half-etched marks as a guide, and solder two pieces of 0.45mm brass wire

onto the rear face at the same distances from the top and bottom edges.

Punch out the five bolt heads in the chosen arm, then solder it to the half-etched side of (3), ensuring the arm's half-etched bolt heads are on its front face. Solder the arm assembly to a 30 x 1.0mm brass rod spindle. To keep things square, drill a 1.0mm hole in a wood block, insert the spindle then drop the arm on to it face down. When soldering, do not press the arm at the spectacle plate end, or it will tilt. Remove the excess front spindle and file it almost flush with the spectacle plate. Leave the excess rear material for now as a painting handle. Joggle the operating wire arm back 1mm so the operating wire will clear the spectacle plate.

Tubular Posts:

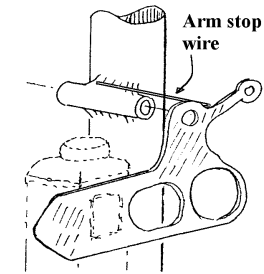
Tubular posts were made in two parts, the post and the butt. They usually came in one of a range of standard heights, chosen to give adequate sighting, as shown in the first column of the table. The height given is the height of the arm centre-line above rail level, so the post cutting length given in the second column includes an allowance of 16mm and 8mm 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.

Height (ft/ins)	Post cutting length (mm)	Butt cutting length (mm)	Post to ladder distance (mm)
16.0	136.0	49	18
20.0	164.0	49	20.5
22.6	181.5	77	22
25.0	199.0	77	23
27.6	216.5	77	24.5
30.0	234.0	77	26
32.6	251.5	77	27.5
35.0	269.0	77	29

Having chosen your post height, cut *T18* and *T532* brass tubes to the lengths shown in the second and third columns of the table respectively. Ensure that the ends are square. If not mounting the signal on a baseplate, remember to add sufficient length (the same to both tubes) for soldering into a *T316* ground tube.

Attach (188°) a length of *T200* bearing tube to the post at right angles 7mm below the post top – again, a hole drilled in a wooden block will help keep things square. Use the minidrill and slitting disc to trim the bearing so it projects 1.5mm beyond both the front and rear of the post (the post faces, not its centre line). Solder (188°) the post tube inside the butt tube, leaving 1mm of the post projecting at the bottom if using a baseplate. File the characteristic bevel to the butt top.

Fix the post/butt assembly into a 1/8" hole drilled in the baseplate, or solder the ground tube to the bottom of the post/butt, leaving 3.5mm showing above ground level.



Temporarily fit the arm spindle into its bearing, and solder (145°) a 0.45mm 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.

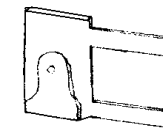
Other post types:

For etched lattice posts, proceed according to the supplied instructions, and add the bearing and arm stop wire as described above. The position below the post top will vary with the prototype being modelled.

For cast whitmetal posts, remember that the post is easily melted or distorted. Handle it carefully, and ensure you have picked up the low-temperature (70°) iron before making any joints! Remove any flash and moulding lines from the post, and straighten it using gentle finger pressure if it has become distorted. Remove any cast-on bearing or mounting plate detail. Affix (70°) the bearing tube as described above, but solder (188°) the arm stop wire to the tube first. Again, the distance of the bearing below the post top will depend on the prototype being modelled.

The Balance Weight and Post Fittings:

Use 188° solder for the start of this section.



Sweat the two balance weight levers (5 or 5a) together. Add weights (6 or 6a) either side to increase the thickness as desired. Open out the axle hole to no.65 (0.90mm), and the two operating wire holes to no.77 (0.45mm). Fold up the bracket (7), as shown, with the half-etched lines on the **inside** of the bends.

Now switch to 145° or 70° solder.

For tubular posts, solder the bracket to the right-hand side of the butt, with the straps pointing to the rear. The bearing hole should be 28mm (4ft) above the baseplate/ground level, unless the signal is in a public area, when it should be 28mm (4ft) below the arm centre line. Wrap the straps around the butt, then solder them in place. Other types of post had the bracket in varying positions, so check with photographs.

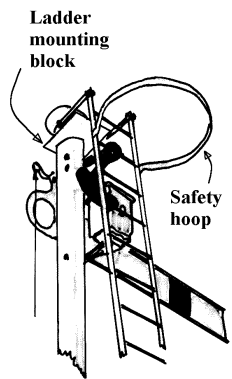
Using the bracket bearing holes as a guide, drill no.65 (0.90mm) right through the post. Insert a 0.9mm brass bearing wire, trapping the balance weight arm in the bracket such that the weight is positioned correctly according to your photographs. Oil the balance weight arm bearing, then solder the wire at the butt and bracket hole outer faces. Remove excess wire and tidy up the joints.

Consider from which direction the signal box operating wire would have approached the signal. Solder a crank (9) to the front of the bracket (8), using a 22swg nickel silver wire axle, such that when the bracket is soldered to the post as appropriate, a horizontal pull on the lower lever will translate into a downwards pull on the other lever. Use one of the etched brass washers to space the crank off the bracket. There is no need to make the crank work, unless it is to form part of the eventual operating mechanism. Some signals had a pulley wheel (10) instead of the crank. Solder the bracket to the post, so the lowest crank hole or the bottom of the pulley is just above the baseplate/ground level, and the half-etched bolt-heads are facing outwards and are symmetrical about the butt.

Fold up lamp bracket (11), with the half-etched line on the inside. Solder (188°) triangle (12) into the half-etched lines inside the bend; one is longer than the other to match the triangle sides. Solder the bracket to the left-hand side of the post, with the shortest side of the triangle against the post. The vertical position is variable - check that the lens of your chosen lamp will fall centrally behind the left-hand spectacle, when the arm is horizontal.

Add the Rule 55 exemption plate (13) if needed (not on distant signals). Centre it 91mm (13ft) above the baseplate/ground level. Two pairs of bolt holes are half-etched into the plate. Either the vertical or horizontal pair was used to fix the plate to the post; check from photographs which pair is redundant and fill with solder.

### The Ladder and Platform:

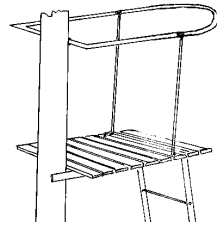


For tubular posts without platforms, solder (145°) ladder mounting block (4) 2mm below the post top. Use the slitting disc to cut back the front face of the block so it is just in front of the post.

For LNER signals with platforms (usually those over 20ft tall), remove the right-hand end plank

from platform (15). For all signals with platforms, open

out the holes on the end-but-one plank and in the handrail (16) to no.77 (0.45mm). The other pair of holes on the platform should be filled with solder. The handrail height above the platform depends on the prototype (typically SR/BR(S) 21mm, LNER/BR(E) tubular posts 24.5mm and LNER/BR(NE) tubular posts 28mm), so add two overlength 0.45mm brass wire stanchions through the holes in the platform, with the half-etched side of the latter on top. An easy way to do this is to take a 1/4" balsa block, lay the platform face down on it, drill two no.77 holes through the block using the holes in the platform as a template, insert the stanchions through the holes and solder (188°) in place.



For LNER etc signals, use pliers and suitable round formers to make the handrail semi-circular in plan as shown. For all platforms, place the handrail over the stanchions, then solder (188°) it in place at the correct height above the platform. Remove any excess wire with side cutters. As these will not cut exactly flush, a "bolt-head" is naturally left at each cut.

Solder (145° or 70°) the platform and handrail to the post. On the SR, the platform is typically 35mm below the arm bearing centre line, and the tag on the handrail should be removed. For LNER/BR(E) tubular post signals, this distance is 42mm, and for the LNER/BR(NE) version it is 24.5mm. Bend in the two tags on the platform so they grip the post, then solder the handrail or its tag to the rear of the post and the platform tags to the post sides. The nearest platform tread should not be soldered to the post, otherwise the platform will not be level. Note that on an LNER/BR(E) signal, the handrail/post joint is very near that between the lamp bracket and post, so you may need to clamp the latter to prevent it unsoldering. Also, on an LNER/BR(NE) signal, the handrail does come above the arm bearing - you haven't made a mistake!

For signals without platforms, remove the end rung from the ladder, then bend the side stiles over at around 105° just above the new top rung, with the half-etched side on the outside of the bend. For signals with platforms, cut the side stiles from the top end of the latter, thus leaving a rung as the topmost edge. Cut the ladder to length, so its bottom end fits on the baseplate or ground at the correct slope, and its top end fits around the mounting block, post, or against the rear of the platform. The distance of the ladder foot from the rear face of the post for tubular post signals is given in the fourth column of the table above - add 16mm for signals with platforms. Solder (145° or 70°) the ladder top and bottom; any top bend should be positioned 7mm from the rear of the post.

Add pairs of ladder bracing struts (17). Solder them to the ladder and post, joggling them to account for any 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.

For signals without platforms, form the safety hoop from strip (14). Wrap it round a 15/32" or 12mm drill; the natural spring of the brass will open it to the correct 14mm diameter. Bend the end tags to the ladder width and solder them to the outside of the ladder stiles, usually 7mm below the arm bearing. Remove any excess tag or strut length and tidy up.

### The Lamp and Finial/Post Cap:

Use 70° solder or glue for this section.

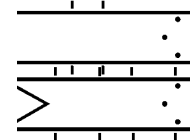
Remove any casting sprue and mould lines from the lamp and finial or post cap. Fix the lamp to the bracket, so that in side view, the lamp body is in line with the post, and from the front, the lamp lens falls behind the left-hand arm spectacle. Finally, add the finial or cap to the post top.

### 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):** – post to just above and including the balance weight assembly; ladder above the level of black on the post and any bracing struts above this, but not the mounting block; platform or safety hoop; lamp, but not the lamp bracket; arm bearing; a band on the post 4mm deep above and below the track circuit plate; 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. If the primer has filled your scribed guide lines, here is a full-size template for marking out again:



**Silver:** lamp lenses front and rear.

Glaze the spectacles; use red (home) or yellow (distant) in the left-hand aperture, and blue-green in the right-hand one. The easiest method is to cut a rectangle approximately to size so the whole of the aperture is covered, fix it in place using MSE's GSA adhesive or

gloss varnish, and then trim the edges when set. 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 (18) to no.61 (1.0mm). Place an oiled paper washer over the spindle end, with its reinforcing rib to the rear. 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. If the blade is too high to cover the lens, cut off the right-hand half and solder (188°) it to the bottom of the left-hand half, thus increasing the depth. Once correctly in position, solder (145°) the back blinder to the spindle. Wash off any surplus flux, then prime and paint black or light grey as detailed above.

### The Operating Wire:

Make a small hook in the top of a 0.45mm brass wire. Measure the distance between the arm hole (arm horizontal) and the inner balance lever hole (lever around 30° below the horizontal). With the short end of the hook facing you, bend the bottom of the wire 90° to the right at the measured distance. Put the hook in the arm hole so the wire is to the rear, and then the bottom bend through the balance lever hole from the left-hand side, forming a hook to retain it. The wire can pass in front of or behind the track circuit plate - both are found on the prototype. 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.

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