

# SM2 7-LEVER SIGNAL FRAME KIT

## Parts checklist

- Etched brass fret (1)
- Cast brass lever (7)
- Lever spring (8)
- Top-hat brass bushes (2)
- 1/8" brass rod (4") - axle
- 1/16" brass rod (4" & 9") - catch handle pins and U-bolts
- 1.2mm brass rod (2 x 10") - catch rods
- 1.5mm square brass rod (2 x 10") - catch strips

## BACKGROUND NOTES

Thank you for choosing the MSE SM2 7-lever frame. This kit has been introduced to meet modellers' requirements for a smaller frame than the SM1 14-lever kit already in the MSE range. Provision has been made for the frame to be a unit of 7 levers in a larger frame, either during building or at a later date. You can either use a spacer and 6BA screw and nut on the end plates, or omit the next end plate of a subsequent kit and piggyback the frame plate onto the existing one.

The catch handles are now supplied as two ply, for additional strength in use. An optional improvement is to fit the catch handles to the levers with 10BA screws and nuts, with a washer each side of the lever. It is easier to obtain a fine adjustment this way, to prevent slop on the catch handle. These parts are included in the upgrade kit SM2/1.

A new design of catch block and "U" bolt has been introduced to help in making a better job of this item. 3/64" square brass rod has been provided for the catch strips as this has been found to be more positive than the etched version in SM1.

## ASSEMBLY SEQUENCE

This kit is designed for soldered construction, with a 40W iron being quite sufficient. It is suggested that 145° solder is used as a minimum melting point together with Fry's Powerflow Flux. Wash off after each session of work otherwise you will build up verdigris on the job. This is not harmful but will ruin your subsequent paint job if ignored. For some stages, a Resistance Soldering Unit will be easier to use if you have access to one.

Having prepared all the parts, the assembly sequence is to make up the basic frame first, insert the levers and axle and then assemble and fit all the catch handle components.

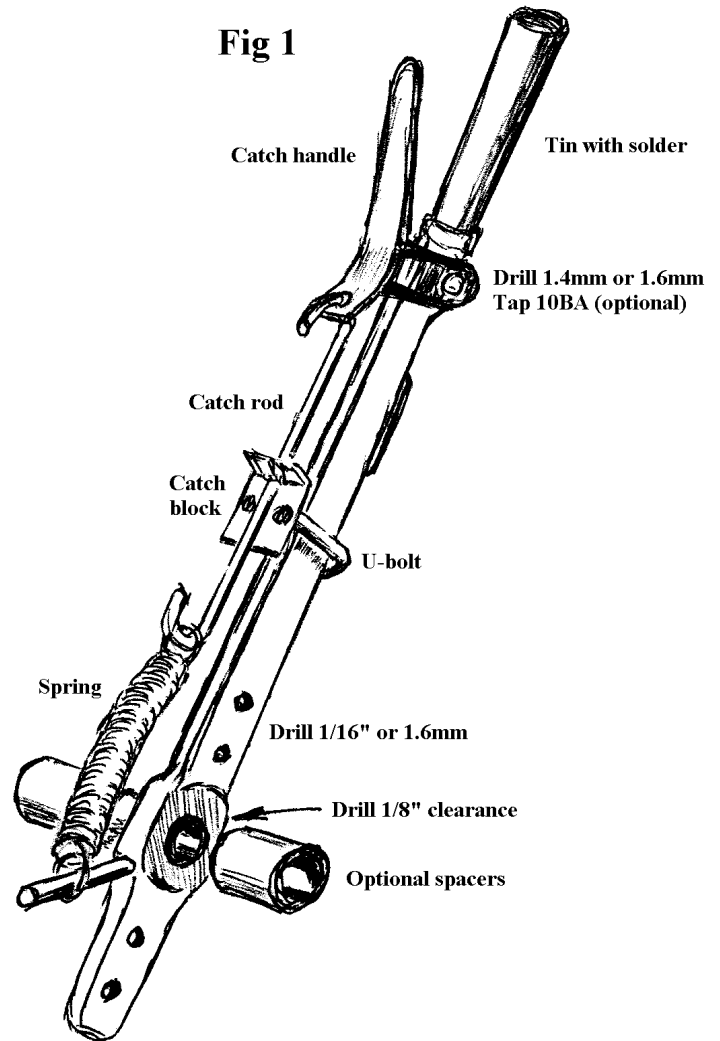
For simplicity, the "front" of the frame is that which has the lettering on the front plate. However, levers in this position are referred to as "reversed". The "back" of the frame is that which

has the catch handles facing what would be the signal box window. Levers in this position are referred to as "normal".

## 1. PREPARATION OF PARTS

### Levers

Smooth off any casting marks and straighten each lever if slightly bent. Finish off the 1/8" clearance hole at the lever boss, to suit the 1/8" axle supplied (Fig 1). The remaining holes in the bottom of the lever can be opened out to 1.6mm as can the top hole for the catch handle. If you intend to screw the catch handles, tap for 10BA. The drill size for 10BA is 1.4mm but a 1.6mm or 1/16" drill will still give you enough thread to secure the screw with a locking nut on the outside. Now tin the tops of the handles so that you get a polished steel effect.



Using tubular spacers to space the levers on the axle prevents them flopping sideways and is worth the extra effort. Use 1/8" bore tubing (not supplied) and cut one to go between each pair of levers, 6mm long. Two others for the ends (or 1/8" washers) are also required, but you will need to measure these at final assembly. Alternatively, purchase the SM2/1 upgrade pack, which also contains screws and nuts for fixing the catch handles.

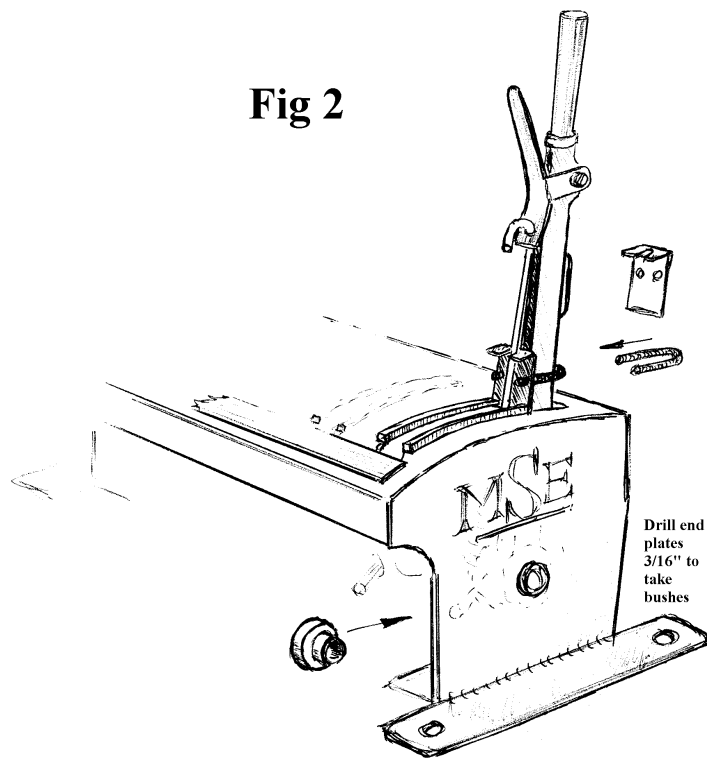
### Frame

Before cutting the etched fret, burnish both sides with a fibreglass brush. All the components can now be removed with tinsnips, working in from the outside of the fret. Make sure that you keep the marked edging strip (to the right of the lever plate): you will need this later for masking the holes in the lever plate.

Fold up the end plates with the MSE logo on the outside (the half-

etched lines go on the **outside** of the bends). Note that the end plates are handed, with the vertical edges matching the front and back plates of the slotted lever plate. Sweat the two thicknesses of brass together. Working from the inside face of the end plates, bore out the axle rod holes to 3/16" to accept the top-hat bushes. Solder the bushes into the end plates, with the rim of the bush on the inside, i.e. the side without logo (Fig 2).

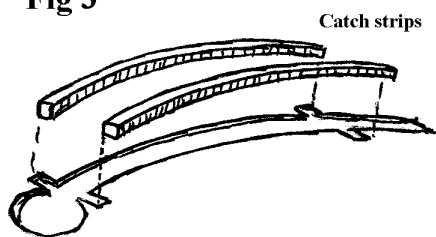
**Fig 2**



With the *Model Signal Engineering* inscription on the outside/face down, roll the slotted lever plate, using bending rollers if you have access to them. If no rollers are handy, use a thick tea towel on a hard surface with a rolling pin or a broom handle to do the forming. Don't roll the front or back plate portions of this etch. Fold the front and back plates to the profile of the ends, such that the half-etched lines are on the outside of the bends, and all of the half-etch ends up on the outside portions of the plate. Tin the underside edges and the inside of the folds.

Roll the two lengths of 1.5mm square brass rod to the same radius as the top plate of the frame. Ensure that the square section does not skew during this process - rolling them together side-by-side helps. Tin the whole length of the inside of the curve and cut into lengths which cover the two small slots each side of the lever slots (Fig 3). These form the material, which prevents the lever going back to normal when pulled "off" unless the catch handle is released against the spring.

**Fig 3**

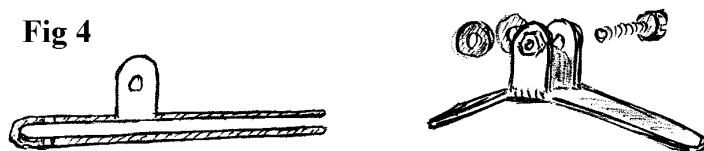


**Catch handles, catch blocks & catch rods**

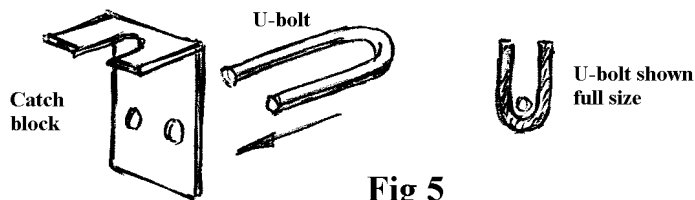
Tin the catch handles on all surfaces; this is not just for making joints, but also provides a polished steel effect to the handles. Fold them to double thickness with the half-etched line on the outside of the bend, then sweat together, making sure that the hole is clear. Now fold up the side lugs of the catch handle with the lugs pointing away from the double thickness, and then curve the

handle to shape, as shown in Fig 4.

**Fig 4**

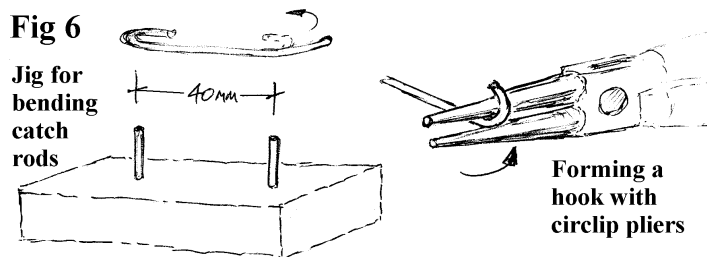


Fold the catch blocks so the half-etched line is on the inside of the bend (Fig 5). On this inside face, tin the holes and slot, and also reinforce the fold with solder. Prepare "U-bolts" from the 1/16" brass rod, to the profile of the drawing.



Similarly, prepare seven catch rods, one for each lever. These connect the catch handles to the catch blocks, allowing the lever to be released. Take a 65mm length of 1.2mm brass rod and form a 10mm long parallel hook on one end (Fig 6). Set two 1" round nails 40mm apart in a block of wood and with the hook around one nail, form a similar hook on the other end (this will be around 6-7mm long). Finally, trim the longer hook to the same length as the shorter one.

**Fig 6**

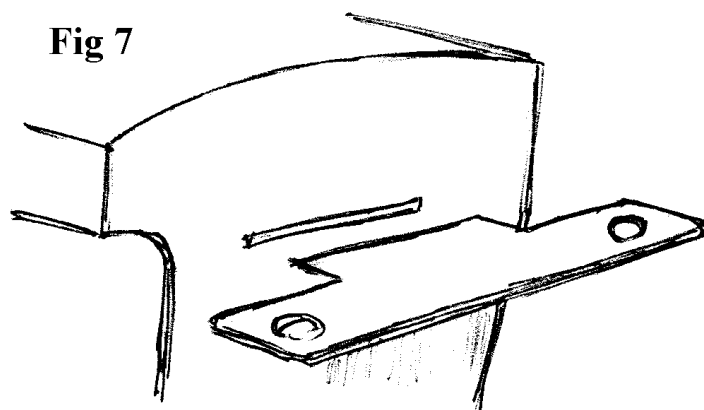


You should now have all the items ready for assembly.

**2. ASSEMBLY**

If the frame is to be recessed into the layout baseboard, add the subsidiary mounting plates (the two flat plates with two holes). The tabs fit into the slots just below the logo on the end plates (Fig 7). Solder these in with a good fillet.

**Fig 7**



Detach the two similar plates from the bottom of the endplates, but retain the inner mounting flange at the bottom in case you need to surface mount the frame at a later date.

Tabs are provided to tack solder the frame together before making

the final joints. If you prefer, you can remove the tabs and make good butt joints instead. Solder the endplates to the underside of the lever plate, with the *MSE* logos facing outward (Fig 2). You may need to file just a little off the top tab to locate the arc onto the endplate. After tacking one, insert the 1/8" axle into the bearings to help align the other plate. When everything is square, run a good fillet of solder around all the joints, but only on the inside of the frame.

If you are building a multiple frame, unless simply bolting the frames together, you will need to piggy back each frame top onto an intermediate end at this stage. You also need to find a 1/8" axle slightly longer than the total frame length before proceeding.

The catch strips can now be soldered to the top of the lever frame plate (Fig 3). They are placed in pairs, each side of the lever slot, so that when a lever is reversed in the frame, the lever and the thickness of the catch block can be accommodated just at the end of the strip (Fig 2). The other end is not so critical because the lever is at rest, in the normal position. The strips must be flush with the outer edge of each slot. With a 1" flat file, which has a safe edge, rest the safe edge on the plating and initially true up the ends of the catch strips. Final truing is done when the levers are in position.

Invert the frame and drop all the levers into their slots. The levers' catch handle holes must be on the same side of the frame as the wording *Model Signal Engineering*. Run the 1/8" axle through the end plate bush and subsequently through each lever bush, spacing with tubular spacers as you go, if you are fitting these. Measure the two end spacer lengths, cut them to size, and add to the frame by retracting the axle from each end bearing in turn. Alternatively, 1/8" bore washers may be used. Having checked that everything is the right way around, secure the axle in the frame by soldering the washers provided on the fret to the outer ends of the axle. A more flexible arrangement is to use a couple of split pins or wire retainers through holes drilled in the outer ends of the axle, outboard of the bushes. A 0.45mm or #77 drill hole with 26SWG wire will be adequate. This provides for the possibility of later removal or modification of levers, should that become necessary. You may also wish to neatly trim the axle to a more exact length at this stage.

Catch handles are next to be fitted (Fig 1). Jiggle in the sides of the handle to match the lever width, leaving sufficient space for either a paper wrap or two 10BA brass washers (see next). There are two methods of attaching the handles: 1. Economy, using 1/16" rod in each hole, with the outer ends soldered to the outsides of each catch handle. You must wrap a scrap of paper around each lever before soldering to prevent the handle from being soldered to the lever. 2. De luxe, replacing the rod with 10BA cheese head screws, inserting a washer between each side of the lever and the catch handle, nutting up on the outside and soldering the nut to the catch handle (Fig 4). This latter method allows better adjustment of the fitting and assumes that you will have drilled and tapped the holes in the levers, as directed earlier. Either work quickly, or use a paper washer to ensure that only the nut is soldered! Trim the pins or screws to length.

Now insert the catch rods into the frame. The bottom end is attached to one loop of a spring, the other loop in turn being anchored to the long pin that protrudes at an angle from the boss of each lever. Taking each rod in turn pop the hooked end into the hole in the bottom of the catch handle, drop the other into the frame and connect a spring loop (Fig 1). Close all windows and doors for this, as you have only one spare spring! Loop the free end onto the spigot of the lever boss. Tin each rod just above the lever plate. You may need to trim the top end of the lower hooks to stop them hitting the bottom of the lever plate when the catch handle is operated.

Insert a catch block behind each rod, spaced away from the lever by a piece of paper. With the lever reversed and the catch block engaging the ends of the catch strips, solder the catch block to the rod (Fig 2). Note that the joint is made solely at the slot at the top of the catch block, and not along the length of the block. Put a U-bolt through the two holes and tack solder from one side, thus pulling the block close to and parallel with the lever. Trim the length of the catch strips so that the catch block "bottoms out" on the lever plate in both the normal and reversed positions. Once adjusted correctly, solder the U-bolt firmly in place. You should now have a working lever. Repeat the process for all of the levers. With the levers all restored to "normal" in the frame, solder the spare strip of etching along the round holes in the frame top so that the catch blocks fall behind the catch strip and the rods just touch the neat line of the strip you are fixing. This is visible on the edge of the frame in Fig 2.

Solder the correct number plate to each lever, on the fixing bracket below the catch handle. Frames are always numbered with lever 1 at the left-hand end, with levers to the left applying to trains approaching from the left. For a multiple frame, tin the number sides and solder on so the plain side is showing. The numbers will have to be painted on or made up from transfers.

### 3. FINISHING

Don't put the springs into water, as they will rust. Remove them from the frame (windows/doors/cat etc precautions) and immerse the frame in detergent water, as hot as possible. Scrub, rinse off and leave to dry. Lightly oil all the bearings. In order to retain the brightwork on the tops of the lever handles and the catch handles and also the number plates which need to show as polished brass eventually, paint them over with Humbrol Maskol, which can be sprayed over and peeled off afterwards.

Spray the whole frame with cellulose undercoat grey primer, or red oxide. When dry, paint the frame chassis in black matt or satin finish. The whole of the lever fitting above the top of the frame should be painted to suit its designated function. Distant signal levers are at the outer ends of the frame and are yellow. Sequentially, home and starting signals in order are next, in red. Points are black and locking levers are blue. Crossing gate levers are brown. Ground signals are red also. You can paint the lever below the frame similarly, if you wish. Finally, remove all masking, replace the springs, fill in the numbers with black paint, and polish the number plates, lever tops and catch handles.

### 4. FITTING

You should now be the proud owner of a very satisfying looking frame to operate your layout. The frame should be positioned at a point where it is convenient to operate and can be seen so as show off your endeavours. It has been found useful to mount the frame on a sub-base and take short drive rods to the edge of the base, which are afterwards connected to either a locking frame or direct to the baseboard linkage. Use rod and tubular bearing supports for the drive, with cranks and joints from the MSE range (SM8/SM9). Whatever connections are used, ensure that they are positive, by the use of set screws etc, so that there is no loss of motion. Electrical operation and interlocking can be achieved with microswitches activated by rods taken from the spare holes on the bottom of the levers.