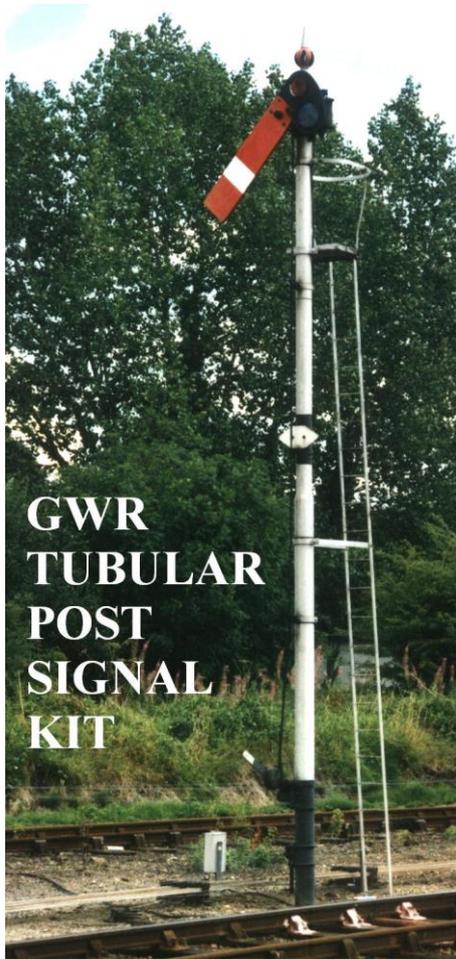




MODEL SIGNAL ENGINEERING

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SCALE	CODE
7 mm	S7/KW2



**GWR
TUBULAR
POST
SIGNAL
KIT**

Complete kit to build a working (un-motorised) home, distant or goods line signal up to 26ft tall. Some marking out, cutting and shaping of parts is required.

This design of signal dates from around 1930 as a replacement for the extant wooden arm on a square wooden post style. It was used for new installations and renewals until the end of the GWR period, and by the Western Region of British Rail(ways). Many examples are still in use today, and new ones are still being installed where replacement by colour lights is inappropriate.

Parts supplied:

- S015/1 arm etc fret
- S09/5 ladder fret
- SC018 finial casting
- SC023 lamp casting
- 2 off SC041/1 weight castings
- 9" x 1/8" brass tube (post)
- 100mm x 5/32" brass tube (butt)
- 30mm x 2.0mm brass tube (arm bearing)
- 30 x 1.0mm brass rod (arm spindle)
- 50mm x 22swg nickel silver wire (axles)
- 200mm and 4 off 50mm x 0.45mm brass wire (operating rod, arm corrugations, handrail stanchions)
- Red, yellow and blue-green glazing
- Baseplate

ASSEMBLY INSTRUCTIONS

General:

The test kit was built using 50W normal and 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 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, and these should be easy to find, as this type of signal was very common.

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. The part numbers in brackets () are those etched on the fret.

The Signal Arm:

Use 188° solder for this section.

As supplied, the arm blades represent the later style with a turned edge for reinforcement. If you wish to model the earlier corrugated style, solder lengths of 0.45mm brass wire to the top and bottom of the front face.

Open out the centre holes in your chosen 4ft home (1), 4ft distant (2) or 3ft goods (3) blade and in the spectacle plate (4) to 1.00mm (no.61). The hole near the edge of the arm and its counterpart in the spectacle plate should already be etched to be a loose fit on the 0.45mm brass wire. For a 4ft arm, the top spectacle needs broaching out to the edge of the full-relief frame. The etched diameter is correct as supplied for a 3ft arm.

Solder the blade on top of the spectacle plate, using stainless steel needles (or anything else that won't take solder) to align the holes. For a goods line arm, solder the ring (20) to the front face of the blade, about 1.75mm in from the left-hand end.

Solder the arm assembly to the 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 one end, or it will tilt. Remove the excess front spindle and file it almost flush with the motion plate. Leave the excess rear material for now as a painting handle.

The Post:

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 below. 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 4mm and 8mm at the top and bottom of the post respectively. 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 16ft high, and that posts above 18ft were fitted with a lampman's platform.

Height (ft/ins)	Post cutting length (mm)	Post to ladder distance (mm)
16.0	124.0	20.5
17.0	131.0	21.0
18.0	138.0	22.5
19.0	145.0	27.5
20.0	152.0	28.0
21.0	159.0	29.0
22.0	166.0	30.0
23.0	173.0	31.0
24.0	180.0	31.5
25.0	187.0	32.5
26.0	194.0	33.5

Having chosen your post height, cut the 1/8" brass tube to the length shown in the second column of the table. Ensure that the ends are square. The butt on all GW tubular post signals was 12ft tall above the rail, regardless of post height. The 5/32" brass tube should therefore be cut to a length of 91mm. However, if you are not mounting the signal on the baseplate, remember to add or subtract sufficient length (the same for both tubes) to suit your chosen fixing method.

Attach the 2mm bearing tube to the post at right angles 4mm 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 around 1mm beyond both the front and rear of the post (the post faces, not its centre line).

Solder the post tube inside the butt tube, with 1mm of the post projecting out of the bottom of the butt, then file the characteristic bevel to the butt top.

If using the baseplate, scribe a longitudinal centre line along it, then drill a 1/8" hole on the line around 20mm from one end. Solder (145°) the post/butt assembly to the baseplate through the hole, ensuring squareness in all three planes. It helps to fit the arm to the bearing temporarily, to ensure the bearing is parallel to the baseplate centre line.

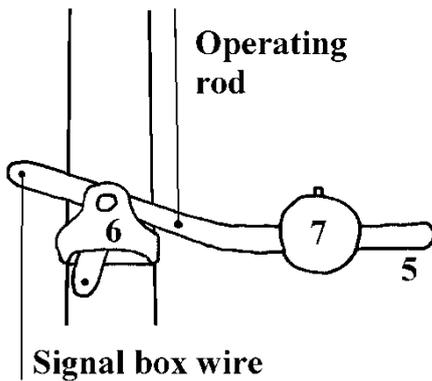
Use the minidrill and slitting disc to cut a groove in the baseplate to take the bottom end of the ladder. This should be perpendicular to the centre line, at the distance from the rear of

the post given in the third column of the table above.

The Balance Weight and Post Fittings:

[Note on balance lever design - the cranked arm on (5) is usually only found on offset bracket signals, but it provides a convenient method of providing arm motion stops on a straight post signal. If you are unhappy with this compromise, remove the cranked arm, and provide wire stops mounted on the post. The second balance lever (5) and the wider-jawed bracket (8) are for other applications of the S015/1 fret.]

Use 188° solder for this section unless otherwise stated.



Open out the central hole in a balance lever (5) to 0.65mm (no.71). Do the same to the holes in a bracket (6). Open out the other holes in the balance lever to 0.50mm (no.76). Solder weights (7) to either side of the lever to increase the thickness as desired. Fold up the bracket (6), with the half-etched lines on the **inside** of the bends. Tin the rear of (6) with 145° solder.

Solder one of the etched washers to the end of the 22swg nickel silver axle, having first opened out the washer hole to 0.65mm (no.71) and before removing the washer from the fret. Pass the axle through the holes in (6), trapping the balance lever in the gap so that with the open jaw upwards, the crank is pointing downwards through the slot, and the weight is to the right.

Drill a 0.65mm (no.71) hole right through the left and right hand sides of the post, 17.5mm above the bottom end (or higher if your prototype requires it, particularly if an operating wire crank is to be added; examples with the balance lever halfway up the post are known). Push the axle through the post from the left-hand side, and solder (145°) it in place at the right-hand side. Ensure the lever still moves freely - if not, remelt the joint, and push the wire out slightly. Run a bead of 145° solder along the top edge of (6) to secure it to the post. Trim the axle so it is flush with the post.

The signal box operating wire was usually taken away from the signal via a vertically mounted pulley wheel (9). Fold up the second bracket (6) as before, and again trap the wheel inside the bracket using a nickel silver wire axle with a washer soldered to each end. Trim the axle ends and solder the bracket base to the

baseplate, in line with the hole on the short arm of the balance lever, and pointing in the direction from which the operating wire would have approached the signal (this may be parallel or perpendicular to the track).

However, some signals had a crank arrangement. If you wish to model this, attach one of the cranks (10) inside the second bracket (6), in the same manner as described for the wheel, with the open jaw pointing downwards, and the crank pointing down like an inverted "V". Consider from which direction the signal box operating wire would have approached the signal. Drill 0.65mm (no.71) in the appropriate direction through the post faces, at a height such that the lowest crank hole is just above the baseplate/ground level. Solder the axle and bracket in place, as described above for the balance lever.

Fold lamp bracket (11), with the half-etched lines on the inside. Solder support (12) into the half-etched lines so the narrowest part falls underneath the circle. Tin the back and top of the bracket with 145° solder. Solder (145°) the bracket to the right-hand side of the post, so its top surface is 3.5mm below the arm bearing centre line. Temporarily fit the arm and offer up the lamp to ensure the lens falls centrally behind the spectacles; adjust the bracket's position if required.

If needed (never on distant signals), solder (145°) the track circuit plate (13) to the post. Centre it 10.5mm (18") above the post/butt joint, or around 26mm below the arm bearing centre line on short posts.

The Platform and Ladder

Use 145° solder for this section unless otherwise stated.

Post height 18ft or less:

Remove the end rung from the ladder S09/5. 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. Cut the ladder to length, so its bottom end fits in the baseplate groove or can be soldered to fixing wires, and its top end fits around the post, 10.5mm below the arm bearing centre line. Solder the ladder top and bottom; the top bend should be positioned 5mm from the rear of the post.

Form the safety hoop from strip (14). Wrap it round a 1/2" or 12.5mm drill; the natural spring of the brass will open it to the correct 13mm diameter. Bend the end tags to the ladder width and solder them to the outside of the ladder stiles, just below the top rung. Cut a length of side stile from the redundant portion of the ladder to form a lampman's handhold. Very carefully solder (or glue) this to the right-hand ladder/hoop joint, sloping it so it is in line with the ladder, rather than vertical. Trim the top so it projects 7mm above the top rung.

Post height above 18ft:

Position platform (15) to the rear of the post, 26mm below the arm bearing centre line, and with the half-etched lines uppermost. Ensure that the back edge is touching the post,

splaying the tags in or out slightly to give a tight fit. Solder it in place.

Warning: the etched handrail (16) is rather delicate. Make sure the holes clear the 0.45mm brass wire before removing it from the fret. Once removed, do not attempt to remove the remains of the fret tags until the handrail is strengthened by being fixed to the post.

Fold down the handrail tag so the half-etched line is on the **inside** of the bend. Solder the tag to the post with it pointing downwards, so the handrail is 9mm below the arm bearing centre line and when seen from above, the handrail's "square" corner is on the right-hand side of the post. Err on the side of having the handrail slightly too low, rather than too high, otherwise you will have difficulties fitting the back-blinder.

Solder two 0.45mm brass wire supporting stanchions between the handrail holes and the notches in the platform corners. Remove any excess wire with side cutters. As these will not cut exactly flush, a "bolt-head" is naturally left at each cut.

Cut the side stiles from one end of the ladder, thus leaving a rung as the topmost edge. Cut the ladder to length, so its bottom end fits in the baseplate groove or can be soldered to fixing wires, and its top end rests against the rear edge of the platform. Solder the ladder top and bottom, with the half-etched side to the rear.

All post heights:

Add a pair of ladder bracing struts (17), approximately halfway up the post. Solder them to the ladder and post. The ladder end joints should be on the outside of the stiles, and never exactly level with a rung. Bend them around the front of the post to give the appearance of a single continuous strip. Remove any excess strut length and tidy up.

The Lamp and Finial:

Use 70° solder or glue for this section.

Remove any casting sprue and mould lines from the lamp and finial, but leave a fixing peg on the finial. Fix the lamp centrally on the circular portion of the bracket, with the slightly larger lens facing forwards. Fix the finial into the top of the post, checking it is vertical in both front and side views.

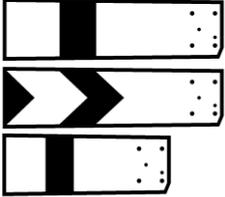
Painting:

When first introduced, the general post colour was white. In Western Region days, this changed to an aluminium grey. Signals on lines then taken over by other Regions changed back to white – as always, check with photographs!

Degrease the post and arm assemblies by washing in warm water and leaving to dry. Spray overall with white or grey car primer as determined above (use white for the arm, regardless of post colour). Mask the ends of the bearing to avoid painting the inside of the tube. Detail paint as follows:

Black: post to just above and including the balance weight assembly (lever outboard of the weights is white); lamp and lamp bracket; arm bearing; vertical sides of the finial base; a band on the post 3.5mm deep above and below the track circuit plate; track circuit plate bolt-heads; arm spectacle plate; arm rear band/chevron; front chevron on a distant arm.

Full-size arm painting templates:



Red (home) or Yellow (distant): front and edges of the arm except the home's white band or distant's black chevron; finial ball.

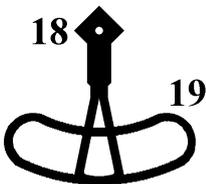
For an arm fitted with a goods line ring, the white stripe on the front is omitted, and the front, rear and edges of the ring are white.

Silver: lamp lenses front and rear.

Glaze the spectacles; use red (home) or yellow (distant) in the top aperture, and blue-green in the bottom one. The easiest method is to cut a piece of glazing 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:

Place the arm spindle into its bearing and ensure it moves freely – clean off any paint that might have crept in. Open out the hole in back-blinder spindle (18) to 1.00mm (no.61). Solder (188°) the spindle to the plain face of back-blinder (19) so the arc on (18) is at the outer edge of (19), and (19) is symmetrical about the axis of (18):



Place the back-blinder assembly onto the arm spindle, up against the rear face of the arm bearing. Unfortunately, this is where any constructional inaccuracies will become apparent, as the back-blinder arc is very close to the platform handrail. If it will not swing freely, unsolder (19) from (18), and push it towards the pivot hole, thus decreasing the radius of swing. File off any part of (18) that now projects outside (19). You may now find that the back-blinder no longer covers the lamp's rear lens when it is rotated. Again, adjust the position of (19) on (18) until it does so, and still swings freely, perhaps removing some material from the bottom edge of (19).

Remove the back-blinder from the spindle and place an oiled paper washer over the spindle end. Replace the back-blinder and solder (145°) it to the spindle, adjusting its position so it just clears the lamp rear lens when the arm is horizontal, and pushing it sufficiently far on to the spindle to remove any fore and aft spindle motion. Remove the excess spindle length with the slitting disc. Wash off any surplus flux, then prime and paint black.

The Operating Rod:

Blacken the 0.45mm operating rod, by either priming and painting black, using a permanent marker pen, or (preferably) a proprietary metal blackening solution. Make a small hook in the top of the rod. Put the hook in the bottom arm hole from the rear of arm. With the arm horizontal, and the balance lever at the bottom of its travel, cut off the surplus rod around 5mm below the balance lever rod hole. Form a 90° bend to the left in the rod at the correct distance, and pass it through the balance lever hole from the right-hand side, forming a hook to retain it. Note that the rod usually passes in front of the track circuit plate, if fitted. Move the balance lever through its travel, and check for adequate motion of the arm. You may find that the rod flexes, rather than moving the arm. To prevent this, thread a couple of the etched brass washers onto the rod to act as guides, and carefully solder them into horizontal channels filed into the post. Make good the paint finish afterwards.

You may find that the weight of the balance lever is insufficient to keep the signal arm on. If so, add one or both of the SC041/1 cast weights to the lever.

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

With thanks to the Kidderminster Railway Museum, the Severn Valley Railway and Network Rail for allowing me to measure and photograph the real thing.

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