



Australian Railway Kits

ABN: 27 416 246 418

Incorporating Main West Models

Manufacturers, Wholesalers and Retailers of Quality Australian Model Railways

PO Box 252 Warwick, Queensland, 4370 Australia

Phone/Fax: 617 4667 1351 Website: www.arkits.com Email: info@arkits.com

NSWGR AD60 NSWGR 4-8-4 + 4-8-4 Beyer Garratt Locomotive

E16B Manufactured Exclusively for AR Kits by DJH Engineering from Patterns owned by AR Kits & DJH

PLEASE READ INSTRUCTIONS THOROUGHLY BEFORE COMMENCING ASSEMBLY

CONSTRUCTION

It is important to ensure that all parts are clean, free of "flash" (excess metal on castings) and fit properly. The "flash line" is easily removed from most areas by scraping gently with a sharp hobby knife - a round blade is more effective than a straight pointed type. Pull the blade along the "flash line" - several light strokes are better than a single one. Some areas are better cleaned up with 6" jewellers' files. Take care not to flatten round parts by filing too heavily. All locating holes for detail fittings should be pre-drilled to the size specified in the instructions. Sometimes it is necessary to clean out these holes with a "rat tail" file; take care not to snap off the tip of the file. Gently wash the castings in warm soapy water to remove mould release residue.

Etched brass items are best removed from the fret by placing the fret on a scrap piece of timber (e.g. Pyneboard) and cutting the tabs with a large Stanley knife - cut the tab at the point furthest away from the part, then trim the tab off close to the part with a small pair of quality side cutters. Hold small etched parts with a pair of flat nosed (not serrated jaws) pliers while cleaning up with jewellers' files. Be careful not to distort the etchings; they are difficult to straighten if bent or twisted. Drill all required holes before assembly, noting the sizes shown on the drawing, because some holes will be difficult to drill after parts are assembled.

A history of the AD60 locomotives is of course beyond the scope of these instructions, but they have been well covered in a number of publications. Suggested reading includes *Locomotives of Australia* by Leon Oberg, *A Compendium of NSW Steam Locomotives* by Alex Grunbach, and *Beyer, Peacock, Locomotive Builders to the World* by R.L.Hills and D. Patrick. It is important to ensure that all parts are clean, free of "flash" (excess metal on castings) and fit properly. The "flash line" is easily removed from most areas by scraping gently with a sharp hobby knife - a round blade is more effective than a straight pointed type. Pull the blade along the "flash line" - several light strokes are better than a single one. Some areas are better cleaned up with 6" jewellers' files. Take care not to flatten round parts by filing too heavily. All locating holes for detail fittings should be pre-drilled to the size specified in the instructions. Sometimes it is necessary to clean out these holes with a "rat tail" file; take care not to snap off the tip of the file. Gently wash the castings in warm soapy water to remove mould release residue.

Etched brass items are best removed from the fret by placing the fret on a scrap piece of timber (e.g. Pyneboard) and cutting the tabs with a large Stanley knife - cut the tab at the point furthest away from the part, then trim the tab off close to the part with a small pair of quality side cutters. Hold small etched parts with a pair of flat nosed (not serrated jaws) pliers while cleaning up with jewellers' files. Be careful not to distort the etchings; they are difficult to straighten if bent or twisted. Drill all required holes before assembly, noting the sizes shown on the drawing, because some holes will be difficult to drill after parts are assembled.

Modellers are advised to check photographs of the particular locomotive they have chosen to model, also keeping in mind the era they are modelling. For assistance in general detailing, modellers are referred to the Data Sheet's plan, and the many photos which appear in Australian railway books and journals.

These kits are designed to give many years of operating pleasure. A little extra time taken during construction will ensure that your kit will do this. It cannot be emphasised too strongly that the basis of a smooth operating model is care taken with the construction of the chassis and valve gear, i.e. you must double check every step. Check that the axles turn freely in their bearings, check again with the side rods on, then again with the connecting rods on, etc, etc.

Assembly methods

The two main construction methods are:

(a) Low melt solder - Low melt solder is an excellent medium for use with white metal kits. It is quick and easy providing a stronger joint than can be achieved with glue. It has the added advantage of easily repairing minor casting flaws, and because

of the relatively low temperature, many parts can be held in the fingers while soldering. Brass to white metal joints can also be made by "tinning" the brass first with normal solder. Low melt soldering requires correct type of soldering iron (e.g. Dick Smith T2200). These irons have temperature control, as low melt solder only requires between 70 to 138 degrees centigrade depending on what you are soldering. You must use special low melting point solder, such as that available from AR Kits

IT IS ADVISABLE NOT TO ATTEMPT TO SOLDER ANY CASTINGS WITH A STANDARD SOLDERING IRON

(b) Glue - Superglue and Plastibond are two types of glues suitable for use with this kit. Some modellers prefer to superglue major joints first then "fillet" the joint with Plastibond. Small detail parts are best glued with Superglue. Glue is not recommended for those parts needing good electrical contact, such as the tender bogies.

It does not matter which method you choose but dry fitting parts will ensure a good fit.

The electrical system used on these kits is called "half live", that is, the non-insulated wheels collect one polarity which passes to the motor via the chassis, while the insulated wheels pick up the other polarity which is passed to the motor via the small insulated pickups attached to the chassis. The insulated bogie wheels are "shorted out" with brass wire so that the respective polarity current is collected from them also. This method means that you can choose to power one or both driving units, and if you power both, they will be electrically independent, and will not short out through the centre unit. Drawing 12 shows the wiring used for this method. If powering one unit only, we recommend that you power the front unit, in which case the rear unit will not require the insulated pickups fitted to the chassis.

Cleaning up/Painting

On completion, any areas which were soldered should be washed using a soft brush and methylated spirits to remove all traces of flux; if this not done the paint will not adhere properly to these areas. An excellent pressure pack flux remover is available from Dick Smith stores. Then wash the complete model thoroughly in warm soapy water. Rinse with clean water and allow to dry thoroughly before applying a suitable self-etch primer.

Spare Parts

Spare parts are available on a replacement basis. Should any part be missing or damaged contact AR Kits for a replacement. Should you have any problems with the Mashima motor please do not attempt to repair it yourself. Return the motor to us. Mashima will not replace motors which have been tampered with. Also, please take particular care when fitting the worm gear to the motor shaft. Do not use force, and do not allow glue or Loctite to come into contact with the motor bearings.

Should you have any queries or problems with construction please drop us a note and we will do our best to advise. Likewise we would be pleased to hear any suggestions you may have for improving the kits or instructions.

General

Mechanical Jacks. Two pairs of mechanical jacks have been included for those modellers wishing to add this feature to their model. The fitting and use of jacks is covered in Ray Loves article appearing in the April 1992 issue of the AMRM.

The following drill sizes are required: 0.4mm, 0.5mm, 0.6mm, 0.7mm, 0.8mm, 1.0mm, 1.1mm, 1.2mm, 1.5mm, 1.6mm, 1.8mm, 2.0mm, 2.1mm, 3.7mm.

During construction refer to the drawings at all times. A number of parts are quite similar, so double check if in doubt. Note that attached to the instructions is a photocopy of the lost wax brass castings sprues with each part numbered for easy identification. In the general instructions, part numbers are shown in brackets. The large numbers shown on some drawings, for example the two "11"s on Drawing 6, indicate that the assembly links to another shown on Drawing 11. The instructions sometimes refer to the right hand (R/H) and left hand (L/H) side. This is taken as viewing the model from above and looking forward. To minimise the risk of losing parts, do not remove them from the etched fret or the plastic packing until you are ready to use them. We recommend that you start construction with the two chassis units (which are identical except for a couple of points as noted. Drawing 9 covers the construction of both chassis units.

Safety First

These models are not toys and are not suitable for young children. White metal castings contain lead and modellers are advised to wash their hands after working with unpainted white metal castings. When using superglue, solder or when spray painting, ensure your work area is well ventilated

Chassis Drawing 9 (Parts 157 - 193)

This section deals with the construction of both engine chassis. Take one L/H frame (157) and one R/H frame (158). Carefully clean out the axle holes with a 3.7mm. drill bit and push fit the axle bushes (159 X 8 per chassis) The bushes should be a firm fit in the frames - any loose bushes should be soldered in place.

Fit the turned brass chassis spacers (160 x 2) between the frames using the spacer screws (161 x 4). Before tightening the screws, fit the motor mounting plate (162), the pickup mounting plates (163 x 2) and rear chassis mounting plate (168). Check the drawing for correct positioning of the holes in the pickup mounting plates (the holes for the wipers are on the same side as the insulated driving wheels). Fit the pilot plate (164) between the frames and tighten the spacer screws. Temporarily fit axles and wheels to the front and rear axle holes and place the chassis on a section of level track to check that the chassis sits properly on the track. If necessary, loosen the spacer screws and adjust. Remove the wheels and axles and solder the chassis together. Looking from the front check that the pilot plate (164) is correctly lined up before soldering it in place.

Fit the driving wheels (172/177) (insulated wheels on the right for the front unit and on the left for the rear unit see drawing), axles (169x4) and axle washers (174 x 8) to the chassis with axle nuts (173 x 8) placing the axle gear (175) on the second axle as shown on the drawing. If necessary, clean out the hole in the axle gear with a 1/8" reamer or 1/8" drill bit. Move the gear to one side of the axle, place a small spot of superglue or Loctite 601 on the centre of the axle and push the gear into the centre of the axle. Make sure that the gear is "square" with the axle. Be careful not to get any glue or Loctite in the axle bushes. Make sure that all axles rotate freely in the axle bushes.

The wheels are quartered so that the crankpin on the right hand wheel leads that of the left hand wheel by 90 degrees when the rotates forward. Use a Romford axle nut driver to tighten the axle nuts. Remove the etched counterweights (180x2 and 181x6) from the fret and glue to the wheels as shown. Using a Romford axle nut driver fit the crankpins (178x8). Fit the coupling rods (183x2) - note: for easy removal of the coupling rods during testing, painting etc, strip a short length of insulation from some fine electrical wire and push this "tubing" onto the crankpins as a temporary retainer.

The crankpin washers (184 x 8) and axle covers (182 x 8) should not be fitted until the chassis has been completed and painted. Check that the rods revolve freely; should binding occur, locate where this is happening and gently ease out the offending hole in the coupling rod with a rat-tail file, removing the minimum amount to achieve free movement. Sometimes swapping the coupling rods around (i.e. left to right) can overcome binding.

Cut one M2 x 16mm CH screw (170) to a length of 15mm. and fit to the pilot plate with an M2 nut (171). Drill the buffer beam (185) as shown and fix under the pilot plate. Fold the steps (193x2) and solder in place the step treads (1g2x2), fix the steps in place. Fold the L/H guard iron (190) and the R/H guard iron (191) before fixing in place. Add the buffers (186 x 2) and the R/H and the L/H brake pipes (188/189). Drill and glue a length of 0.7mm wire either side of the buffer beam and trim to a length of 7.0mm. Cut four lamp irons (166) from the etch and fix in place, similarly two buckeye lift ring brackets (167). Fix the pilot front plate (165) between the frames, and add the lifting jacks (166A) if desired (they were removed in later service).

Chassis Drawing 10 (Parts 194-229)

Pickups. Note: each **powered** chassis is fitted with two pickup assemblies. Fit the two pickup assemblies to the chassis as follows. Fold the pickup (228 x 2) as shown and lightly "tin" the tab (for the pickup wire) with solder. Pass the plastic pins (227x2) through the pickup then add one plastic washer (229) before passing the pins through the pickup mounting plate (163) in the chassis and adding a second plastic washer. Hold the assemblies together and lightly touch the top of the plastic pins with a soldering iron to melt them over to secure the assembly. Bend the pickups so that they press lightly against the rear of the tyre on the insulated drivers and trim off any excess. Fix the sandbox bearing plate (197) to the rear of the chassis after drilling the "dimples" underneath for later fitting of the sand pipes (0.5mm wire). Add one bearing washer (204) and screw in the bearing pin. Note: the front unit is fitted with the long bearing pin (203) and the rear unit is fitted with the short bearing pin (203A). Fit one insulated bush (199) to the sandbox bearing plate (197) and fit one M2 x 16mm C/H screw (198) through. Under the sandbox bearing plate add one insulated washer (200) followed by one power clip (201) and one M2 nut (202). It is recommended that you "tin" tab of the power clip with solder before fitting.

Brake gear.

Remove the driving wheels from the chassis to enable fitting of the brake gear. Trim four pieces of 0.7mm wire to a length of 25mm, pass these through the holes in the top of the mainframes and solder in place. Clean out the holes (top and bottom) in the brake shoes (194 x 8) to accept 0.7mm wire before removing them from the fret.

Turn the chassis on its side and place the strip of timber supplied over the axle bushes and slip four brake shoes onto the 0.7mm wire - the timber ensures they are correct distance from the frame. Align the brake shoes vertically and solder in place. Cut another four 25mm lengths of 0.7mm wire and pass through the holes in the bottom of the brake shoes, at the same time adding the brake Roding (195) which sits against the outside of the frame on the same side as the non-insulated driving wheels for both front and rear units -see Drawing 12.

Solder the assembly into place and snip off the wire flush with the outside of the brake shoes, except for the rear top wire which is left 1.5mm proud so that the brake tanks (196x2) can be fitted to these (both sides). For the first and second top pieces of 0.7mm wire only, snip off almost flush with the inside of the frames to allow later fitting of the gearbox.

Cylinders.

Glue cylinder backs (209) to cylinder blocks (205) ensuring they are aligned vertically. Drill the piston hole in the cylinder back, drill the piston hole 1.2mm dia., and the slide bar locating hole above it 0.8mm dia. Fit the valve crosshead guides (210) and drill the centre 0.8mm dia to a depth of approx. 2.0mm. Glue in place the cylinder fronts (206), and valve fronts (207).

Turn the cylinder block upside down, drill out the three dimples to a depth of approx. 1.0mm and fit the drain cocks (208) - these are on small separate etch. Fit the completed cylinder assemblies to the mainframes.

Valve Gear

The following covers the valve gear assembly, probably the most complicated area of construction. Please study the drawings carefully, noting that by following the lines you will see how the different pieces inter-relate.

Valve Gear Hangers

Fold the motion bracket (212) and pivot plate (213) as shown in the drawing and fit the tab in the motion bracket through the slot in the pivot plate - fold the tab down and solder together. Fit the assembly to the chassis and solder in place.

Remove one pair of slide bars (211) from the valve gear fret - note that the slide bars are left and right handed - the "dimple" which allows the vertical section to fold down goes to the inside of the chassis. Take one crosshead assembly (215x2) (also left and right handed - the rivet heads go to the outside) and trim the crosshead rod to length as per the diagram. Check that the crosshead slides smoothly on the slide bar (the slide bar may need cleaning up with a small file). With the crosshead fitted to the slide bar, fold the vertical section of the slide bar over (outwards) and down, ie through 180 degrees.

Next, remove the connecting rods (216x1 pair) from the valve gear fret together with the connecting rod big ends (217x2). Lightly "tin" the rear of the connecting rods big ends with solder and solder to the connecting rods. Using a 14BA bolt (218) and nut (219), attach the connecting rod to the crosshead. Use solder or glue to retain the nut, then trim excess off bolt. Now fit this assembly to the chassis with the crosshead rod in the cylinder and the slide bar spigot in the locating hole above it. Use a pair of tweezers to hold the slide bar against the outside edge of the motion bracket, check that the slidebars are parallel to the frame, and spot solder the slidebars to the bracket.

Locate the spigot in the crosshead assembly into the top of the cylinder and secure the other end of the crosshead assembly (215) to the motion bracket (212) with a short length of 0.7mm wire - do not fix the wire in place yet. Take one expansion link assembly (221x2) (they are left and right handed - rivet heads to the outside), place the small end over the crankpin in the third driving axle, and attach the "half moon" shaped end to the crosshead assembly using a 14BA bolt (220) and nut (223) - this is shown in the enlarged diagram "A" towards the top right hand corner of Drawing 10.

Fit the motion bracket support plates (226x2) to the chassis - they slide down between the two upright sections of the mainframes (you may need to gently ease these brass sections apart slightly with a screwdriver) and secure in place with low-melt solder.

Secure the long section of the pivot plate (213) to the motion bracket support plate (226) before adding the lubricator (214x4). Trim one lubricator link A (222) and one lubricator link B from the valve gear etch. Attach the lubricator link A (222) to the motion bracket (212) using the same 14BA nut and bolt which holds the expansion link assembly (221) to the crosshead assembly (215). Drill the lubricator (214) 0.6mm as shown and fit lubricator link B (224) to it using 0.5mm wire. Connect lubricator link A (222) and lubricator link B (224) with 0.4mm wire as shown.

Note that the eccentric arm on the expansion link assembly (221) (i.e. the arm which locates over the crankpin on the third driver) should be positioned as shown in the inset drawing (bottom left hand corner of Drawing 10) when final assembly is done. Check that the valve gear operates smoothly and repeat for opposite side valve gear. When opposite side valve gear is complete, remove the short lengths of 0.7mm wire from each side crosshead assembly (215) and replace with a single long length which goes right across the chassis.

Chassis Drawing 11 (Parts 230-253)

Gearbox.

Remove the gearbox from the packet and read the instructions carefully. Test fit the worm gear on the motor shaft - if necessary ease out the hole with a 2.0mm drill or hand reamer so that the worm gear fits motor shaft without undue force. Fit one 2mm thrust bearing to the shaft of the motor (230) (with the shoulder of the thrust washer towards the gearbox) followed by the worm gear. Fix the worm gear onto the motor shaft using Loctite 601 or superglue being particularly careful not to get any into the thrust bearing or the motor bearing. Fit the motor to the motor bracket (231) using the motor mounting screw (232). Finish assembling the gearbox according to the instructions on the packet and locate it between the frames and onto the second axle (which has the gear fitted). Complete the assembly of the gearbox with the keeper plate (239). Lastly, fit the bearing washer (241) and shouldered screw (242).

Bogies.

One wheel on each axle of the bogie wheel sets (244) must be "shorted out" to enable electrical pickup. If you are only powering one unit there is no need to short the wheels on the non-powered unit. Close inspection of the bogie wheel sets will show that the insulation between the axle and the wheel has been pre-drilled on one wheel. Using a pair of pliers, firmly push a length of 1.0mm wire into this hole and trim off flush with the wheel. The inset drawing (bottom left-hand corner of Drawing 11) shows the location of the pinned wheels for front and rear units. Push fit the wheel inserts (245) into the bogie wheels and fit the wheel sets into the slots in the front bogie (249) and the rear bogie (243), then fit the keeper plates (246x4). Refer to Drawings 11 and 12 to ensure you have the "shorted" wheel sets correctly located.

For later reference, mark the underside of the bogies to show which side has the "shorted out" wheels. Trim the spring (251) as shown, add the bogie bearing washer (252) and fit the assembled front bogie to the chassis using the M2 bolt (170) previously positioned; retain using M2 nut (253). Remove one pair of bogie brakes (248) from the etched brass fret and fold the top and bottom tabs as shown (note they are right and left handed). Fit the bogie brakes to the bogie followed by the brake cylinders (247x2). Trim the spring (251) as shown, add the bogie bearing washer (252) and fit the assembled rear bogie to the chassis using the M2 bolt (198) previously positioned; retain the bogie using M2 nut (253).

Using the electrical wire supplied, connect one motor terminal to the power clip (201) under the sandbox bearing plate. Connect the other motor terminal to the power clip (240) AND the wipers on the insulated driving wheels. Drawing 11 shows the polarity differences for the front and rear units. Also shown on this drawing are the two M2 x 16mm C/H screws (250) used for later fitting of the body.

Front Unit Drawing 7. (Parts 132-147)

Take the water tank (132) and the front footplate (134) and drill all holes to the sizes shown. Test fit the water tank (132) onto the front footplate (134) and the rear footplate (135). When satisfied with the fit, apply superglue to the inside edge of the water tank and fit the front and rear footplates, making sure they are correctly aligned (the front plate protrudes from the front of the tank; the rear footplate is flush with the rear of the tank).

A close look at the anti vacuum valves (146) will show that the mounting spigot is slightly offset to one side to allow the valve to clear the tank. Fix the valves to the front footplate and trim off any excess spigot underneath. Note that the cutaway in the water tank side has a small "dimple" front and back (on the inside edge) to facilitate locating the 1.0mm brass rod (fitted to the left hand side only). Using a 1.0 mm drill bit, carefully enlarge the dimples. Cut a piece of 1.0mm brass rod to length and file a point on each end to make it a little easier to locate in the dimples before fixing in place. Fit the sandboxes (133x2) from inside the water tank. Remove the front fillets (136 x 2) from the etched brass fret and fix in place. Fix in place the conduit junctions (137 x 6), (some modellers find it easier to drill the junctions 0.5mm and slip them on the wire), the marker lights (138 x 2), and the headlight (139). Note that the front and rear headlights appear similar but the rear headlight has a small lug at the back for fixing into the brass etch.

Fix one medium handrail knob (141 x 14) into the front hole on the left hand side of the water tank. Pass a length of 0.4mm wire through this handrail knob, thread a further six handrail knobs onto the wire and glue them into their holes. Use a dab of superglue to retain the wire in the handrail knobs before trimming off excess wire. Repeat this process' on the right hand side of the water tank (Drawing 8 refers). Also on the right hand side of the tank, fix in place the conduit holders (short handrail knobs) (140 x 6) (Drawing 8 refers). Also fix in place the footplate sound pipe brackets (after checking that 1.0mm wire will pass through them). Now fix in place the lift hooks (144x4) noting that they "face" the centre of the unit - check drawing. Note: You can improve the look of the lift hooks by drilling them through with a 0.8mm drill bit. Fit the water hatch (145) (the thinner of the two water hatches) with the hinges to the front of the tank, and fix in place the water hatch stop plate (143).

Using 0.4mm wire, shape and fix in place the small grab handle behind the water hatch. Remove the air vents (142 x 2) from sprue of lost wax castings being careful to leave the bottom of the pipe as long as possible. Fit to the holes as shown and low-melt solder from inside the tank. (You may need to slightly countersink the underside of the holes to achieve a good fix).

Front Unit Drawing 8. (Parts 148-156)

Drill all holes as shown on the drawing. Remove the tank deck (154) and fall plate (155) from the etched brass fret and fold the tabs (hinges) downwards 90 degrees. Locate the two parts together and pass a length of 0.5mm wire through the "hinges", fold down either end of the wire to retain it and trim off excess. Glue the tank deck into the recess of the water tank. Trim from the etch the step treads (149x2) (they have an "0" etched underneath) and fix in place. Fix in place the elbow (148), and junctions (153x2), joining these with 0.4mm wire as shown. Add the 0.4mm wire to the conduit holders (140) previously fitted. Trim the sound pipe holders (150x5 and 151x2) from the etch leaving the bottom tab as long as possible - form the 1.0mm wire as shown (leaving a little extra at the front) and slip the sound pipe holders over the wire. Fix the sound pipe assembly to the water tank, passing the pipes through the two footplate sound pipe brackets.

Test fit the unit onto a chassis to determine the bend in the pipes as shown in the insert drawing, bottom left hand corner of Drawing 8. After bending to shape, trim to length and fit the sound pipe funnels (152 x 2), noting the orientation shown in the insert drawing. On the underside of the two footplates add the support plates (156 x 4) after trimming the lugs to 0.8mm as shown - note these are similar to support plates 128 on the rear unit, check the different shape on the drawing. **Do not drill the dimples in the footplates any deeper.**

Rear Unit Drawing 4. (Parts 99-110)

Carefully clean up any remnants of holding tabs on the sides of the coal hopper sides and back (99). Fold lines are etched on the inside of the two corners - use these to assist folding the etched brass fret as shown in the drawing. Fold the two tabs in the cutaway (midway along the bottom of the side) inwards 90 degrees. Trim the hopper lifting links (100 x 2) from the etched brass fret, fold the tabs on the bottom over and fit into the slots in the coal hopper sides -solder in place.

Fit the etched brass items to the front footplate (101) and rear footplate (102). Note that, as with the water tank, the front footplate protrudes slightly from the body while the rear footplate is flush with the bottom edge of the coal hopper side. Apply low melt solder from inside the coal hopper to secure in place. Fix the hopper front plate (103) to the rear footplate (102). Refer to Drawing 6 and note the detail fittings at the end of the unit (marker lights (119 x 2), headlight (123) conduit junction boxes (124 x 7), front fillets (125 x 2) and step treads (126 x 3) -it is recommended that these be fitted at this stage so that you can solder them from inside the hopper.

Fit the rear support plate (104) to the front footplate (101) making sure it rests on the footplate. Fix in place the front support plates (105 x 2) (they are left and right handed) so that the chamfer on the top of them will align with the slope of the deck plate (107). Refer again to Drawing 6 and note the conduit holders (129) along the bottom left hand side. It is recommended that these be soldered in place at this stage, except for the fourth one from the buffer end which must be left off until the deck plate has been fitted.

Fit in place the deck plate (107), making sure that it is level along the top of the hopper. Slide the hopper floor (106) into the hopper from the end - hold it in place and check its position by test fitting the hopper door plate (108). Now fix in place the hopper floor (106), followed by the hopper door plate (108). Fix in place the coal (110).

Rear Unit Drawing 5. (Parts 111-118)

Fix in place the hopper side support (111) and the coal bulkhead (111A). Note -the distance between the inside face of the hopper end and the coal bulkhead is 27.5mm. Fit the lifting brackets (112 x 2), the water hatch (113) (hinges closest to the coal bulkhead), the anti vacuum valves (114 x 2) and the sandbox filler (115). The medium handrail knobs (118 x 8) should be fixed in place from inside the hopper using either glue or low melt solder. Drill and fix in place the support plates (117 x 2) after trimming the spigots to 0.8mm. **Do not drill the holes in the footplate any deeper. Pass the elbow (116) through the support plate as shown and fix in place.**

Rear Unit Drawing 6. (Parts 119-131)

Fit the grab handle (0.7mm wire) as shown and trim to a height of 4.0mm - for a sturdier fit, trim the 0.7mm wire long enough to sit on the footplate. Fit the anti vacuum valves (120 x 2), filler vent (120A) and the toolbox (121) followed by the air vents (122 x 2). Note that parts 120A, 121 and 122 x 2 can be low melt soldered in place from inside the hopper, working from underneath. Fix the medium handrail knobs (131x 8) in place from inside the hopper using either superglue or low melt solder. Following on from the note in the instructions for Drawing 6 fix in place the remaining conduit holder and pass the 0.4mm wire through them. Fix the 1.0mm wire into the cutout in the hopper side (only fitted to the side shown). Fix in place the sandbox filler (130). Trim the spigots on the support plates (128) to 0.8mm and fix in place. Fix in place the footplate platform (127). Fix in place any end detail not fitted as advised in Drawing 4 instructions. Fit conduit as shown in inset drawing on bottom left hand side of Drawing 6 the conduit continues up and along the rear deck to butt against rear coal bulkhead.

Centre Unit Drawing 1. (Parts 1-63)

Remove the pair of mainframes (2) from the etched brass fret together with the pair of footplates (3). Solder the firebox support plates (61 x 2) to the main frames as shown in the drawing. Locate the tabs in the footplate into the slots in the mainframe noting that these parts are left and right handed with matching tabs and slots. Solder the footplates to the frames from the inside keeping the solder on the bottom of the tabs so as not to interfere with the later fitting of the main footplate (1). Next fit the main footplate casting (1) to the two frame assemblies using glue or low melt solder. Position the boiler (4) onto the footplate assembly, locating it over the two spigots towards the front - glue or low melt solder from inside the boiler.

Add the spectacle plate (5) and cab back (7), followed by the two cab sides (6). Fix the screw reverser (9) to the boiler back head (8) before fixing in place. Cab interior detail can now be completed with seats (10x2), ash pan lever block (11). Note that the mechanical stoker tunnel (12) should be fitted later after fitting the mechanical stoker (37) behind the cab.

Test fit the cab roof (13) but do not fix in place until the cab interior has been painted. (Note that on the AD60 the cab roof does not overhang the cab sides, but actually sits on top of them). Using superglue sparingly, fix in place the etched brass side window headings (14x2), front window headings (16 x 2) (**note: use the front window beadings on the separate etch, not those included on the main etch**), rear window headings (15 x 2), and cab doors (25 x 2), followed by door steps (26 x 2).

Remove the pump plate (50) from the fret and fold as per the drawing before fixing to the smoke box. Now add the boiler fittings: steam turret (17), safety valves (18 x 3), dome (19) and chimney (20). Fit the smoke box door (21), add the saddle front plates (22 x 2). Fit the front footplate (23).

Continue detailing the boiler, adding the whistle (39), continuous blow down valve (40), valve (41), clack valves (42 x 2), superheater access panel latches (43 x 2), junction box (44), handrail elbow (45), pump air filter (46), smoke box door light (47), smoke box door handle (48), smoke box steam pipe (49) and pump (52). Add the 0.5mm wire to the pump as shown together with the governor (51). Behind the cab, add the rear footplate (24), mechanical stoker engine (36) and mechanical stoker (37). Now fit the mechanical stoker tunnel (12) inside the cab.

Commence detailing the underside of the centre unit, fixing the ash pan grills (59 x 2) to each side of the ash pan (27). Place the ash pan in position and note the three etched pipe brackets adjacent to it. You might find it easier to "tin" these with solder now (for later fitting of pipe work) before the ash pan is fixed in place. Check that the ash pan sits properly against the underside of the footplate - you may need to chamfer the top edges to clear any excess solder there. Drill the ash pan front and rear 2.0mm as shown and fix in place. Add the small air tank (54), large air tanks (56 x 2), front exhaust pipe (53) and rear exhaust pipe (60).

Take a rear step locating tread (29) - it has a "C" etched on the back - and fold up the edges of the tread. Pass the tab on the tread through the top slot in one rear step (28) and then through the slot in the mainframe. Fold the tab up against the back of the mainframe, check that the step is level and solder in place. Repeat the process for the other two treads, (30B) and (31A).

Follow the same sequence for the opposite side cab steps, and again for the front step (32, 33, 34 and 35) -it is recommended that the four sets of steps be reinforced using a spare strip of brass from the etched brass fret. Add the junction boxes (55 x 2) at either end of the mainframe, and add the junctions (57 x 3), and junction box "A" (58). Add the steam delivery pipe (62) and junction box "B" (63). Add the steam generator (38), and fold down the tab on the mainframe beside the steam generator. Note - when first delivered the AD60s were fitted with two generators, one of which was later removed. However, the mounting bracket was left in place.

Centre Unit Drawing 2. (Parts 64-86)

Add the ash pan levers (76x2) to either side of the firebox. Fit the builder's plate (67) to the left-hand mainframe, followed by the rear L/H steam delivery pipe (77) and the front L/H steam delivery pipe (78). Using short handrail knob (83), handle (82) and a length of 0.5mm wire, make up the assembly as shown and fix in place. Bend a length of 0.7mm wire as shown and fit to the mainframe above the footplate before fixing in place the steam reverser (80). Fix in place the smoke box regulator fitting (74), the boiler regulator fitting (75), the reversing rod pulley (79), pipe fitting (81) (which mounts on the pipe work) and the L/H smoke box fitting (84). At each end of the footplate (1) drill 2.0mm as shown and fix in place the elbows (85x2). Fit the large pipe connections (86x2) after trimming to length.

Trim the sound pipe holders (70, 71 x 3 and 72) from the etch making sure you leave the tab on the bottom as long as possible. Cut and shape the 1.0mm wire to form the sound pipes along the top of the boiler. Feed the pipe holders (70, 71 x 3 and 72) onto the pipe and locate the ends of each pipe into the holes in the spectacle plate (5). Glue the pipe holders into the boiler and spot solder the two pipes together where they merge adjacent to the dome. Trim the small pipe connection (73) to length and push over the front of the sound pipe. Using 0.4mm wire, shape and fit the two small grab handles behind the chimney. Behind the cab, add the hopper supports (64 x 2). Add the cab back cylinder (65), rear spectacle fitting (66). Fit the junctions (68 x 4) adding the 0.4mm wire for conduit as shown. Using 0.4mm wire and short handrail knobs (69 x 2), make up the grab handle and fit as shown. Drill 0.8mm for all handrail knobs.

Centre Unit Drawing 3A/3B (Parts 87-98)

Fix in place the injectors (91 x 2) (the top part fixes behind the frame), the steam turret valves (92 x 2) before adding the handrails and pipe work as shown in the drawing. The handrails above the cab side windows (both sides) are made using 0.4mm wire and medium handrail knobs (88 x 4). Add pipe work as shown noting the sizes shown in the drawing. When using split pins (93 x 2 and 94 x 5) reduce the size of the eye in the split pin by placing it on a short length of 0.7mm wire and squeezing it with a pair of flat nosed pliers, reducing the eye to a more acceptable size. Make up cab door handrails (both sides) using 0.4mm wire, short handrail knobs (89 x 2 and 98 x 2) at the top and medium handrail knobs (90 x 2 and 97 x 2) at the bottom. Trim the ladders (95 x 2) from the etch making sure you leave the tabs on the bottom to fit into the slots in the footplate. Fold the ladder with the holes for the handrail to the outside and rungs to the bottom - see Drawing 3B. Bend the ladder as shown in the drawing. Slip the medium handrail knobs (96 x 7) and the two folded ladders (95 x 2) onto a length of 0.4mm wire and fix in place on the right hand side. Slip the medium handrail knobs (87 x 9) onto a length of 0.4mm wire and fix in place on the left hand side. Add the piping as shown in the drawing to complete detailing the centre unit.

Lightly oil the mechanism and test run, check for electrical "shorts" on sharp curves etc. Also check that the motor does not overheat due to chassis binding.

16 April 2009

(E168) - AD60 Beyer Garratt - Parts List - Page 1

Drawing 1.

1.	Footplate	W/M
2.	Main Frames x 1 pair	E
3.	Footplates x 1 pair	E
4.	Boiler	W/M
5.	Spectacle Plate	W/M
6.	Cab Sides x 1 pair	W/M
7.	Cab Back	W/M
8.	Boiler Backhead	W/M
9.	Screw reverser handwheel	W/M
10.	Seats x 2	W/M
11.	Ashpan Lever Block	W/M
12.	Mechanical Stoker Tunnel	W/M
13.	Roof	W/M
14.	Side window Beadings x 1 pr	E
15.	Rear Window Beadings x 1 pr	E
16.	Front Window Beadings x 1 pr	E
17.	Steam Turret	W/M
18.	Safety Valves x 3	W/M
19.	Dome	W/M
20.	Chimney	W/M
21.	Smokebox door	W/M
22.	Saddle Front Plates x 1 pr	W/M
23.	Front Footplate	W/M
24.	Rear Footplate	W/M
25.	Doors x 1 pr	E
26.	Door Steps x 2	E
27.	Ash Pan	W/M
28.	Rear Steps x 1 pr	E
29.	Rear Step Locating Treads x 2	E
30.	Rear Step Treads x 2	E
31.	Rear Step Large Treads x 2	E
32.	Front Steps x 2	E
33.	Front Step Locating Treads x 2	E
34.	Front Step Treads x 2	E
35.	Front Step Large Treads x 2	E
36.	Mechanical Stoker Engine	W/M
37.	Mechanical Stoker	W/M
38.	Steam Generator	W/M
39.	Whistle	L/W
40.	Continuous Blowdown Valve	L/W
41.	Valve	L/W
42.	Clack Valves x 2	L/W
43.	Superheater Access Panel Latches x 2	L/W
44.	Junction Box	W/M
45.	Handrail Elbow	L/W
46.	Pump Air Filter	W/M
47.	Smokebox Door Light	L/W
48.	Smokebox Door Handle	L/W
49.	Smokebox Steam Pipe	W/M
50.	Pump Plate	E
51.	Governor	L/W
52.	Pump	W/M
53.	Front Exhaust Pipe	W/M
54.	Small Air Tank	W/M
55.	Junction Boxes x 2	W/M
56.	Large Air Tanks x 2	W/M
57.	Junctions x 3	L/W
58.	Junction Box/Junction "A"	L/W
59.	Ashpan Grills x 1 pair	E
60.	Rear Exhaust Pipe	W/M
61.	Firebox Support Plates x 2	E
62.	R/H Steam Delivery Pipe	W/M
63.	Junction Box "B"	L/W

0.5mm - Wire

Drawing 2.

64.	Hopper Supports x 2	L/W
65.	Cab Back Cylinder	W/M
66.	Rear Spectacle Fitting	L/W
67.	Builders Plate	E
68.	Junctions x 4	L/W
69.	Short Handrail Knobs x 2	T
70.	Short Pipe Holder	E
71.	Long Pipe Holders x 3	E
72.	Medium Pipe Holder	E
73.	Sound Pipe Connection	-
74.	Smokebox Regulator Fitting	L/W
75.	Boiler Regulator Fitting	L/W
76.	Ashpan Levers x 2	E
77.	Rear L/H Steam Delivery Pipe	W/M
78.	Front L/H Steam Delivery Pipe	W/M
79.	Reversing Rod Pulley	L/W
80.	Steam Reverser	W/M
81.	Pipe Fitting	L/W
82.	Handle	E
83.	Short Handrail Knob	T
84.	LH Smokebox Fitting	L/W
85.	Elbows x 2	W/M
86.	Large Pipe Connection	-

0.4mm - Wire

0.5mm - Wire

0.7mm - Wire

1.0mm - Wire

Drawing 3.

87.	Medium Handrail Knobs x 9	T
88.	Medium Handrail Knobs x 4	T
89.	Short Handrail Knobs x 2	T
90.	Medium Handrail Knobs x 2	T
91.	Injectors x 2	L/W
92.	Steam Turret Valves x 1 pair	L/W
93.	Split Pins x 2	-
94.	Split Pins x 5	-
95.	Ladders x 2	E
96.	Medium Handrail Knobs x 7	T
97.	Medium Handrail Knobs x 2	T
98.	Short Handrail Knobs x 2	T

0.4mm - Wire

0.5mm - Wire

0.7mm - Wire

1.0mm - Wire

Drawing 4.

99.	Hopper Sides & Back	E
100.	Hopper Lifting Links x 2	E
101.	Front Footplate	W/M
102.	Rear Footplate	W/M
103.	Hopper Frontplate	W/M
104.	Rear Support Plate	W/M
105.	Front Support Plates x 1 pair	W/M
106.	Hopper Floor	W/M
107.	Deck Plate	W/M
108.	Hopper Door Plate	W/M
109.	No part	-
110.	Coal	W/M

(E168) - AD60 Beyer Garratt - Parts List - Page 2

Drawing 5.

111.	Hopper Side Support	E
111A.	Coal Bulkhead	E
112.	Lifting Brackets x 2	W/M
113.	Water Hatch Rear (thick)	W/M
114.	Anti Vacuum Valves x 2	W/M
115.	Sandbox Filler	W/M
116.	Elbow	*W/M
117.	Support Plates x 2	W/M
118.	Medium Handrail Knobs x 8	T
	0.4mm - Wire	

Drawing 6.

119.	Marker Lights x 2	L/W
120.	Anti Vacuum Valves x 2	W/M
120A.	Filler Vent	W/M
121.	Toolbox	W/M
122.	Air Vents x 2	W/M
123.	Headlight	W/M
124.	Junctions x 7	L/W
125.	Front Fillets x 2	E
126.	Steptreads x 3	E
127.	Footplate Platform	W/M
128.	Support Plates x 2	W/M
129.	Conduit Holders Short x 6	T
130.	Sandbox Filler	W/M
131.	Medium Handrail Knobs x 8	T
	0.4mm - Wire	
	0.7mm - Wire	
	1.0mm - Wire	

Drawing 7.

132.	Water Tank	W/M
133.	Sand Boxes x 2	W/M
134.	Front Footplate	W/M
135.	Rear Footplate	W/M
136.	Front Fillets x 2	E
137.	Junctions x 6	L/W
138.	Marker Lights x 2	L/W
139.	Headlight	W/M
140.	Conduit Holders x 6 (Short Handrail Knobs)	T
141.	Medium Handrail Knobs x 14	T
142.	Air Vents x 2	L/W
143.	Water Filler Stop Plate	E
144.	Lift Hooks x 4	W/M
145.	Water Hatch Front - (thin)	W/M
146.	Anti Vacuum Valves x 4	W/M
147.	Footplate Sound Pipe Brackets x 2	E
	0.4mm - Wire	
	1.0mm - Wire	

Drawing 8.

148.	Elbow	W/M
149.	Steptreads x 2	E
150.	Soundpipe Holders x 5	E
151.	Front Sound Pipe Holders x 2	E
152.	Sound Pipe Funnels x 2	W/M
153.	Junctions x 2	L/W

154.	Tank Deck	E
155.	Fallplate	E
156.	Support Plates x 4	W/M
	0.4mm - Wire	
	0.5mm - Wire	
	1.0mm - Wire	

Drawing 9.

157.	L.H. Frames x 2	E
158.	R.H. Frames x 2	E
159.	Bushes x 16	T
160.	Spacers x 4	T
161.	Spacer Screws x 8	T
162.	Motor Mounting Plates x 2	E
163.	Pick-up Mounting Plates x 4	E
164.	Pilot Plates x 2	E
165.	Pilot Front Plates x 2	W/M
166.	Lamp Irons x 8	E
166A.	Lifting Jacks x 2	W/M
167.	Buckeye Lift Link Brackets x 4	E
168.	Rear Chassis Mounting Plate x 2	E
169.	Axles x 8	T
170.	M2 x 16mm CH Screws x 2	T
171.	M2 Nuts x 2	T
172.	16.4mm Insulated Driving Wheels x 8	T
173.	Axle Nuts x 16	T
174.	Axle Washers x 16	E
175.	Axle Gear	
176.	No Part	-
177.	16.4mm Non-insulated Driving Wheels x 8	T
178.	Crankpins x 16	T
179.	No part	-
180.	Large Balance Weights x 4	E
181.	Small Balance Weights x 12	E
182.	Axle Covers x 16	E
183.	Coupling Rods x 2 pairs	E
184.	Crankpin Washers x 16	T
185.	Buffer Beams x 2	W/M
186.	Buffers x 4	W/M
187.	No part	-
188.	L/H Brake Pipes x 2	L/W
189.	R/H Brake Pipes x 2	L/W
190.	L/H Guard Irons x 2	E
191.	R/H Guard Irons x 2	E
192.	Step Treads x 4	E
193.	Steps x 4	E

0.7mm - Wire

Drawing 10.

194.	Brake Shoes x 8 pairs	E
195.	Brake Rodding x 2	E
196.	Brake Tanks x 4	W/M
197.	Sandbox Bearing Plates x 2	W/M
198.	M2 x 16mm CH Screws x 2	T
199.	Insulated Bushes x 2	P
200.	Insulated Washers x 2	P
201.	Power Clip	E
202.	M2 Nuts x 2	T
203.	Long Bearing Pin	T
203A.	Short Bearing Pin	T
204.	Bearing Washers x 2	E
205.	Cylinder Blocks x 4	W/M

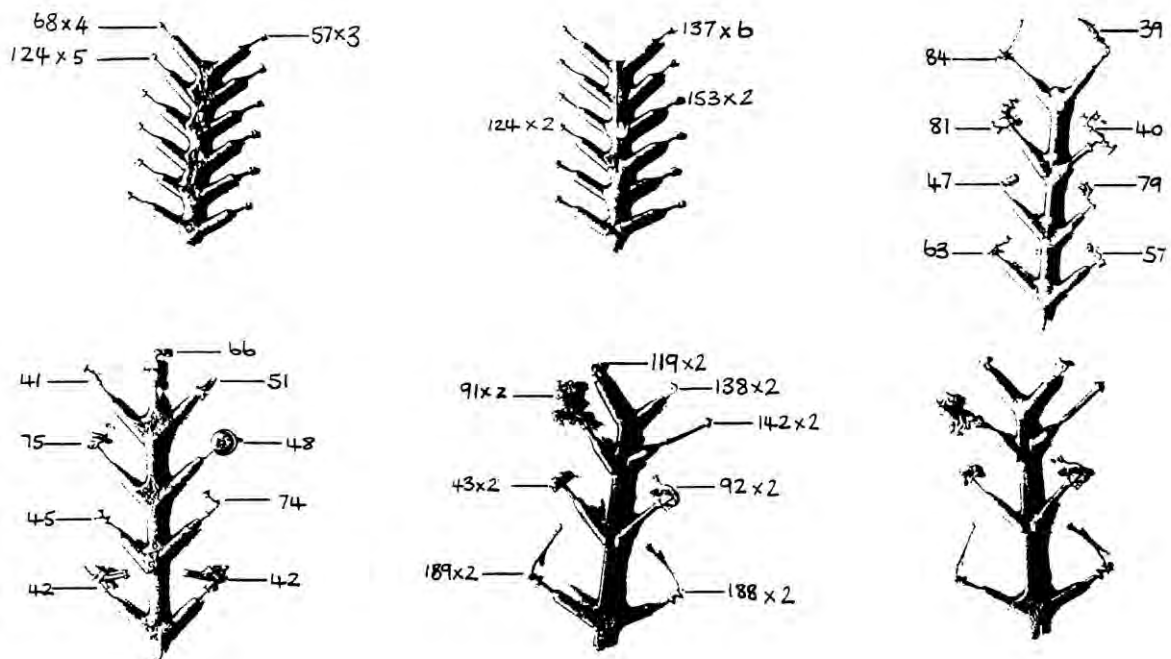
(E168) - AD60 Beyer Garratt - Parts List - Page 3

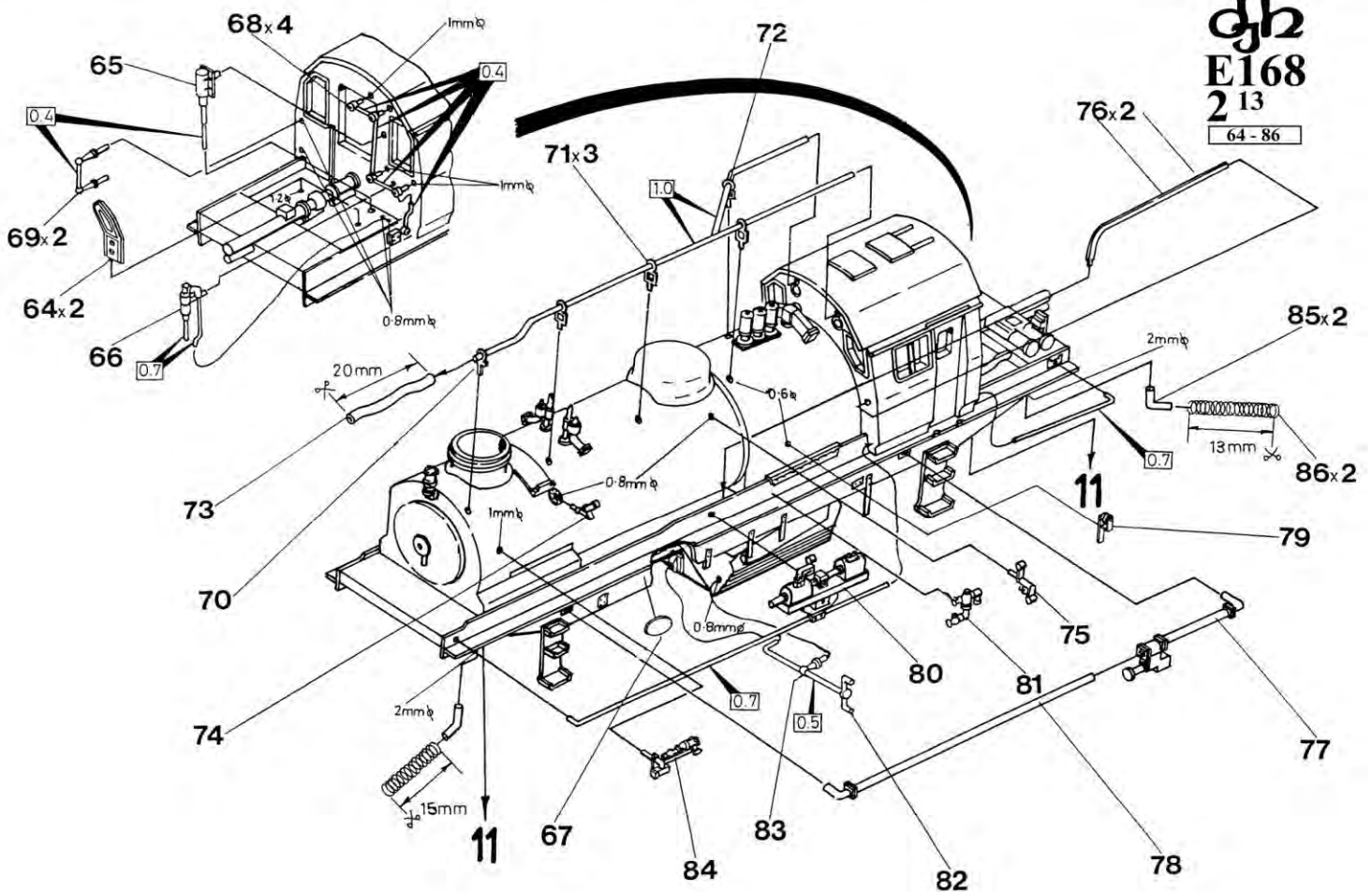
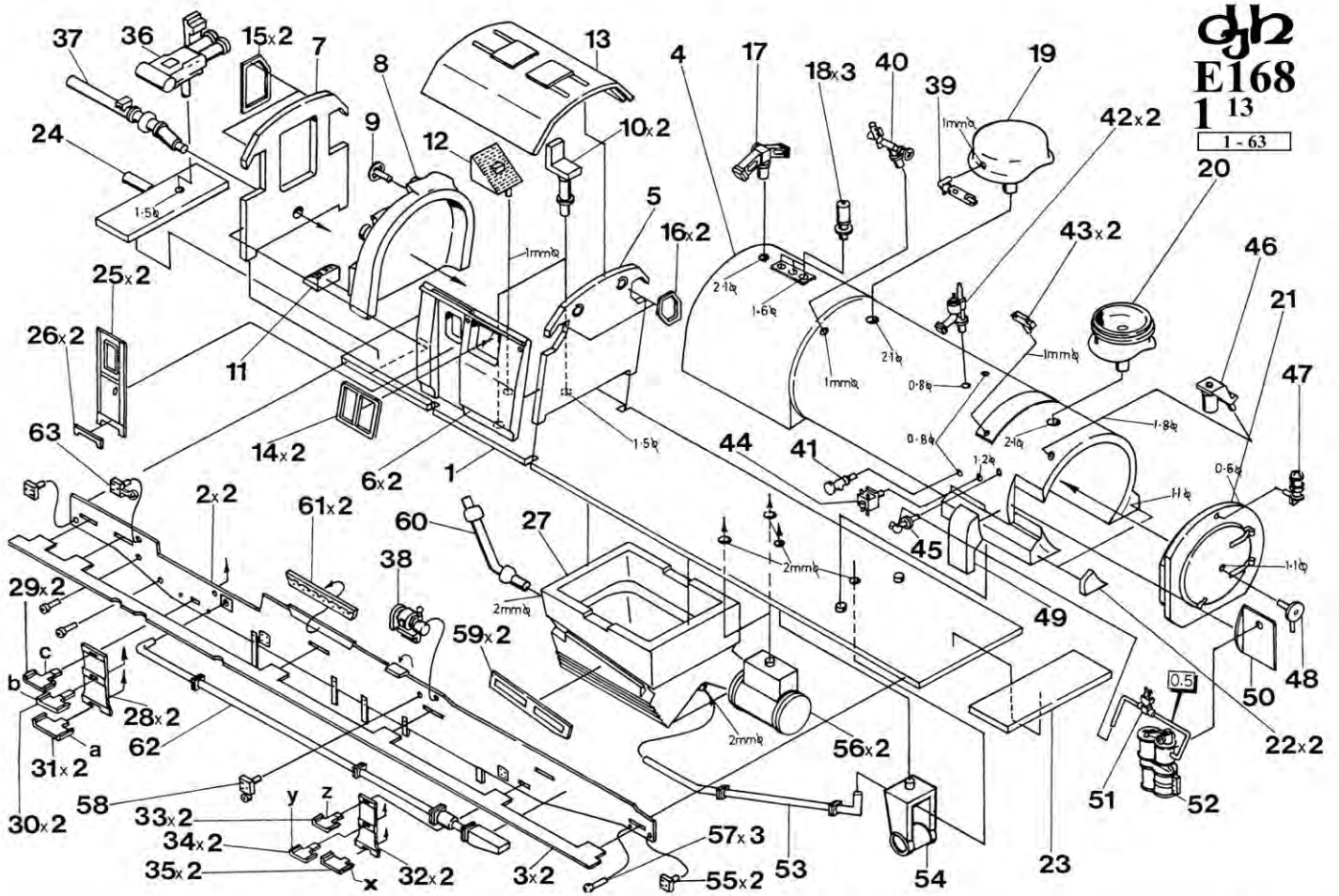
206. Cylinder Fronts x 4	W/M		<u>Drawing 11.</u>	
207. Valve Fronts x 4	W/M		230. Mashima 1626 Motor	-
208. Draincocks x 4	E		231. Motor Bracket	W/M
209. Cylinder Backs x 4	W/M		232. Motor Mounting Screw	T
210. Valve Crosshead Guides x 4	W/M		233. L/H Gearbox Side	P
211. Slide Bars x 2 pairs	E		234. Gear	T
212. Motion Brackets x 2	E		235. Thrust Washer	E
213. Pivot Plates x 2 pairs	E		236. Bearing	T
214. Lubricators x 4	W/M		237. R/H Gearbox Side	P
215. Crosshead Assemblies x 2 pairs	E-L/W		238. Screws x 6	T
216. Connecting Rods x 2 pairs	E		239. Keeper Plate	P
217. Connecting Rod Big Ends x 4	E		240. Power Clip	E
218. 14BA x 1/8" CH Screws x 4	T		241. Bearing Washer	E
219. 14 BA Nuts x 4	T		242. Shouldered Screw	T
220. 14 BA x 1/8" CH Screws x 4	T		243. Rear Bogies x 2	W/M
221. Expansion Link Assemblies x 2 pairs	E		244. 10.5mm - Bogie Wheels x 8	T
222. Lubricator Links "A" x 4	E		245. Wheel Inserts x 16	W/M
223. 14 BA Nuts x 4	T		246. Keeperplates x 8	W/M
224. Lubricator Links "B" x 4	E		247. Brake Cylinders x 4	W/M
225. Crankpin Washers x 4	T		248. Bogie Brakes x 2 Pairs	E
226. Motion Bracket Support Plates x 4	W/M		249. Front Bogies x 2	W/M
227. Plastic Pins x 2	P		250. M2 x 16mm C/H Screws x 4	T
228. Pick-ups x 2	E		251. Springs x 4	T
229. Plastic Washers x 4	P		252. Bogie Bearing Washers x 4	E
			253. M2 Nuts x 4	T
0.4mm - Wire			1.0mm - Wire	
0.5mm - Wire			Insulated Wire	
0.7mm - Wire				
Insulated Wire				

Legend:

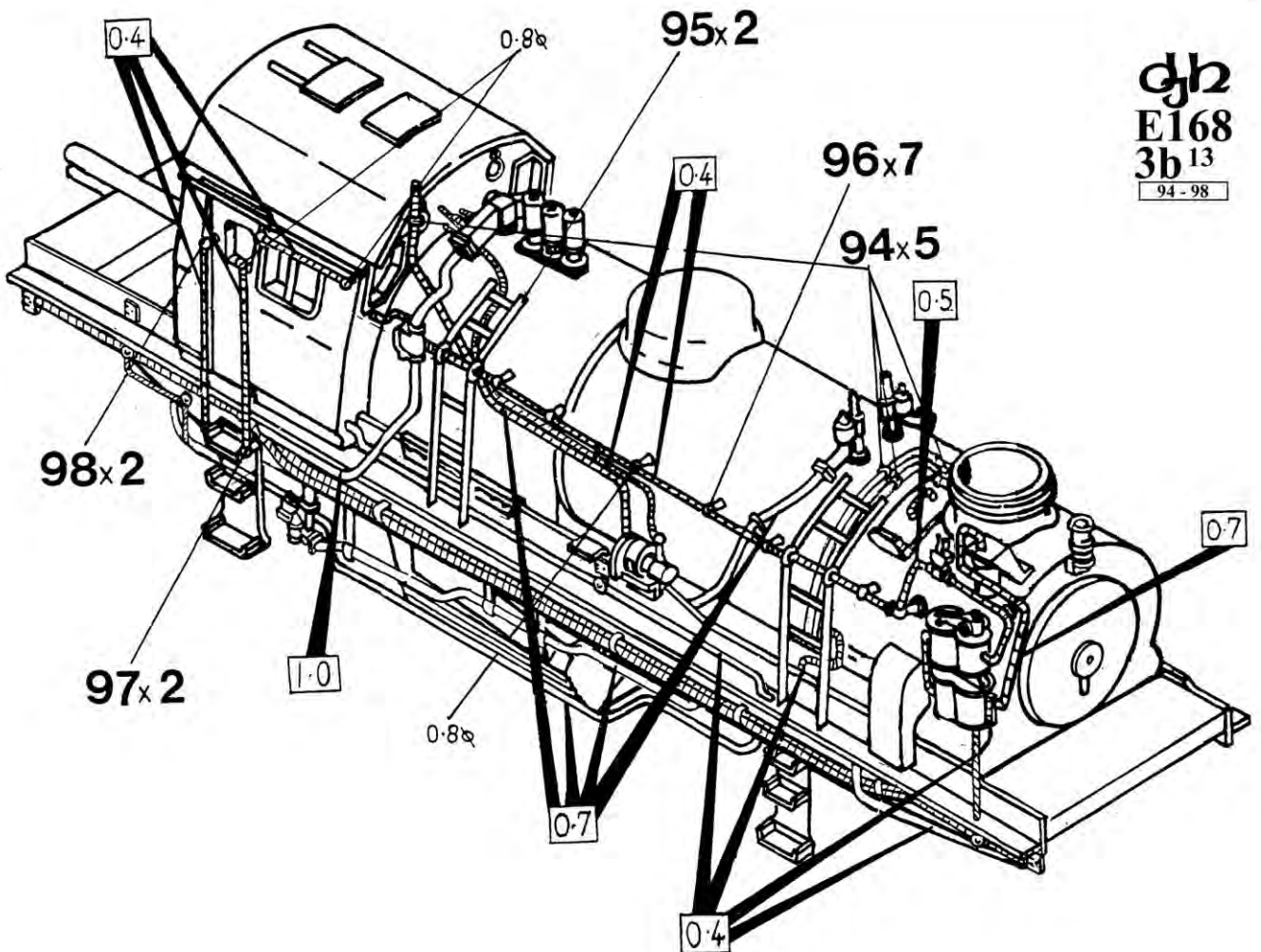
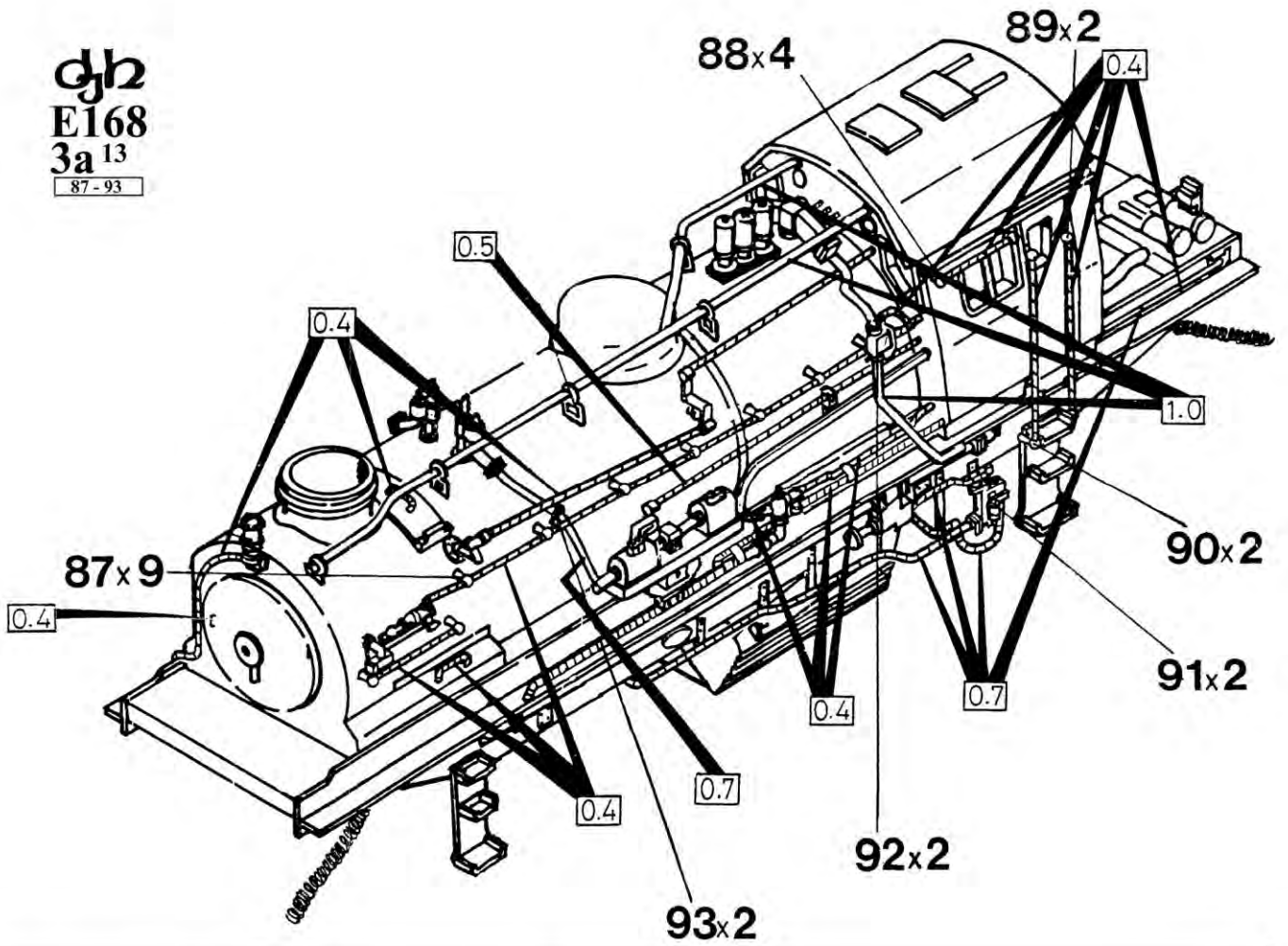
W/M - White metal
 E - Etched brass
 L/W - Lost wax brass casting
 T - Turning
 P - Plastic

(E168) - AD60 Beyer Garratt - Lost Wax Brass Castings

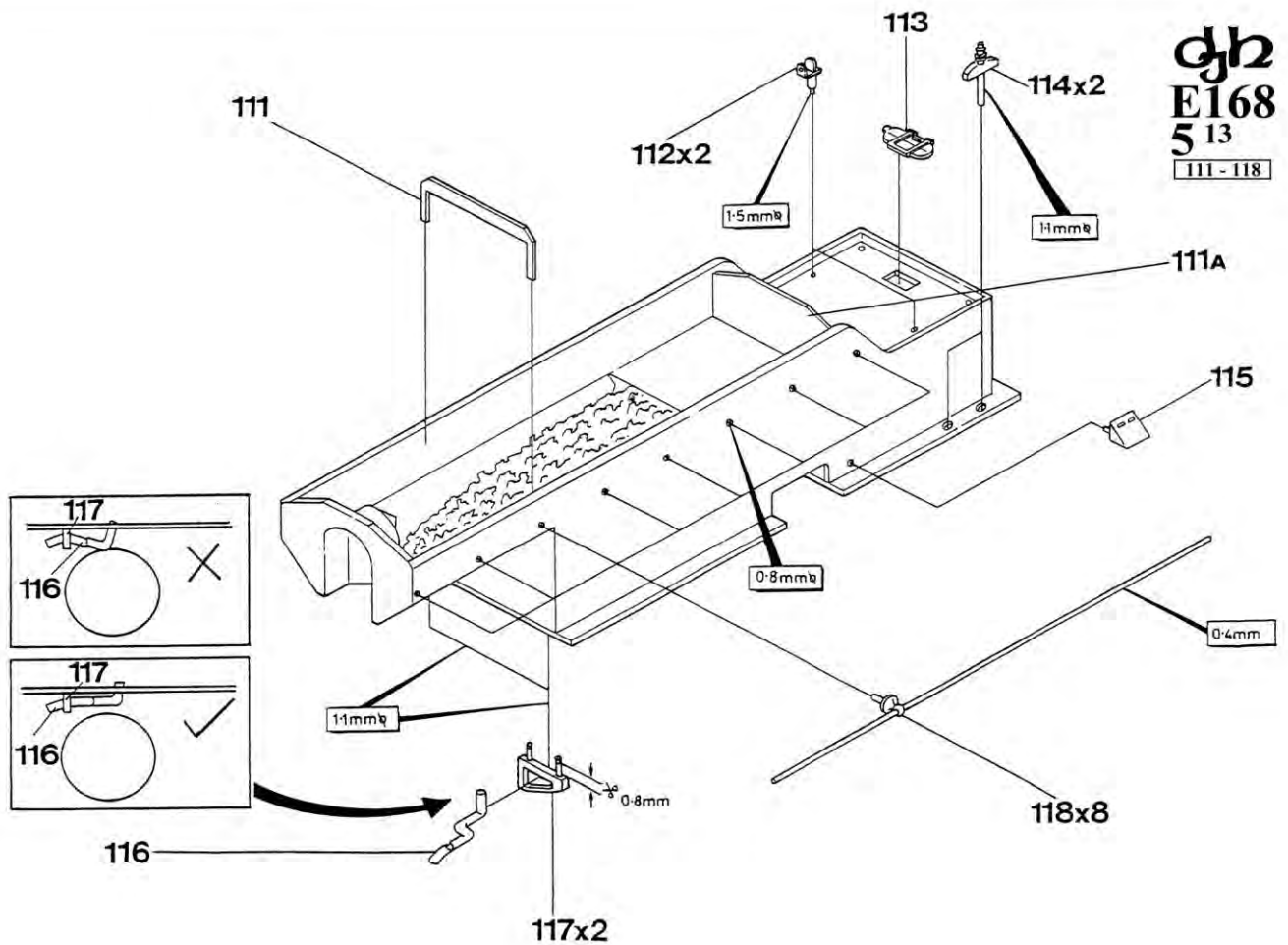
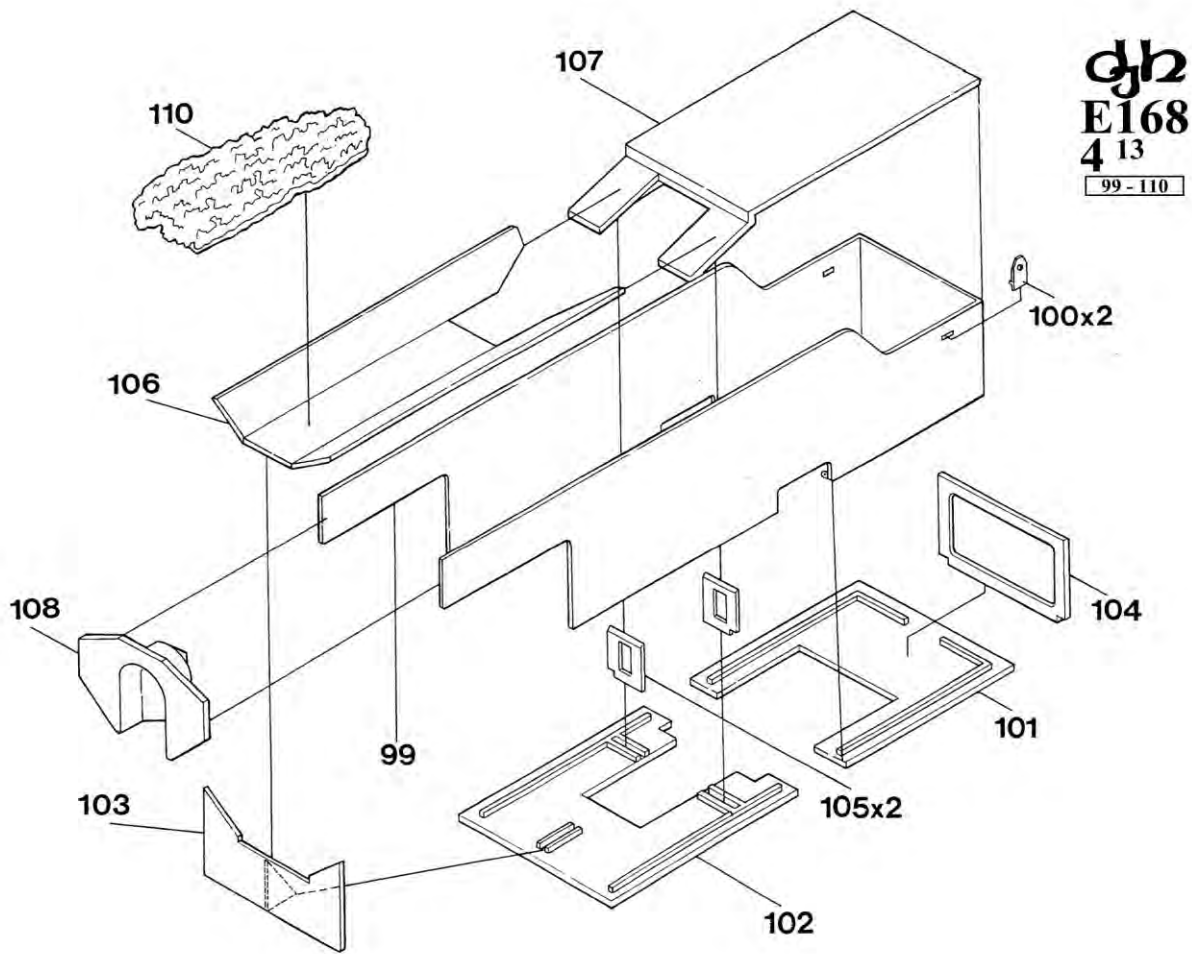


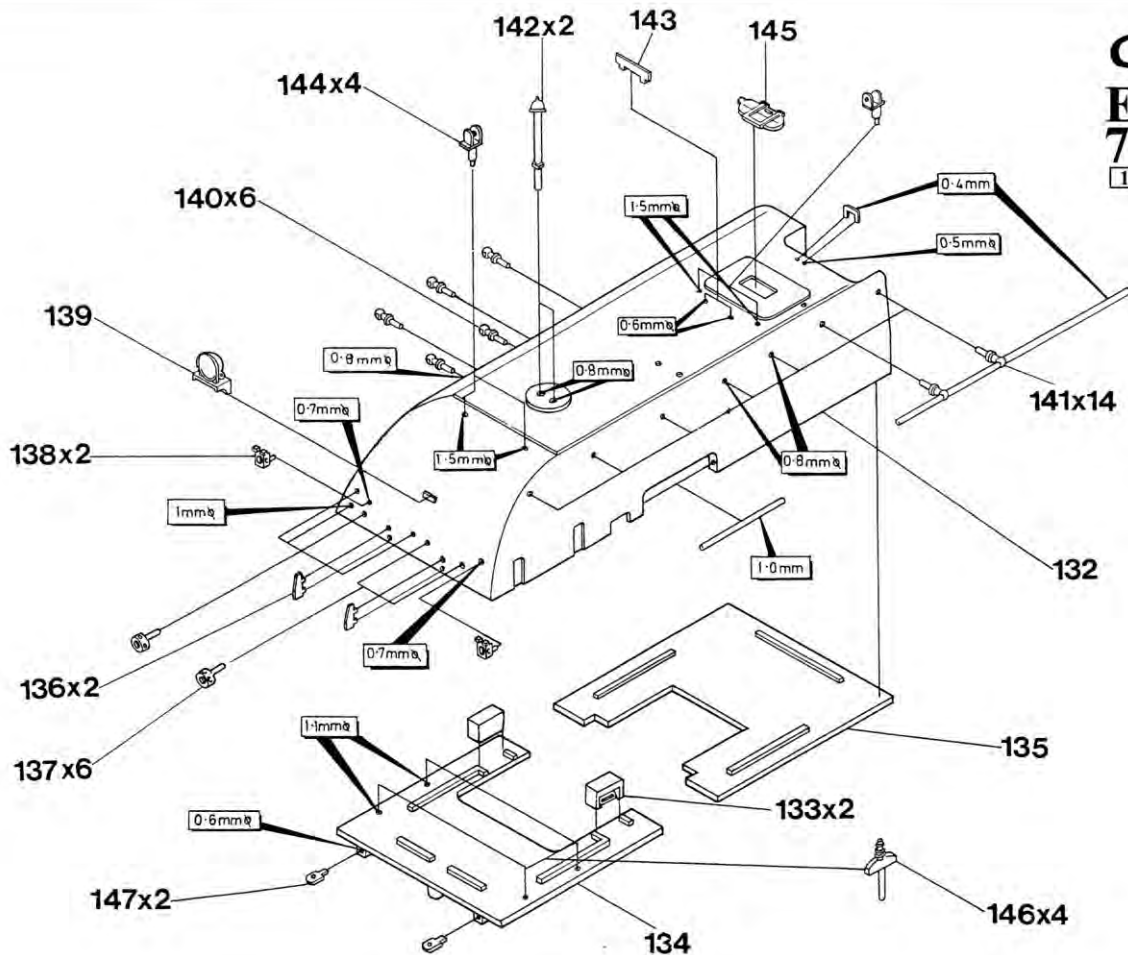
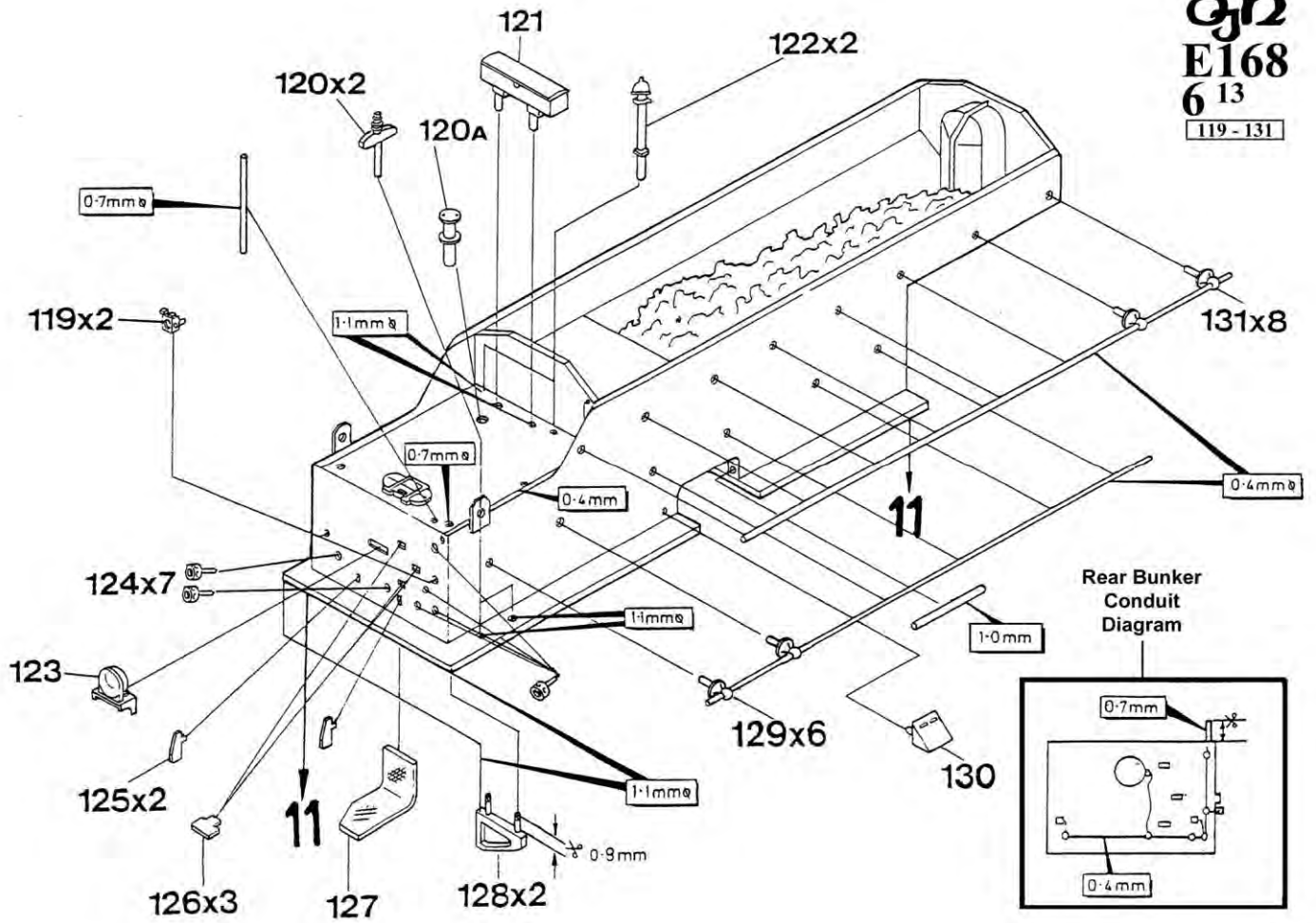


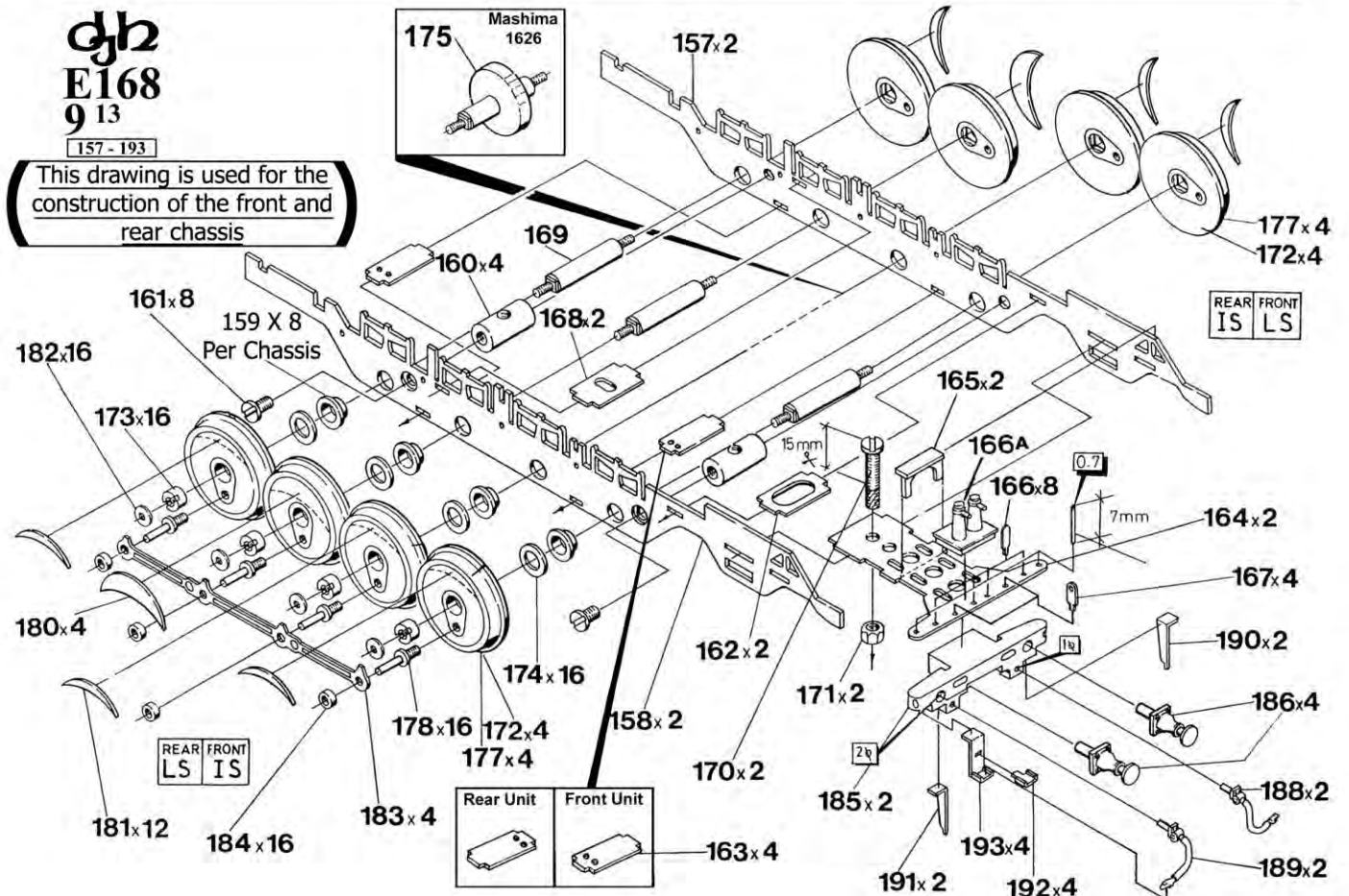
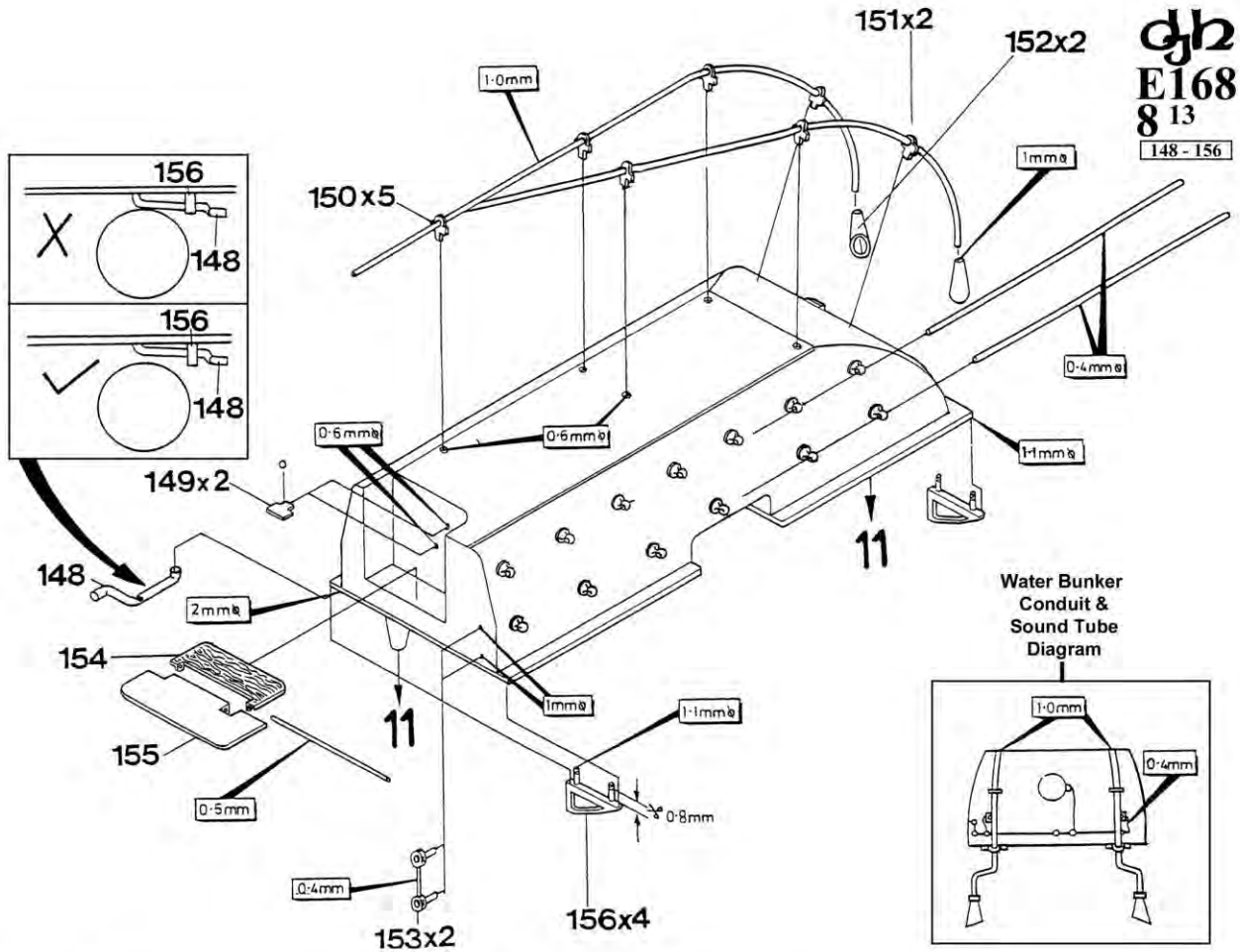
dh
E168
3a¹³
87 - 93



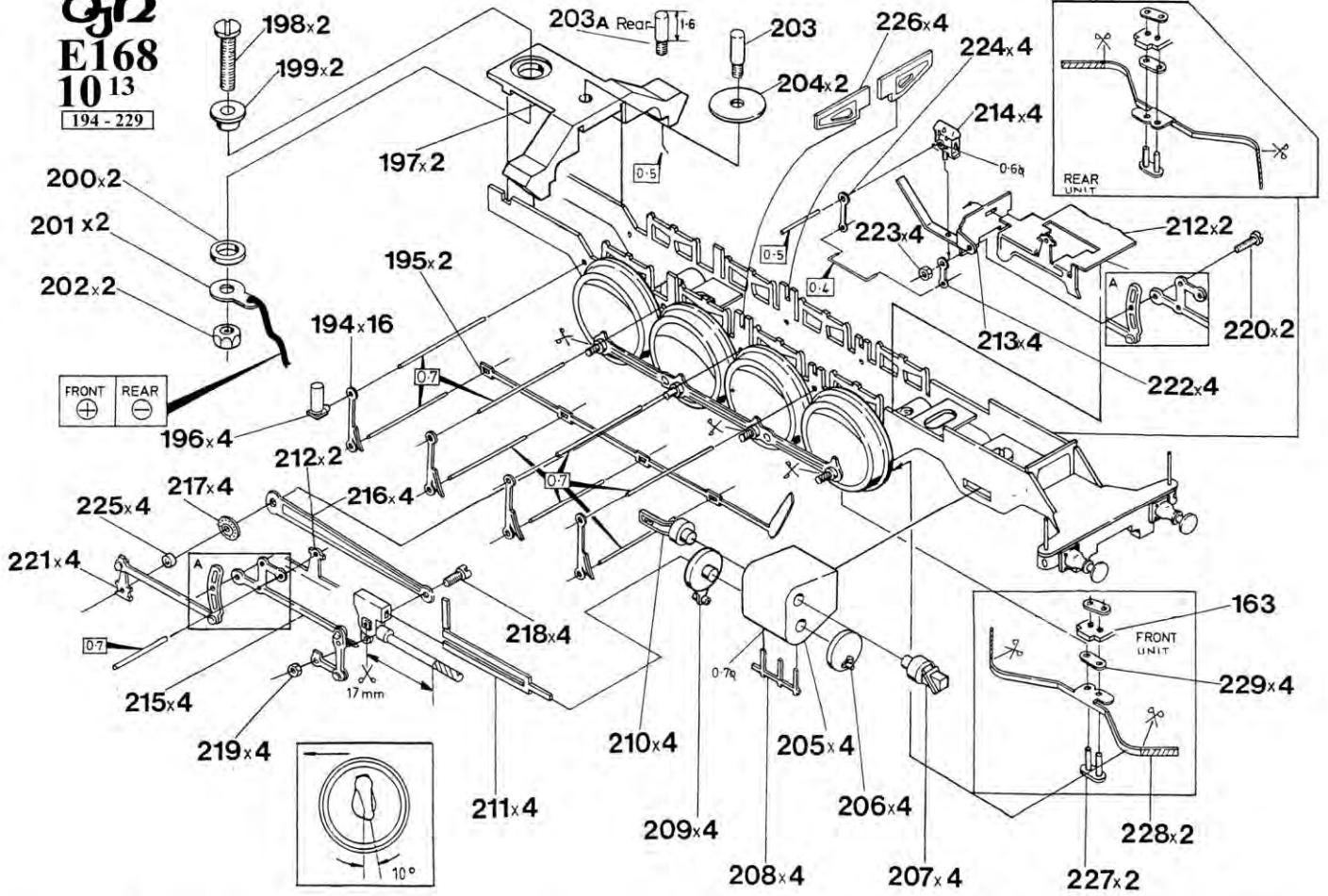
dh
E168
3b¹³
94 - 98







dh
E168
10 13
 194 - 229



dh
E168
11 13
 230 - 253

