



Australian Railway Kits

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Incorporating Main West Models
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NSWGR C32 4-6-0 LOCOMOTIVE AND TENDER KIT

E151 Manufactured Exclusively for AR Kits by DJH Engineering from Patterns owned by AR Kits

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 hard 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 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 spigot sizes of the fittings, because some holes will be difficult to drill after parts are assembled.

A detailed history of the C32 locomotives is covered in Ron Preston's book "Standards in Steam, The C32 Class", and an excellent Data Sheet is also available.

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 Standards in Steam, The C32 Class book by Ron Preston, 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 smoothly operating model is care when constructing 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 coupling rods on, then again with the connecting rods on, 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 the correct type of soldering iron (eg Dick Smith T2200). These irons have temperature control, as low melt solder only requires around 200 degrees centigrade. You should use special low melting point solder 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 Pastibond. 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.

Electrical pickup.

The electrical system used on these kits is called "half live". Looking from the top facing forward the locomotive chassis collects current from the live wheels on the right-hand side, shown as LS (live side) on the drawings. The tender is insulated from the locomotive chassis by a plastic bush and current is collected from the wheels on the left-hand side of the tender.

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 is not done the paint will not adhere properly to these areas. Alternatively an excellent pressure pack flux remover is also available from Dick smith stores. Then wash 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.

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

The following drill sizes are required: 0.5mm, 0.6mm, 0.7mm, 0.8mm, 0.9mm, 1.0mm, 1.2mm, 1.5mm, 1.6mm, 1.9mm, 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 the part numbers are shown in brackets.

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 tender.

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

Tender Drawing T1(Parts T1 - T20)

Take tender back and sides (T2) and fold to form 90 degree corners - note that fold lines are etched on the inside of the corners to assist in folding. At this point solder the bogie centre pivots (T10x2) to the underside of the tender floor. Now fix the back and sides onto the tender floor (T1). Bend the door shapes on the tender front (T3) as shown in the small insert drawing 1, then fix to the floor and sides. Bend the coal trough (T4) and fix to the front (T3) noting that fold on the rear coal trough helps to locate this part. Now fix in place the rake irons support (T20). Fit buffer beam (T32 from drawing 2) onto the underneath of the floor, noting that the two vertical spigots form the lamp irons.

Fit the side valances (T6x2) followed by front valance (T5). Check that the assembly is "square" before adding the front steps (T7x2). Fold up edges of front step treads (T8x2) before adding to front steps. Fit the brake cylinder (T17) to the tender floor. Prior to fixing the tender top (T18) into the tender body, some modellers may prefer to fit parts T21, T22, T29, T30 and the grab rail from drawing 2 before fitting the tender top in place. Fit the coal plates (T19x2) to the tender top.

Fix the turned brass side frame mounts (T14x4) to the bogie side frames (T12x4). For good electrical pickup low melt solder is recommended here. The bogie stretchers (T11x2) are on the etched nickel silver valve gear fret -remove them and check that the holes either side fit over the brass side frame mounts (T14), you may need to enlarge the hole slightly. Check also that the holes for the screws (T16bx4) are large enough. Fold the stretchers as per drawing 1, using a pair of flat nosed (non-serrated) pliers.

Push the brass wheel bearings (T13x8) in the bogie side frames using low melt solder if necessary, and attach the side frames to the stretcher with 0.4mm long brass screws (T16bx4) and washers (also from the nickel silver fret) (T16ax4).

Tighten the screws then gently ease the side frames apart to fit the wheel sets (T15x4) in place, making sure the insulated wheels are on the same side for each bogie - see drawing 1.

Trim the bogie mounting screws (T9ax2) to a length of 7.0mm and attach the assembled bogies to the tender using the springs (T9bx2) and washers (T9cx2).

Tender Drawing T2 (Parts T21 - T34)

If you have not already done so, fit water filler (T21) and tool box (T22). Fit drawbar pin (T23) using two M2 nuts (T24x2). Add fire irons (T25x3). Fit tender footplate (T26) followed by handbrake stand (T27) and handbrake handle (T28) - note, drill handbrake stand 0.8mm to accept the handbrake handle. Prior to fitting the ladder (T29) fold as per the insert drawing. Fit lamp bracket (T30), lamps (T31x2), buffers (T33x2) and brake pipe (T34).

Locomotive Drawing 15 (Parts 35 - 66)

As mentioned previously all holes shown on the drawing should be drilled prior to assembly.

Trim the M2 screw (43) to a length of 12mm and secure in place inside the smoke box. Clean up the footplate (35) and remove any feed sprues from the centre cutout under the boiler. Fix the smoke box/boiler/firebox (42) assembly to the footplate (35) securing in place with M2 nut (44) making sure that the footplate is kept straight. Check that there is no flash inside the smoke box which may prevent the motor from fitting properly.

Remove the cab (51) from the fret and fold as shown. Solder the inside corners of the sides/front. Fix the screw (52) into the cab as shown at this stage as it is not possible to do this once the cab assembly is completed. Take the fall plate (56) and fold the tabs down 90 degrees, then glue the plasticard (56a) to the underside trimming so that it overlaps the three outside faces by 0.8mm to prevent it shorting out against the tender. Attach to the cab floor (55) using 0.4mm wire as shown. Fold the cab support floor (54) as shown and fix into the cab. Fix the cab floor (55) on top of the cab floor support (54).

Fit rear steps (39). Fold up edges of rear step treads (40x2) before fixing to rear steps (39). Fit buffer beam (41). Fit the completed cab to the footplate using M2 nut (53). The cab roof (57) should be fitted after the motor is fitted. Detail the boiler by adding the safety valves (50), steam generator (49), dome (48), chimney (47), smoke box door (45) and smoke box door handle. Fit front splashers (36x2), centre splashers (37x2) and rear splashers (38x2).

The fitting of the gearbox (66), motor (60), motor tag (63), motor clip (64), flexible shaft (65), back head detail (59) and regulator handle (58) is covered under Chassis Drawing 7.

Locomotive Drawing 25 (Parts 67 - 93)

Drawing 4 shows the location of the locomotive body detailing parts 67 to 93. Note that the beam step (83) should be folded as shown before fitting. When fitting the guard irons (85x2) bend them out to the track centres before fitting (see photograph on the label for clarity). An insert drawing is provided as an aid in bending the clack valve piping. Note also that the boiler handrails go right around the boiler and that they have been shown broken on the drawing for clarity.

Chassis Drawing 35 (Parts 94 - 113)

Take the chassis frames (92x2). Carefully clean out the axle holes with a 3.7mm drill bit and push fit the axle bushes (95x6). The bushes should be a firm fit in the frames, any loose bushes should be soldered in place. Note there are a number of holes on the chassis that may require cleaning out to a specific size, check drawing for details. Fit the turned brass chassis spacers (96a & 96b) noting that the rear spacer (96b) has a M2 thread for fixing the motor (see drawing) **the hole in this spacer must be aligned vertically**. Fit front mounting plate (98) and rear mounting plate (99) and tighten the spacer screws (97x4). Temporarily fit axles and wheels to the front and rear axles 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.

Before fitting the driving wheels (102x3 and 103x3) note that the insulated wheels are on the L/H side as viewed from the top facing forward. Fit the driving wheels, axles (101x3) and axle washers (100x6) to the chassis with the axle nuts (103ax6), placing the axle gear (107a) on the first 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 to the centre of the axle. Make sure 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 crank pin on the right hand wheel leads that of the left hand wheel by 90 degrees when the axle rotates forward. Use a Romford axle nut driver to tighten the axle nuts.

Remove the etched counterweights (106x4), (107x2) from the fret and glue to the wheels as shown. Using a Romford axle nut driver fit the crankpins (105x6). Axle covers (104x6) should be fitted after final assembly and painting.

Now fit drawbar/tender pickup placing Insulator (109) on M2 screw (108) cut to 10mm, and pass this through the rear mounting plate (99). Now add spring plate (110), loco tender coupler (111) and spring (112) as shown, followed by M2 nut (113.)

Chassis Drawing 45 (Parts 114 - 128)

Fit crankpin spacer washers (114x6) then add rear coupling rods (115xpair) and front coupling rods (116xpair). 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 (117x6) should not be fitted until the chassis has been completed and painted. Check that the rods revolve freely; should binding occur, locate where this 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. Sometime swapping the side rods around (i.e. left to right can overcome binding)

Remove the wheels from the chassis. Using 1.0mm wire, fit the brakes (120x6). Fit brake stretchers (118x2), leading brake stretchers (119x2), pull rods (121x2). Fit brake link L/H (122) and brake link R/H (123) as shown -note the insert drawing shows the angle of part 123.

Test fit slide bar support bracket (128) into the cutouts on top of the frame and put aside for later fitting. Make up cylinder assemblies using cylinder bodies (126x2), rear cylinder covers (125x2) and front cylinder covers (127x2) - note that rear cylinder covers are drilled 1.2mm.

Fold the slide bars (124x2) as shown, note these are left and right handed, the etched fold line goes to the inside of the fold. Test fit the crosshead into slide bar, you may need to clear out the keyways of the crossheads using a knife-edge file, or you may need to lightly file the inside edges of the slidebars to achieve a good fit. Fit crankpin washers (130x2). Fix the slide bar assemblies to the rear of the cylinders and also attach underneath the cylinders - see drawing. Fix the completed cylinder assemblies to the frames.

Chassis Drawing 55 (Parts 129 - 144)

Cut M2 screw (144) to 12.5mm and fit through the second hole on the front mounting plate (98) and secure in place with M2 nut (135). Short one wheel on each of the locomotive bogie axles (140x2) using 0.7mm wire. See insert in drawing. Fit the wheel inserts (142x4) to the wheels and assemble the bogie (138) using keeper plates (141x2) making sure that both shorted wheels are on the same side.

Fit the bogie to the M2 screw (144) using washer (137), spring (136) and M2 nut (139) making sure that the shorted wheels are on the right hand side of the chassis. Fit wheels, axles and side rods. Fit the connecting rods (129xpair) to crossheads (131xpair) using 14BA screw (132x2) and nut (133x2). Fit crossheads into the slidebars and then fit the slide bar support bracket (128).

Assemble the gearbox as per the accompanying instructions and trim the shaft to 6.0mm as shown in drawing 3. Do not force the worm onto the shaft. Carefully ream the worm bore using a 2.0mm drill or hand reamer so that the worm fits the shaft without undue force. Use a spot of superglue or Loctite 601 to permanently fix in place. Clean the shaft of excess glue or Loctite. As the gearbox screws are self tapping, screw the bottom cover plate screws in and out a couple of times before fitting the gearbox to the chassis.

Trim the motor coupling sleeve (65) to 12mm and fit to the worm shaft of the gearbox - check that the ends of the worm shaft and motor shaft are free of sharp edges which could damage the tubing. Fit the gearbox onto the axle gear and secure in place with the gearbox keeper plate.

Fit the locomotive body to the chassis securing with M2 nuts (134 and 143)

Take two 60mm lengths of pickup wire and solder to the motor terminals and mark the positive (+) lead for later identification. Pass the motor through the hole in the front of the cab ensuring the motor coupling sleeve (65) couples to the shaft of the gearbox. Note, for easier fitting/removal of the motor, temporarily screw an M2 x 16mm bolt into one of the threaded holes in the rear of the motor, **finger-tight only**. Pass the wires down through the footplate, see drawing 3. Fit M2 screw (96c) to the rear chassis spacer (96b) **and gently tighten the M2 screw just enough to retain the motor.** Take the negative lead and solder it to the motor tag (63) which locates under M2 body mounting nut (143) (see drawing 7). The positive lead spot solders to loco tender coupling (111) (see drawing 5).

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

(E151) - C32 - Parts List Page 1

Tender Drawing 1

T1.	Floor	E
T2.	Sides and Back	E
T3.	Front	E
T4.	Coal Trough	E
T5.	Front Valance	E
T6.	Side Valances x 2	E
T7.	Front Steps x 2	E
T8.	Front Steps Treads x 2	E
T9a.	M2 Screws x 2	T
T9b.	Springs x 2	-
T9c.	Washers x 2	E
T10.	Bogie Centre Pivots x 2	T
T11.	Bogie Stretchers x 2	E
T12.	Bogie Sideframes x 4	W/M
T13.	Wheel Bearings x 8	T
T14.	Side Frame Mounts x 4	T
T15.	10.5mm Bogie Wheels x 4	T
T16a.	Washers x 4	E
T16b.	Brass Screw (4mm long) x 4	T
T17.	Brake Cylinder	W/M
T18.	Tender Top	W/M
T19.	Hungry Boards x 2	E
T20.	Rake Irons Support	E

Tender Drawing 2.

T21.	Water Filler	W/M
T22.	Tool Box	W/M
T23.	Draw Pin	T
T24.	M2 Nut x 2	T
T25.	Fire Irons x 3	E
T26.	Tender Footplate	E
T27.	Handbrake Stand	W/M
T28.	Handbrake Handle	L/W
T29.	Ladder	E
T30.	Lamp Bracket	E
T31.	Lamps x 2	W/M
T32.	Buffer Beam	E
T33.	Buffers x 2	W/M
T34.	Brake Pipe	L/W

0.4mm dia. Wire

Drawing 1

35.	Footplate	W/M
36.	Front Splashes x 2	W/M
37.	Centre Splashes x 2	W/M
38.	Rear Splashes x 2	W/M
39.	Rear Steps	E
40.	Rear Step Treads x 2	E
41.	Buffer Beam	E
42.	Boiler	W/M
43.	M2 Screw	T
44.	M2 Nut	T
45.	Smokebox Door	W/M
46.	Door Handle	L/W
47.	Chimney	W/M
48.	Dome	W/M
49.	Generator	W/M
50.	Safety Valve	W/M
51.	Cab unit	E
52.	M2 Screw	T

53.	M2 Nut	T
54.	Floor Support	E
55.	Floor	E
56.	Fall Footplate	E
56a.	Plasticard	P
57.	Roof	W/M
58.	Regulator Handle	W/M
59.	Cab Backhead Detail	W/M
60.	Motor	T
61.	No Part	-
62.	No Part	-
63.	Motor Tag (see drawing 7)	E
64.	No Part	-
65.	Motor Coupling	P
66.	Gearbox	

0.4mm dia. Wire
Insulated Wire

Drawing 2

67.	Whistle	L/W
68.	Pipe Valve	W/M
69.	Handrail Knobs Short x 2	T
70.	Lamp Brackets x 3	E
71.	Lamps x 2	W/M
72.	Dummy Coupling	W/M
73.	Buffers x 2	W/M
74.	Handrail Knobs x 6	T
75.	Reversing Lever	E
76.	L/H Pipe Bracket x 2	E
77.	L/H Pipe Bracket Firebox	E
78.	L/H Globe Valve	L/W
79.	Clack Valves x 2	L/W
80.	Lamp	W/M
81.	Lamp Bracket	E
82.	Brake Pipe	L/W
83.	Beam Step	E
84.	Step Handrail Pole	L/W
85.	Guard Irons x 2	E
86.	Air Filter	W/M
87.	Pump	W/M
88.	R/H Pipe Brackets x 3	E
89.	Split Pins x 4	-
90.	Cab Cylinder	W/M
91.	Firebox Valve	L/W
92.	R/H Globe Valve	L/W
93.	Brake Cylinder	W/M

0.3mm dia. Wire
0.4mm dia. Wire
0.7mm dia. Wire

Drawing 3

94.	Chassis Frames x 2	E
95.	Bushes x 6	T
96.	Spacer	T
96b.	Spacer Threaded	T
96c.	M2 Screw	T
97.	Spacer Screw x 4	T
98.	Front Mounting Plate	E
99.	Rear Mounting Plate	E
100.	Axle Spacing Washers x 6	E

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101.	Axle x 3	T		127.	Front Cylinder Covers x 2	W/M
102.	18mm Driving wheels insulated x 3	T		128.	Slidebar Support	E
103.	18mm Driving wheels non-insulated x 3	T			1.0mm dia. Wire	
103a	Axle Nuts x 6	T		Drawing 5		
104.	Axle covers x 6	E		129.	Connecting Rods x pr	E
105.	Crankpins x 6	T		130.	Crankpin Washers x 2	T
106.	Small Balance Weights x 4	E		131.	Crossheads x pr	L/W
107.	Large Balance Weights x 2	E		132.	14 BA C/H Screw x 2	T
107a.	Axle Gear	T		133.	14 BA Nuts x 2	T
108.	M2 Screw	T		134.	M2 Nut	T
109.	Insulator	P		135.	M2 Nut	T
110.	Spring Plate	E		136.	Spring	
111.	Loco - Tender Coupler	E		137.	Spring Washer	E
112.	Spring	T		138.	Bogie Body	W/M
113.	M2 Nut x 2	T		139.	M2 Nut	T
				140.	Bogie Wheels 10.5mm x 2	T
				141.	Wheel Keeper Plates x 2	W/M
				142.	Bogie Wheel Inserts x 4	E
				143.	M2 Nut	T
				144.	M2 Screw	T

Drawing 4

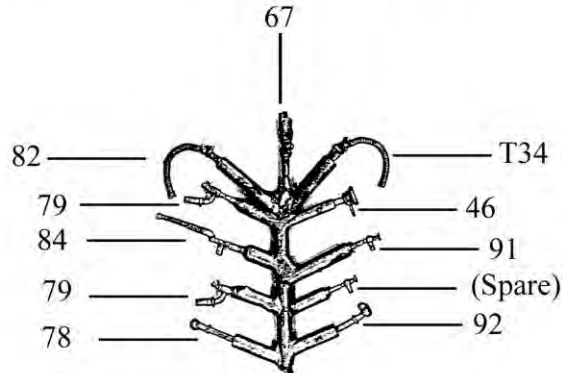
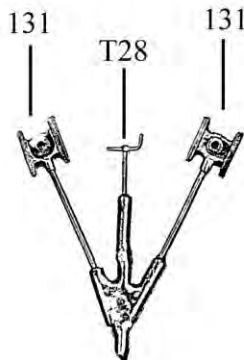
114.	Crankpin Spacing Washers x 6	E
115.	Rear Coupling Rods x 2	E
116.	Front Coupling Rods x 2	E
117.	Crankpin Washers x 6	T
118.	Brake Stretchers x 2	E
119.	Leading Brake Stretcher	E
120.	Brakes x 6	E
121.	Pull Rod x 2	E
122.	Brake Link L/H	E
123.	Brake Link R/H	E
124.	Slidebars x 2	E
125.	Rear Cylinder Covers x 2	W/M
126.	Cylinder Bodies x 2	W/M

0.4mm dia. Wire
0.7mm dia. Wire

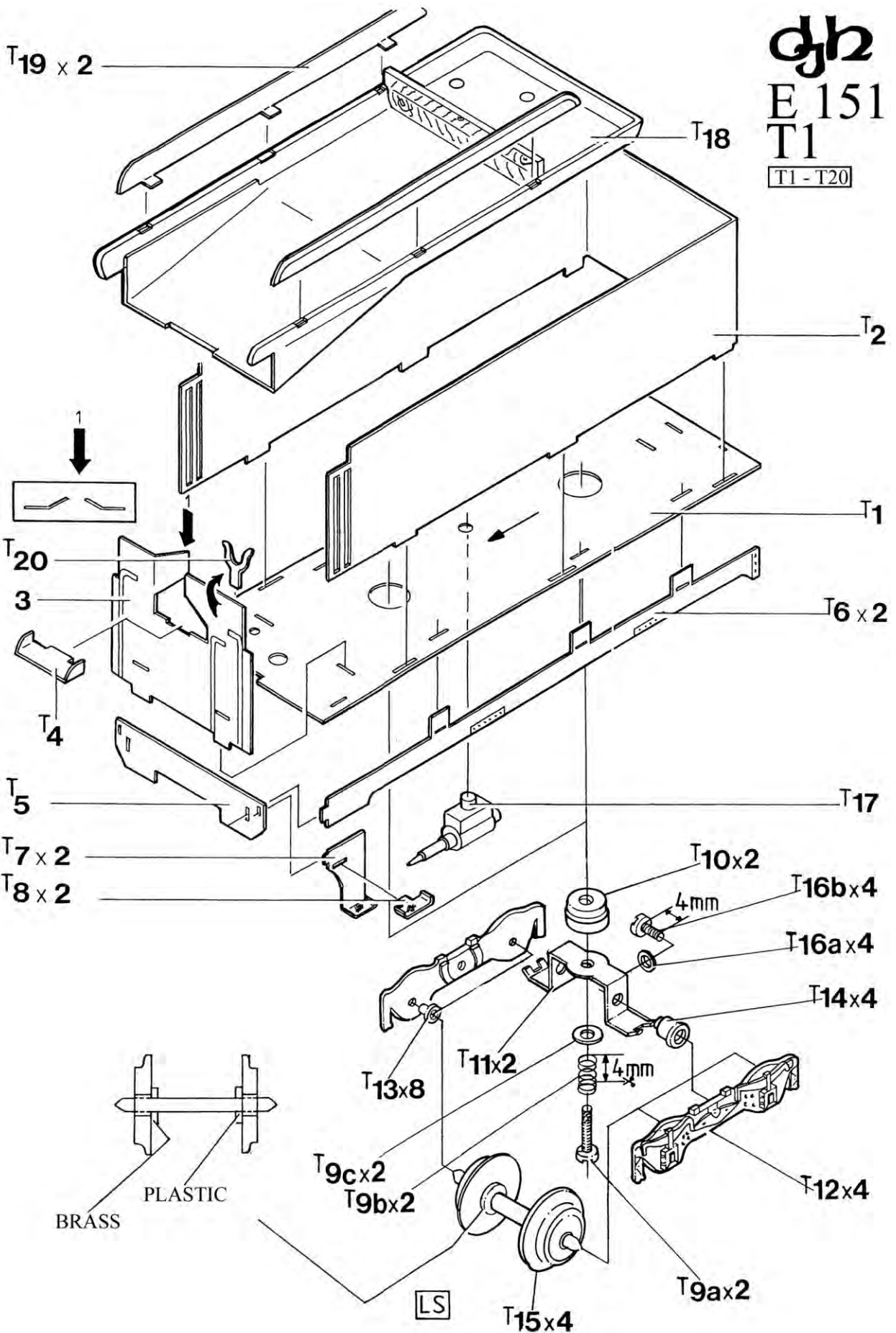
Legend

W/M - White Metal
L/W - Lost Wax Brass Castings
E - Etched Brass
T - Turned
P - Plastic

(E151) - C32 - Lost Wax Brass Castings



gjb
E 151
T1
 [T1 - T20]



djh

E 151
T2

T21 - T34

T25x3



T22



T21

T28

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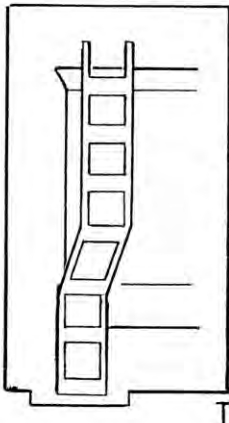
T27

T26

T24x2

T23

T29



T31x2

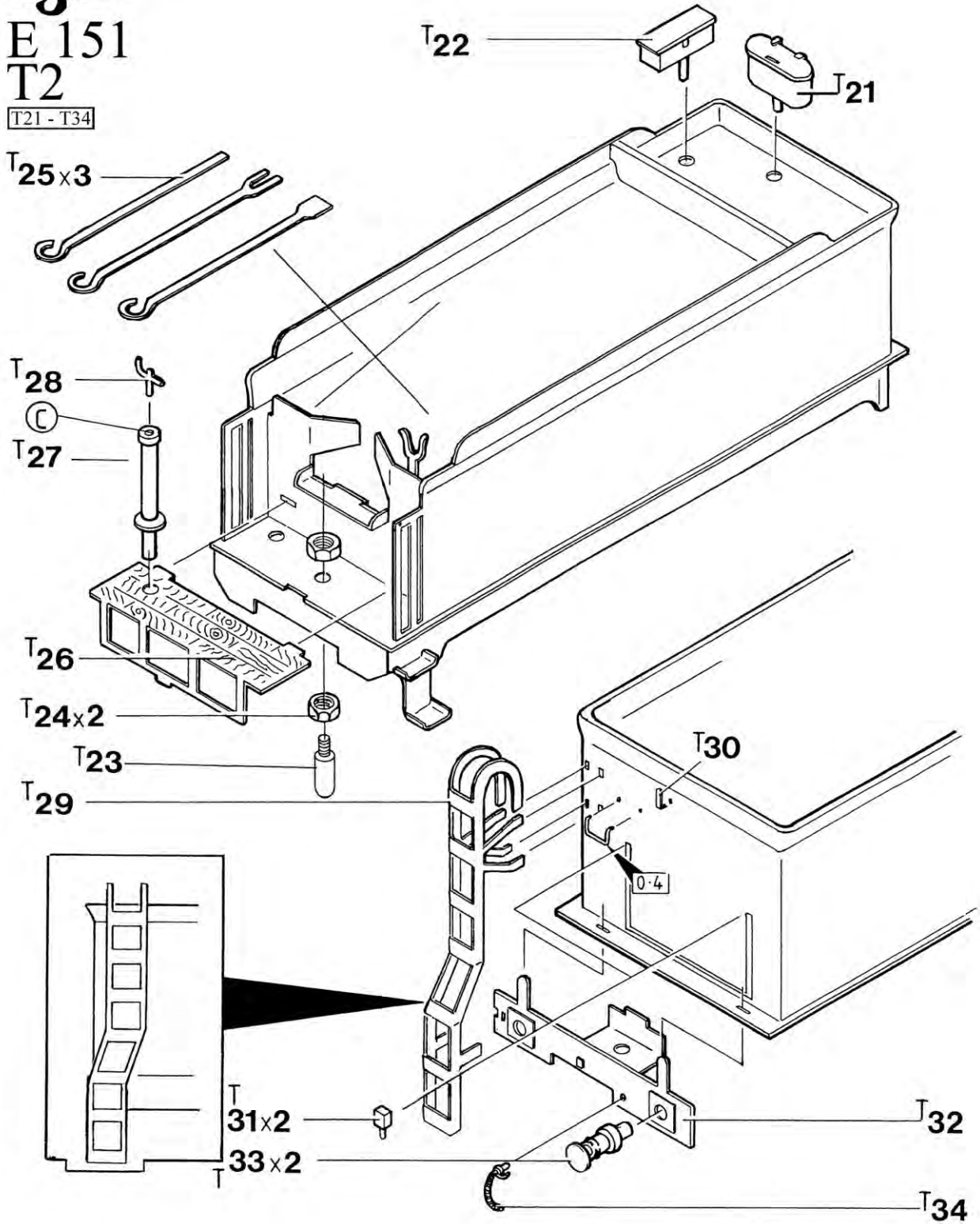
T33x2

T30

0.4

T32

T34

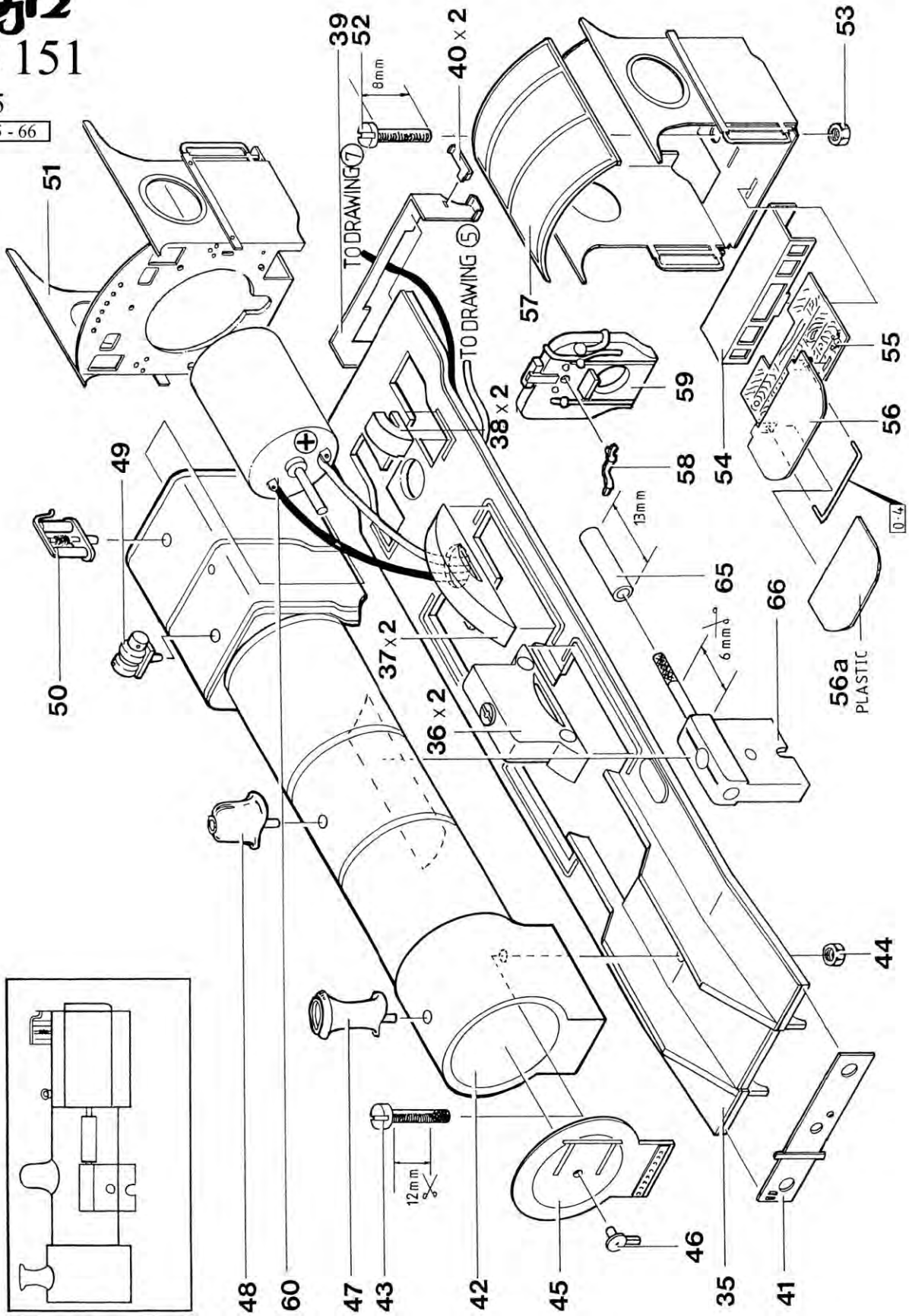


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E 151

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35 - 66

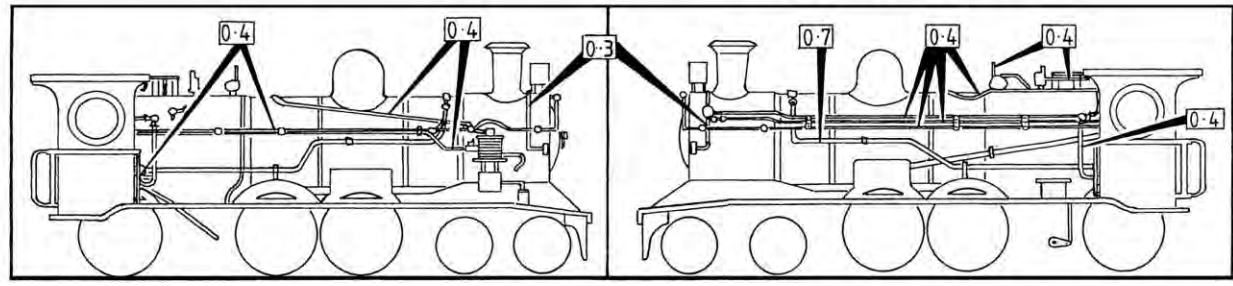
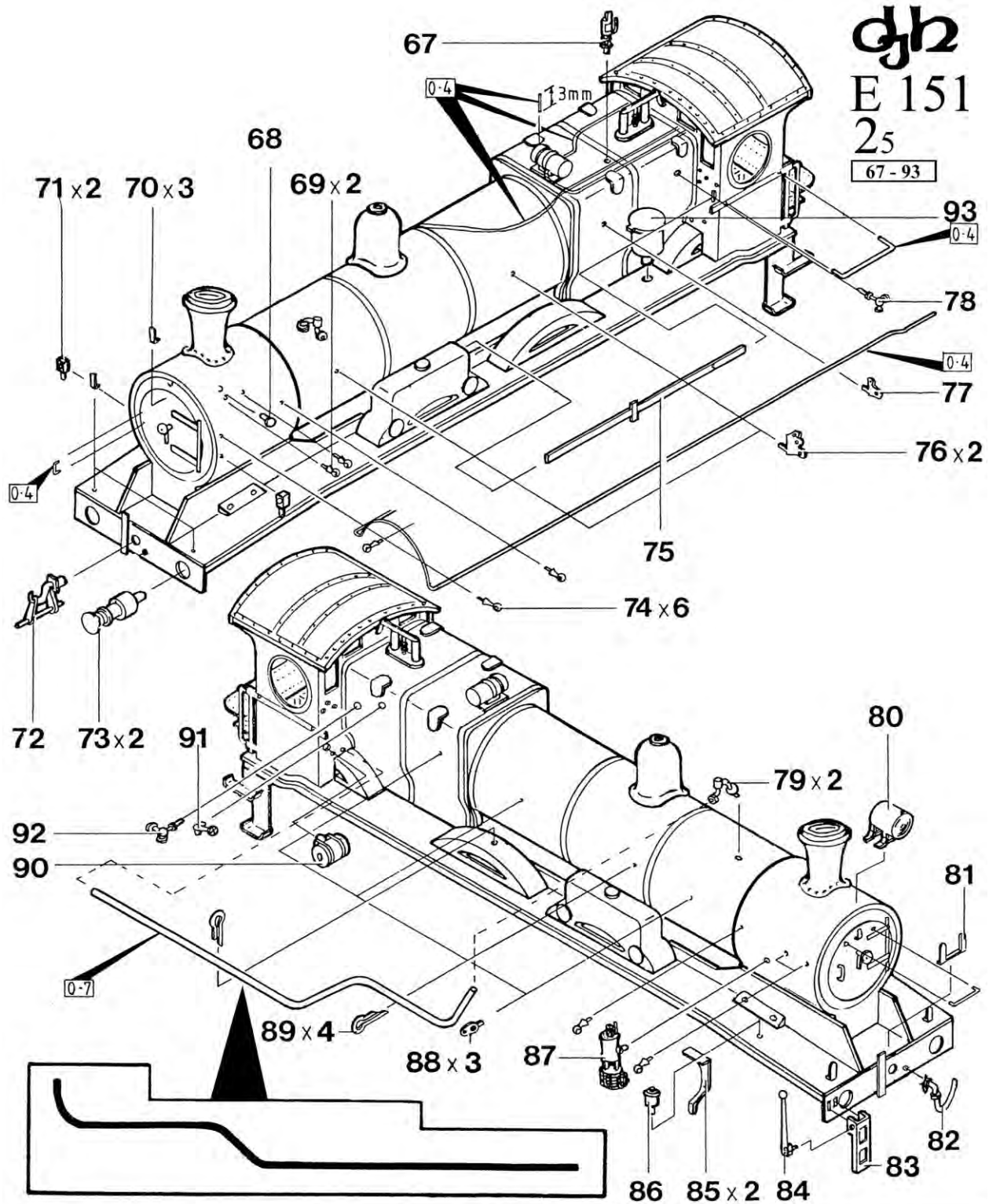


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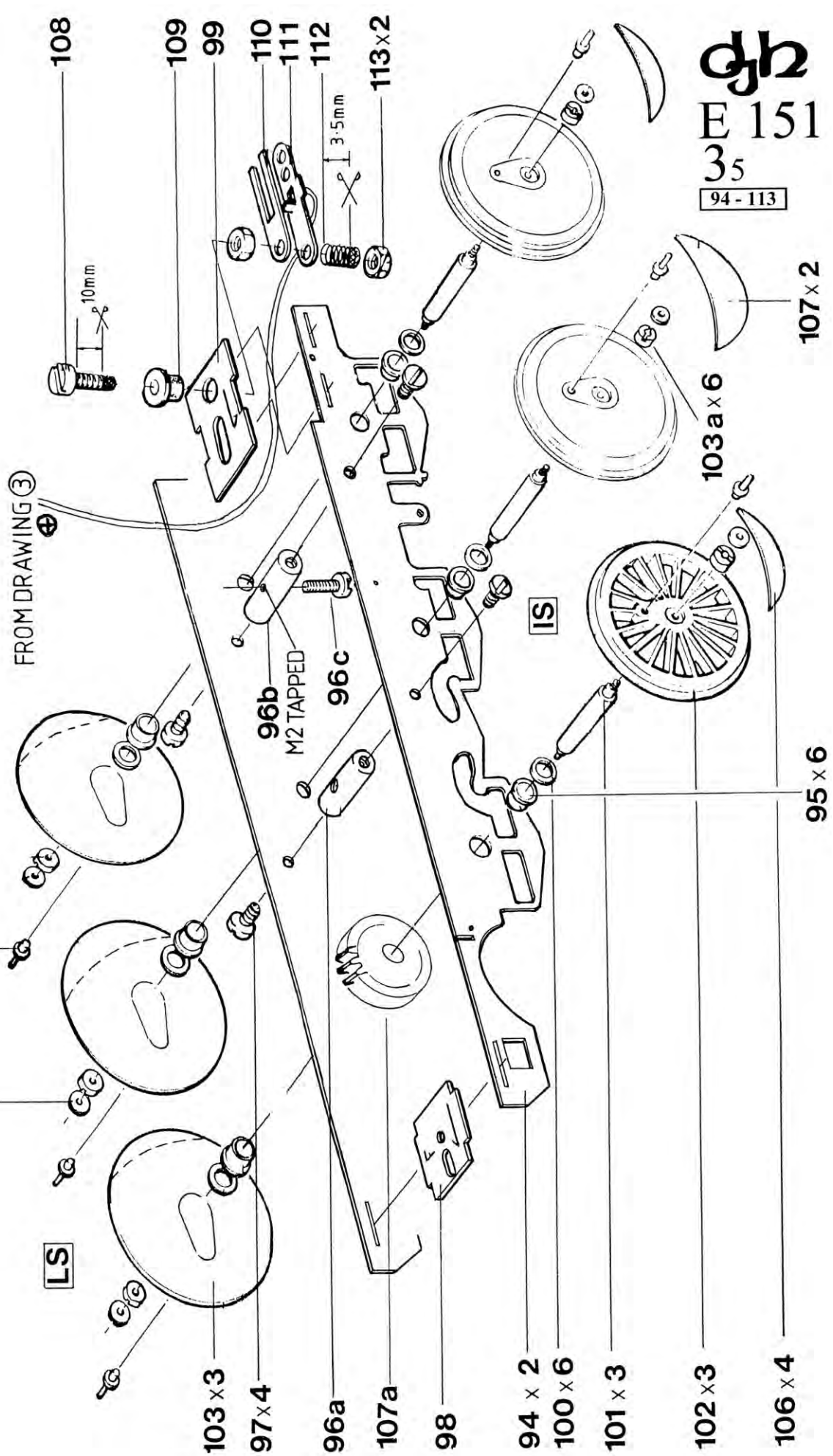
E 151

25

67-93

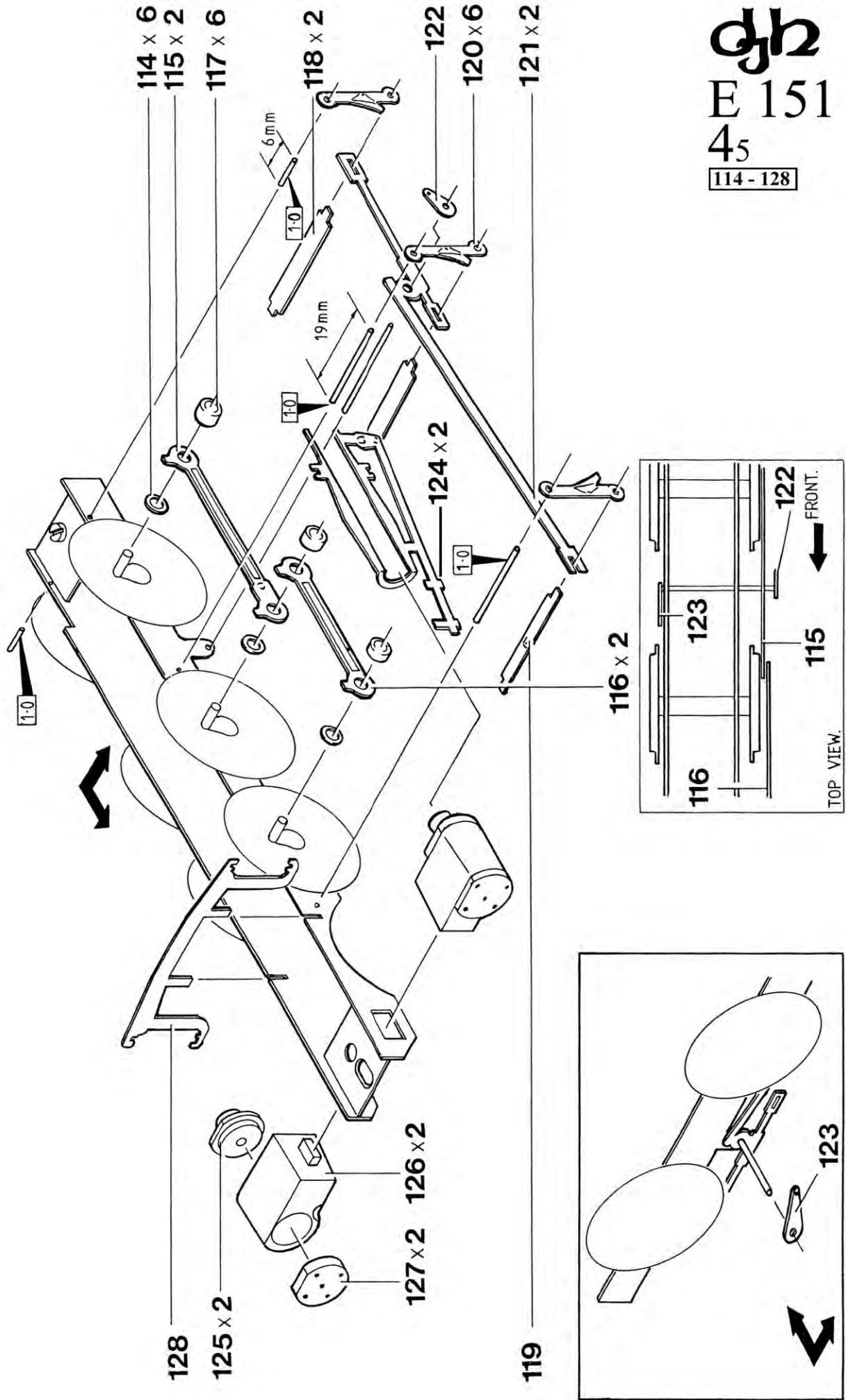


104 x 6 105 x 6



gb
E 151
35
94 - 113

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E 151
4₅
114 - 128



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55
129 - 144

