Assembly Instructions for the 65-ton Whitcomb Centercab Switcher Conversion Kit – TM05 / 06 / ?? Chassis[1]
3/2007

Requires Tomytec Motorized Power Chassis – Tomytec (Tomix) part #'s TM05, TM06, and possibly others in the 17m length group. The older, shorter Tomytec 12M series TM01/02/03 is different enough to require a separate set of instructions - contact me for the other one! Part numbers vary primarily by the length of the stock plastic frame (12m – 15m – 17m) which are all discarded for this conversion project. If you actually have a choice – the shorter/older TM01/2/3 chassis is easier to modify than the TM05/6.

Sources for Tomytec power chassis:
These parts are typically not imported directly to the United States through conventional distribution channels. Tomytec does not sell directly, and does not have an English-language web page. They are available primarily through online dealers that ship internationally. Confirmed sources that have, or have had, the chassis include:
Plaza Japan: http://stores.ebay.com/Plaza-Japan
Ebay (various – search for part# or "Tomytec chassis" in description)

TOOLS YOU WILL NEED:	**FOR:**
N scale ruler (Flint Supply or others)	All measuring and straightedge
X-acto knife and SHARP #2 blades, or similar	All cutting and trimming
Flat file – larger	Truing edges of cab castings
Tweezers	Parts handling and removal, wire bending
Needle files - various	Truing edgings of parts
Sewing scissors (high quality)	Cutting resin flash, wire
Pin vise	Drilling small holes
Drill bits; #80 (.012), .033/.035	Handrails and details
Adhesives:	
Walthers Goo (contact cement)	Gluing in lead weights to shell, various
Conventional 'super glue'	General assembly
Gap-filling 'super glue'	Cab to shell assembly, hole filling
Jewelers Screwdriver	00-90 screws for couplers, disassembly of trucks
Soldering iron and solder	Soldering handrails, wire
Straight pins	Locating holes for drilling
Small tap hammer and steel pin smaller than .035	Driving out motor shaft from flywheels
Thin steel plate with hole or slot in it	Support of flywheel when pounding out motor shaft

Paint: Acrylics recommended; conventional Floquil works OK.

YOU ALSO MIGHT WANT:	
Motor tool with speed control & small cutter	Enlarging casting clearances inside
Motor tool with pin vise arbor	Drilling handrail holes
Flush cutters (Xuron, Lambert)	Cutting handrails after soldering, shaping weights
Micrometer	Verifying drill sizes and dimensions

Couplers – your choice (Shell designed to fit MT 1015 boxes)

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[1] ***"??" refers to the 'yet unborne' versions of the Tomytec mechanism that will hopefully, probably, still work with this chassis….***

Band-aids	handy, don't laugh. Blood does stain resin.
Magnifying glass / optivisor	
Squadron model putty, green preferred	Filling small bubble holes in resin
Sandpaper – very fine grit 600# or higher	Sanding hood and cab seams

PROTOTYPE INFORMATION

The model is based upon typical Whitcomb switcher production of the 1943-1945 65-ton switcher as specified by the United States Army Transportation Corps for use in both Europe and North Africa to operate captured railroad facilities and provide general transportation.

The locomotives were specifically designed to fit lower and narrower European railroad clearances, necessitating the slanted hood and the original-equipment low and slanted-side cab. Similar locomotives with additional hood louvers and a higher center cab were used in the North African campaign. The Whitcomb model number is generally referred to as "DE6518".

The locomotives were also specifically designed with lighter trucks than standard Whitcomb production to lower the axle loadings for light-rail military service. When VE day in Europe arrived, the excess 100+ Whitcomb switchers were immediately repatriated to the United States and stored in Hawkins Pt. MD, awaiting reconfiguration for service in Japan, following the planned mainland invasion and likely destruction of Japanese rail infrastructure.

Not all Whitcomb 65-tonners were sent home, however, and numerous switchers were left to serve in the Netherlands, Italy, France, and possibly other locations as well, leading to a wide distribution of the locomotives on two continents.

Japan surrendered on VJ day before the Whitcomb switchers were redeployed from Maryland. They were declared surplus by the War Department approximately in 1947, and were sold to a wide number of industrial and shortline railroad customers to replace aging steam locomotives.

A significant number of the DE6518 models were repurchased by Whitcomb, and modified to better suit US domestic railroad practices, and resold. Whitcomb modified features primarily include a wider, straight-sided cab, and widening the frame to full 10' US railroad practice, primarily by welding on additional material to the walkways. From the side, these units are almost indistinguishable from the original.

Whitcomb also sold postwar locomotives using much of the same design components of the DE6518. In these 'all domestic' units, all featured elevated center cabs with additional oil coolers underneath, and most (but not all) featured heavier trucks often increasing their weight up to 70 or 80 tons. Subsequent improvements in the power plant led to a longer hood configuration with additional vents and doors, classifying them as true "80-tonners". These locomotives typically had a full-width frame, straight hood sides, but overall similar components to the smaller 65-ton units.

Meanwhile…back in Europe…. The surviving Whitcombs were purchased and often heavily modified by their host country railroads, although the Whitcomb lines were easily recognizable. The Netherlands replaced the original Buda prime movers, and designed an entirely different cab.

US modifications by buyers often included handrail modifications, changes in the power plant and exhaust systems, changes to the bolt-on stock draft gear, replacement of the trucks by heavier 'stock' Whitcomb 80-ton trucks, and individual changes too numerous to list. Replacing the Buda prime movers often entailed relocating the radiators away from the cab, and in some locomotives, a radiator grille on the nose is distinct sign of this change. Because of this, tonnage indications are indistinct as to identification.

Many Whitcomb units were bought and sold numerous times, and had multiple paint schemes and lives. Except for a handful of survivors and a few lucky units now in museums, most were considered to be an expendable' low-cost switcher, ruggedly built, and generally declined along with US heavy industry such as basic steel production in the 1980s'

USEFUL ONLINE REFERENCE MATERIAL:

Original USATC locomotives and specifications:
http://www.gregoriou.itgo.com/custom4.html

History of L&NE 602, through USATC production: (recommended reading!)
http://www.jeff-z.com/wks/locoroster/602/rhp.html

French Whitcombs:
http://cfve.free.fr/
http://cfve.free.fr/materiel/locos/whitcomb/whitcomb.html

Italian Whitcombs:
http://www.railpictures.net/viewphoto.php?id=25102
http://www.railpictures.net/viewphoto.php?id=25101

USA Whitcomb industrial and shortline photos:
(HIGHLY recommended)!!
http://www.northeast.railfan.net/diesel134.html
http://www.northeast.railfan.net/diesel102.html

L&NE 602, the operational museum unit:
http://jcrhs.org/L&NEtrip.html

High center cabs:
Beaufort & Morehead #95: http://www.railpictures.net/viewphoto.php?id=124742
W. R. Grace 2900: http://www.railpictures.net/viewphoto.php?id=77170

Whitcomb-converted square cabs:
http://www.railpictures.net/viewphoto.php?id=101713
http://www.railpictures.net/viewphoto.php?id=88154
http://donsdepot.donrossgroup.net/dr0302/ln103.jpg

Original slant-cab configuration
Hocking Valley Scenic: http://www.railpictures.net/viewphoto.php?id=36726
Prairie Sand & Gravel: http://www.railpictures.net/viewphoto.php?id=33899

Hybrid rebuilds:
Hocking Valley Scenic: http://www.hvsry.org/equipment.htm

BOOKS AND PUBLICATIONS

Big Critters - Compiled by James S. Eakin. An examination of larger, trucked, internal combustion locomotives built by the smaller manufacturers. Generally focuses on those used by industry, shortlines and government agencies, generally those created for one man operation, in the 44-45 ton range. Contains locomotives by Atlas, Brookville, Davenport, GE, Plymouth, Porter, Vulcan, Whitcomb, and conversions. 108 pages, B&W photos, (1993) Railhead Publications

Railroad Model Craftsman, August 1982: "**Columbus & Greenville's 65 ton Whitcomb No. 42** page 52

SURVIVING WHITCOMB 65-TON LOCOMOTIVES

USA:

Survivors fall into two categories, those that are preserved in railroad museums, and those isolated and abandoned industrial units that are reported in steel mills, gravel pits, and other industrial facilities. This is a partial list of those locomotives confirmed to still survive in 2005:

Possible other survivors photographed relatively recently – and please furnish updates if you know of the status! – include:

Hocking Valley Scenic Railroad # 8122 ("active") http://www.hvsry.org/equipment.htm
New York Trolley Museum http://www.tmny.org/tmny0009.html
Wannamaker, Kempton & Southern "L&NE 602" http://www.jeff-z.com/wks/locoroster/602/602.html
(This web link is HIGHLY recommended to visit!)

PACKING LIST OF PARTS

Qty.	Description
	Cast Resin parts (white in photos)
1	Hood casting
4	Step Inserts (2 left, 2 right)
1	Fuel Tank
1	Frame
	--------- CAB OPTIONS ------
1	Military-style sloped-sided cab –or --
1	Postwar flat-sided cab -- or --
1	Elevated center cab
1	Brass tube driveshaft splice
1	Decal Sheet

NOTE: The TM01/3 version does not include the 1/16 brass tube splice

A word about resin parts in general……

Frankly, I've never loved resin kits myself. I've tried some shells, and bought some shells, with limited success. Most shells are too thick, and lack sufficient detail, to be seriously considered as competition with injection molding. Current high-strength rubber molds, combined with higher-strength resin, narrow this gap with a little luck and planning. This particular model has the distinct advantage of the sloped hood, allowing the frame and the hood to be an integral casting – usually a real problem with hood-style units. Because of the variations in the cabs, it was far more desirable to do the cab as a separate casting entirely. This also made it far easier to produce cab details such as roof overhangs, and relatively thin wall sides, than can usually be done in resin.

Resin, by its nature, has limitations. I was told by a veteran model railroad manufacturer to 'relax', and remember that 'casting resin parts isn't a science, it is an art'. Basically I've taken that to mean that no matter how hard you try, you're probably going to have at least some inexplicable variations between parts when using resin from rubber molds.

You will find flash, 'thick parts', and various bubbles in various places.

I do a rough-trim of flash, and sometimes a detail trim of flash to make sure that the part is structurally sound. Not all parts are trimmed off identically in all kits. The reason some parts are well trimmed and some parts are not is because sometimes I really can't tell that a part is OK unless I do that.

While CR600 resin is durable, it's not unbreakable. Some thinning of the cab steps, etc. are thicker than the finished part should be, partially for shipping strength. I experimented with filing, shaving, and carving, and found that scraping an Xacto knife across the back of the cast piece quickly and accurately thinned it, minimizing damage. Filing was difficult, and tended to over-thin certain areas. Carving also works well, but is slower. You will create a virtual snowstorm of dust however, and don't do this near a finished model area. It is messy.

If the bubble can't be seen on the outside of the finished model, if it can be trimmed off without damage, and if the bubble doesn't compromise the structural integrity of the finished kit, it's possibly still there. I inspect each and every part myself before shipping. If you find something that you really can't work with due to internal bubble defects (which may only be discovered when you are trimming and fitting parts), drop me a line and I'll try to get you a new part. If you can, give me a clear description of size, location, etc. as I'm continuously trying to improve the molds and the process.

If you want to patch bubbles, here's how to do it:

I've tried a wide variety of approaches and materials. Some work better than others, and some were complete failures.

In general, ACC works great to fix any broken parts anywhere, but is particularly bad for filling. Don't waste your time, it won't work.

Squadron putty works very well for filling bubbles, and can be sanded and carved to the point where you really can't see it. Green is thinner, smoother, and harder, Squadron White looks less objectionable, but it is softer and less structural and doesn't sand well. For this kit, I recommend the Green, unless you're painting the shell a light color that will be difficult to cover the color contrast. Testor's white putty is more coarse, but more widely available and is white. It's OK. The finished putty can get a finish drop of thin ACC, which soaks into the putty and REALLY solidifies it for sanding, to the point where the finished repair is invisible. That seems to work the very best.

5-minute epoxy works well for big fixes, but takes forever to harden, and has a poor surface finish. You can try it, but I don't recommend it. Conventional model cement doesn't work at all with resin, don't try it.

If I discover bubbles in parts, cutting them and re-filling them with a tiny drop of CR600 was the ultimate fix, and in any 'structural' bubble was the fix. If you can't tell on any parts that I did this, that's how good it is!

A word about weights….

There's a wide variety of ways to weigh up the shell. I've used soft lead, but I won't sell that to anybody because of the obvious health issues. If you do use it, observe high cleanliness standards and clean-up afterward. I've also used the Micro-Mark low-temp 160 casting metal, WHICH CONTAINS LEAD, although it isn't lead. 160 is useful because you can actually pour it in a resin part without damaging it, although it is comparatively expensive. Observe full handling and cleanliness conditions when working with them; beware of filing dust and clean hands, tools, and work surfaces when complete. Painting the castings is highly recommended with a sealing-type paint.

PART 1: Disassembly, testing and modification of the TM05-06-?? Tomytec mechanisms:

The chassis kit consists of a motor/flywheel in a motor bracket, two powered trucks, six sideframes, brass contacts, and various cast metal weights. Only the components are used in the replacement resin frame.

While the kit has two power trucks, only one truck is powered in this conversion due to the short wheelbase. It may be possible to power both trucks with more dramatic surgery, shorter shafts, and a different frame, but not with these parts and these instructions!

1. Test the entire mechanism first and make sure it works. Lift one truck off the rails at a time to make sure the pickups are working. Note normal noise levels, etc. Test with small weights on top if desired Check on your curves and grades *before* changes are made. If it doesn't work now, it won't work later – no modifications improve stock performance except addition of more weight.

GENERAL DISSASSEMBLY

2. Both cast weights are popped out with a jewelers screwdriver. The motor case /bracket is clipped into the sides with four snap clips – insert a jeweler's screwdriver along the side and pop the frame loose on both sides. Remove the motor/flywheels in the motor bracket. Remove both long gray driveshafts and set aside. The silver cast weights are not used in this conversion.

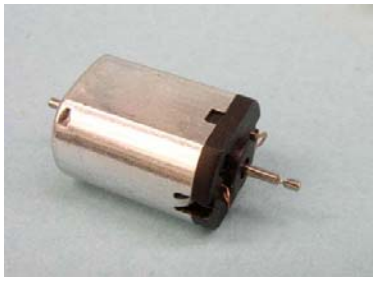
3. Remove the gray plastic motor bracket from the motor/flywheel – it clips front and rear. It, and the contact plate on the end, are not needed.
4. The long brass contact strips can be removed by popping out the transverse clips across the frame, and lifting out with tweezers.
5. Finally, use jewelers screwdriver and insert it between the truck tower and the frame, from the top, and pry the frame wider to pop out the two trucks. This takes a little effort; I haven't broken or damaged one yet. You need both trucks.
6. There is one set of plastic sideframes that reasonably resembled the Whitcomb 65-ton trucks with some trimming. Cut those loose from the sprues. The other sideframes can go to your parts drawers.

MOTOR AND FLYWHEEL MODIFICATIONS

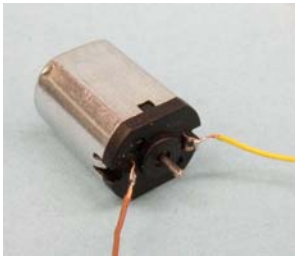
7. The entire motor and flywheel assembly is too long to fit in the hood. Both flywheels must be removed, shortened, the motor shafts shortened, and then reassembled back on the motor shafts. With the right methods, you can do this without destroying the mechanism – this may be the hardest part however, of the whole project!

8. Begin by driving the two flywheels off the motor shaft. Hold the motor suspended, with some method used to hold the flywheel solid and leave the shaft free to move – I use a vise, and a small steel square/triangle that is ideal for this. Find a steel nail, old drill bit, or something similar that measures .035 or smaller – I use an Atlas steel track nail – and pound the motor shaft out of the flywheel with a small hammer. Make sure the motor is going to land on something soft, or is contained from dropping several feet onto the floor.

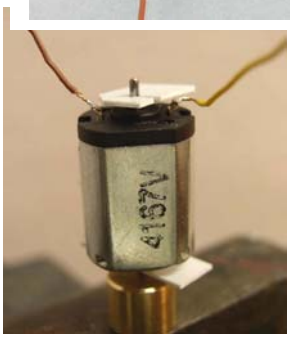
9. Now that you have the flywheels off, use an abrasive disk in a motor tool to cut off/shorten the interior brass shoulders on the flywheels. One flywheel can be cut completely off flush to the back, the other can be shortened to provide just enough of a shoulder so that the flywheel doesn't short out on the motor terminals and leads – leave about .030 behind. ***WARNING. YOU MUST USE EYE PROTECTION. WEAR SAFETY GLASSES! ABRASIVE DISKS SHATTER EASILY.***



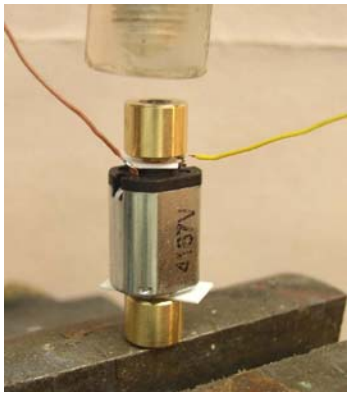
10. The motor shafts measured out .20 from the end bearings. Shorten both end shafts by .050 (remove ¼ of the protruding shaft) by cutting them slowly and gently with an abrasive disk. In the photo at left, the shaft is 'almost' cut through. If you don't shorten the shaft, it will stick through the universal and require an even shorter driveshaft, or internal binding. If for some reason you need extra clearance on the motor terminal end and don't want the flywheel there (DCC receiver space in the nose hood?) you may want to remove the entire motor shaft end.



11. Solder on motor leads by cleaning the end tabs (scraping), and using about an inch of wire on both terminals. If you have self-closing tweezers, use as a heat sink between the solder lug tab and the motor to prevent excess heat from melting the tab – it is actually the end of the motor brush holder inside there. Bend wires and tabs slightly over to the side to miss the flywheel.

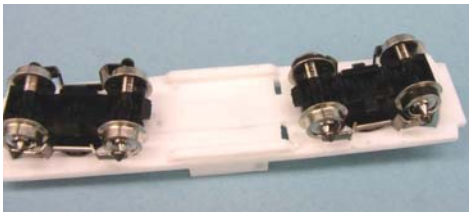


12. To prevent binding the flywheels on the motor, cut a couple of scrap pieces of material as spacers – I used .020 styrene scraps – with a slot in it big enough for the motor shaft. Put one on either end of the motor. These prevent the flywheel from going in to far when pounded on, and they will be removed immediately after the flywheels are put back on.



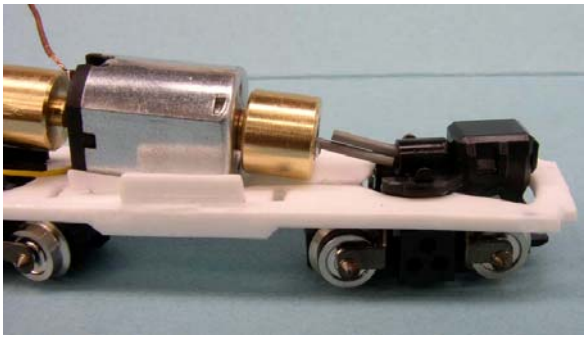
13. Tap the flywheels back on the motor shaft with a small hammer, gently tapping them back on the shafts with the spacers in place. Remove the plastic spacers, and spin motor with your fingers to make sure it works freely. If you have a test track or test leads, check the motor under power for both function and excess vibration. Chances are it won't be perfectly balanced, but the running RPM is slow on this model. Mine was horribly, and visually, off-balance and it still runs fine.

WHEELSET SWAPS

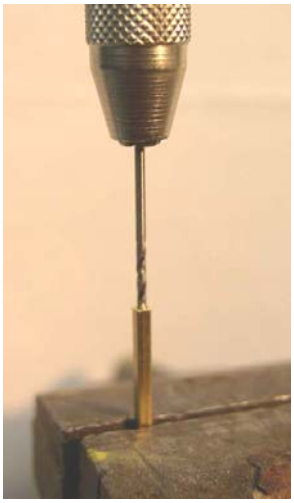


14. Trim any remaining flash out of the frame. Snap the trucks in the new frame, as they make a handy holder. Pop the bottom covers off of the trucks, and relocate both traction tire axles to the 'rear' truck' – the low end of the frame/motor. Remove the worm cover, worm, and loose spur gears from the lead truck, essentially converting it to a free-wheeling pickup truck. Replace covers after swap is done.

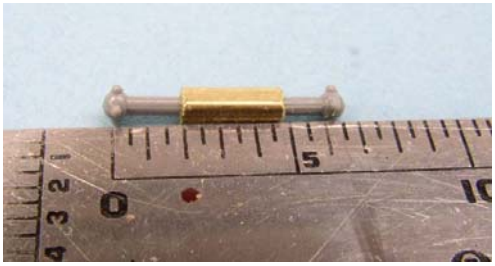
DRIVESHAFT MODIFICATION



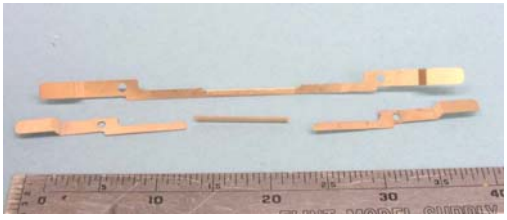
15. Cut one of the gray driveshafts in half with an Xacto knife. Place the motor and flywheels temporarily back on the frame, with 'half a driveshaft' in each universal. Note the position of the motor on the frame – the black plastic end cap should be about even with the tapered edge of the frame motor mount area. With both shafts pushed up into the universals, cut the driveshafts with cutters – roughly at the midpoint between the two universal joints



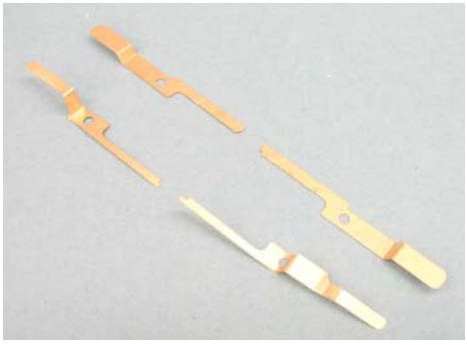
16. The driveshaft will be spliced with a short section of square brass 1/16" tubing from K&S metals. The interior of the tube is redrilled to #61 (.039). That's such an oddball drill size and dimension that I supply the splice tube on the TM05 kit to make sure it is available. The splice tube is ACC'd to the shortened driveshafts, so that the splice doesn't hit either universal, and the motor position on the frame is with the end black plastic cap more or less lining up with the end of the resin support area. (N scale ruler below):

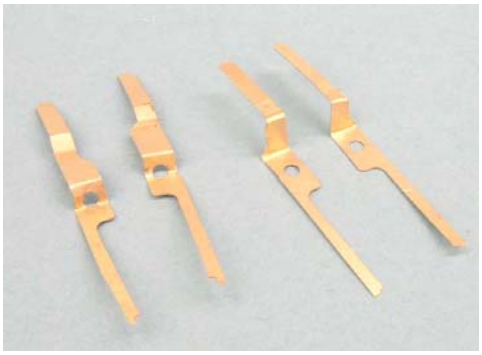


FRAME ASSEMBLY

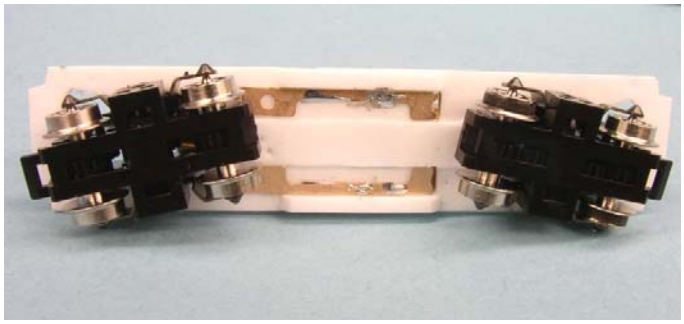


17. The first major step on the frame/motor assembly is to configure and install new pickup wipers from the old ones. Basically, that involves taking the old wipers, cutting them, inserting in the new frame, re-bending and narrowing them, and re-soldering them together. With this approach, nearly any Tomytec wipers of any length frame can be used.
18. The stock Tomytec wipers get the center folded-over area cut out of them, as that's of no particular use I could find.

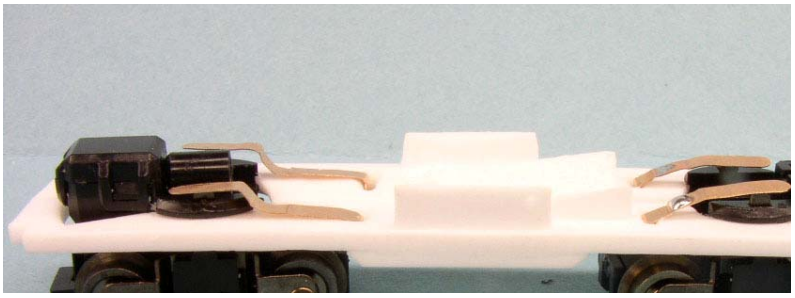




19. The contacts will be cut and rebent to fit the new frame. They will also be narrowed above the frame only, to fit inside the hood.
20. Begin by cutting the wipers – see the before and after shot at left for the first trim/bend with sharp scissors. Study the situation as the wiper under the flywheel area (rear gear truck) has to be longer from the bend than the wiper under the front end (pickup). Dimensions are not critical as they will be resoldered again under the frame to proper length. Note that there is a 'right' and 'left' as well as a 'front' and 'back' cutting pattern here to fit.
21. Next photo shows all four contacts trimmed and bent to final shape. The rear ones by the flywheel are at left, the front ones on the pickup truck are at right.
22. You'll need to have the trucks in the frame to verify the exact bend locations of the contacts.
23. Start with a shorter 'front' contact, put on top of the frame so you can see where it needs bent down to fit down in the slot of the frame. Do a 90-degree bend of the material so that it goes straight down in the slot, with the rounded edge slightly ahead of the centerline of the truck. You need to be able to hit the pickup 'nub' on top of the truck when it is fully rotated to each side.



24. Repeat this with the other four contacts. Note the width of the contacts above the frame – as is, they won't fit up in the hood as they are too wide. Once you've established where the top bends have to be, you need to narrow the portion of the contacts ABOVE THE FRAME, about 30% thinner than the stock width. I re-trimmed them with sharp tiny trimming scissors.
25. Note that the motor-end contact is also slightly bent inward to hit the truck center and miss the flywheel., and is trimmed to the inside – not the outside – edge. Later photos with the motor on should be examined, too.

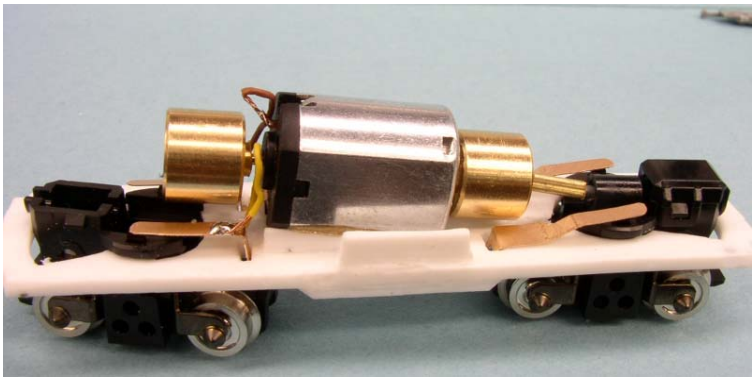


26. The motor end contacts are bent to be low and flat beside the flywheel, then come up at a 90-degree bend behind the truck tower, re-bend again to hit the truck center pickup nub. The front end contacts are less precise, and just need to be bent to hit the truck tower center.

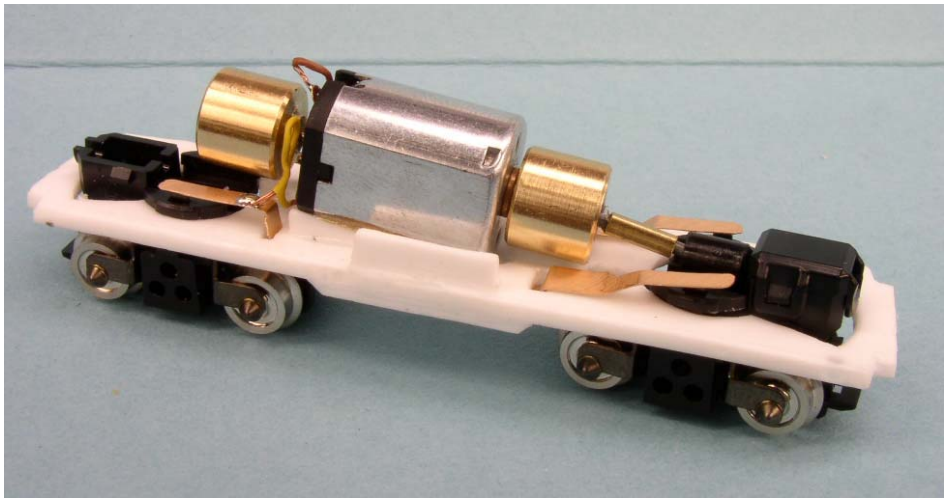
27. From the bottom, the two pickup wipers should fit in the slots , and be able to overlap. Use the slots to help position and test the wipers as you adjust and bend them. This is a fussy process, take your time.
28. When you think you've got the bends and trimming about right,, do a quick solder spot to resolder the contacts while holding them down with the tip of an Xacto knife. It isn't that difficult to re-heat the solder joint there if you would have to remove the contacts for cleaning or repair. You may also have to do a light shot of ACC in the center to hold everything in place here.
29. You need to put two small solder spots on the pickup truck end to solder the motor wires to. This shows in both these views.

MOTOR MOUNTING

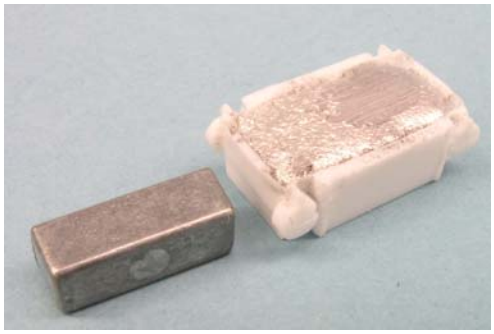
30. Carefully tuck the motor wires around and behind the flywheel. Check the motor position on the frame so that there is some (.020) free movement on the drive shaft between the universal joints.
31. Solder the other two ends to the pre-tinned spots on the pickups, a quick shot will do. If you see the photo, with the number stamping away from you on the motor, the top motor contact goes to the far contact set, the bottom one toward you. That is 'normal' running direction for DC. Check the clearances and fit of the flywheels The flywheel should not touch the pickup wipers. The ideal fit is to push the motor back tight into the driveshaft and into the universals, then bring it forward about .020 so that the driveshaft does not bind in the universals with any truck motion.



32. I secured the motor with a light shot of Walthers "Goo", in release-contact mode. If you are careful to put the glue on the outside edges of the motor rather than underneath, it's fairly simple to just cut the motor loose with an Xacto knife cut if you do ever need to actually remove it for replacement or maintenance.

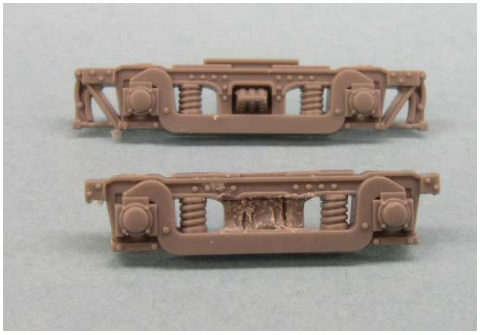


FUEL TANK



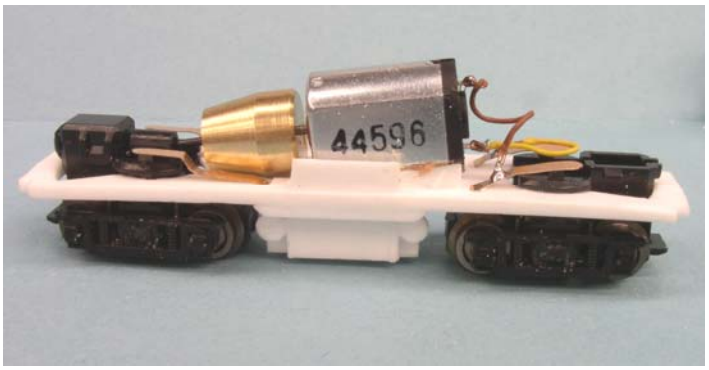
33. You need to put weight in the fuel tank, either by using the original supplied weight or by filling the fuel tank with metal. I used low-temperature "160 Casting Metal" from Micro-Mark, which doesn't even damage it and works as a mold.
34. As-is, the fuel tank was designed to fit OVER the original TM01 frame mechanism tank.. As such, it is actually deeper than it should be. Either before or after putting in the metal, you may remove .020-.040 'off the top' so that it has a little better clearance between the bottom of the fuel tank and the rails. If it is put on the frame without thinning, it only has about .010 of clearance over the railhead. You can put this on the bottom of the frame simply with Goo, or drill a mounting hole through the metal, and put a ¼" 00-90 screw through the whole works for a removable fuel tank to get at the contacts. Be careful that the metal in the fuel tank doesn't short out the motor contacts – insulate either with tape, thin styrene, or file one side slightly deeper than the other.

TRUCK SIDEFRAME MODIFICATIONS



35. One of the supplied Tomytec TM05 sideframes can be modified to a passable Whitcomb sideframe with some trimming only. The stock frame is on the top, the trimmed one is on the bottom. Trim the top edge, remove the center leaf spring, spring support, and the connecting part of the ends and brake shoes, as shown. Also see the prototype photos for guidance.

ASSEMBLED MECHANISM AND FRAME



36. This view shows the finished frame and mechanism with the motor and fuel tank mounted, and the truck sideframes in place. (TM02 version shown, but you get the idea….)

Part II – Building the resin body.

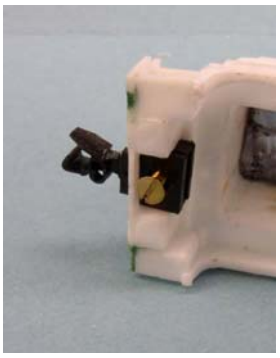
SHELL FITTING AND TRIMMING

37. The basic shell is rough-trimmed to check for quality only. Additional trimming and fitting is necessary to fit to the frame, and to fit the selected cab to the frame..
38. If you turn the shell upside down and examine it carefully, you'll note that one end is actually wider than the other. The wide hood fits over the raised motor end, and may even require some light trimming not to directly hit the shell, on both the interior of the shell and the very top black edge casting of the motor..
39. The second area of attention is the shell cutouts at the frame center. This was developed to originally fit over the TM01 chopped frame, and this remaining section of frame was necessary to hold the motor bracket on. The raised 'cab edge' of the frame actually gave it quite a bit of strength, so it stayed in the redesign. The rounded-out areas above the frame at the cab are completely cut out, and are enlarged, to fit the upright frame edges that fit in there like a slot, and also align the cab. This will require trimming so that the area is completely flat.
40. The step areas need to be completely trimmed out of any remaining flash.
41. Examine the lower edge of the frame, all along, and fill with putty and/or trim flash to get a nice edge.

42. If you are doing the raised center cab version, you can get a nice 'see thru' window effect by cutting out the center cab area behind the windows and above the motor. This allows seeing thru the cab windows from one side to the other . The windows on the straight cab and slant cab versions are really too low to allow this benefit, you can still do it, it just won't accomplish much!

43. Drill out the headlight hole on both ends if you ever desire to put a bulb or LED in there.
44. Now is a good time to experiment with weight options. You can use your favorite method – I like to hammer soft-lead fishing weights to shape and cut them with flush-headed cutters (Xuron or Lambert) to get a good fit, and eventually glue them inside the shell. You want to get as much weight as possible over the gear-drive truck. Depending how well the unit rides, and picks up electrically, you may want to add some weight in the front end as well, but the more you add the less the locomotive will actually pull, so it is a compromise here. With the front flywheel, the TM05 has limited space here.

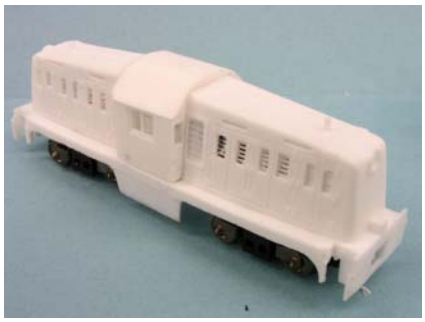
45. If you ARE planning on running the unit on DCC, the nose area in front of the motor is where you've got extra space. You can pretty much do anything you want in there.
46. With the shell propped on the chassis, check your clearances between the weights, flywheel, motor edges, etc, and repeatedly tinker with things until you've got it free and clear. When you finally get things to fit properly again, you can remove the weights and permanently Goo them or ACC them in.
47. If you're planning on a headlight, you can re-drill a hole through the top of the weights again to allow the wire to feed in across the hood top.



48. Now is a good time to test mount the couplers. The shell is designed to fit a normal MT 1015 (short-shank) box and coupler, though a 1016 will work as well. Enlarge the hole and level it out to fit a box in from the back and bottom. You can secure the box with the supplied 00-90 screws, drilling about .035 – tapping is optional in soft resin.
49. You'll need to put in the coupler pin after the coupler is inserted through the end sill.
50. If the frame is fitting all the way up into the shell AND the contacts are set 'soft' enough so that they don't jack the whole unit up off the frame (also a function of how much weight you got in there), you'll be able to fit the body on the frame and the coupler height should come out right-on without shimming. You'll want to adjust the contacts again to put as much load on them as you can without jacking up or tipping the shell
51. Now you can actually test run the locomotive and see how it will run on your layout. If the motor or the flywheel is touching anywhere, you'll hear it. With the shell on, it can be very quiet, so if it isn't keep looking for touch areas. Until the lead weights are in though, it's a pretty noisy shell.

CAB MOUNTING AND INSTALLATION

Slope-sided cab



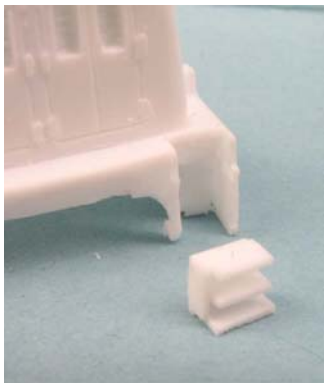
Straight-sided cab

High center cab

52. The first thing you need to notice is that the cab also has a 'front' and 'back' to correspond with the wider end of the hood to clear the motor. It will only properly fit on one way..
53. Trim out the window areas with a brand-new Xacto #2 blade. Don't use an old blade - you will likely break the center frame post, which is nominally .020 thick. When cutting window openings, always cut toward solid corners or the bottom – never toward the center – so that if you do slip you don't cut out the center portion. If you do make a mistake, glue it back in with ACC
54. You will have to remove material from the inside and bottom edges of the cab casting, and the top inside of the cab roof, to get a good fit. Work slowly, and check the fit often
55. .Material may have to be removed from the top or outside edges of the frame to fit the cab area – remove as necessary.
56. Now is the time to paint the inside of the cab. Photos of Whitcombs have indicated that a good light'battleship gray' was the standard inside cab color. Paint the inside of the shell area you can see through the windows, and also any portion of the cab walls you can see through the windows.

57. When satisfied with the cab fit, use gap-filling ACC to glue in place. If necessary, tape down with cellophane tape while it sets to make sure that the cab is as tight to the frame as possible

STEPS



58. There are four separate step castings. Each one is slightly different to fit the exact variations in the scratchbuilt master, so check the steps in the various locations to check for the best fit.. The 'wide' step goes on the bottom, and the vertical 'edge' goes to the inside, behind the curved portion of the frame toward the fuel tank. They may have to be trimmed to fit.
59. I'd encourage the use of photoengraved step material, or even see-through brass photoengraving here from BLMA or Gold Medal Models, if you have it. The minimum thickness to cast resin is about .020, so the steps are thicker than they should be. Glue the finished steps to the body with ACC, working from the inside

BODY PUTTY AND SANDING

60. Chances are you'll have at least one spot on the shell that will require some body putty filler to smooth mold edges, or any bubble irregularities. Fill edges and level seams as necessary. Sand with 600-grit or smaller. Green Squadron adheres particularly well to resin, and is the first choice unless you have a light-colored paint scheme where the contrast will be a problem. (In my first test shells, there was a pronounced problem on the end sills with seam misalignment and bubbles. This is corrected, but shows the process well here)

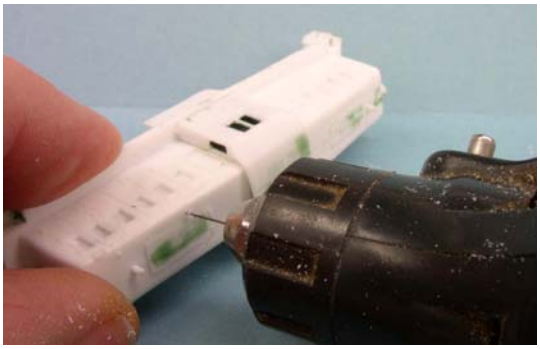
Handrails or Paint?

Depending on your model, your paint scheme, and your prototype, it may make more sense to paint first and then put on handrails, or put on the handrails and then paint.

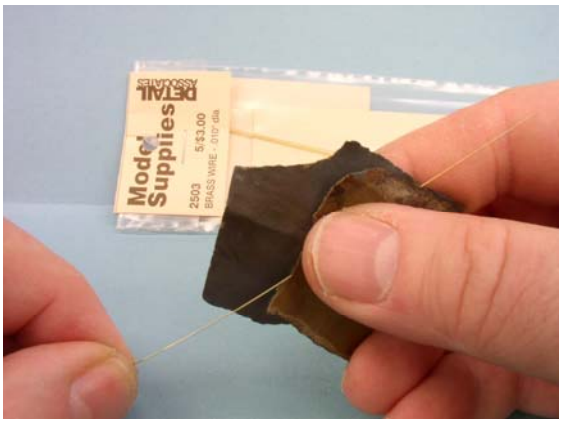
It is particularly hard to get BEHIND handrails to detail paint, apply striping, paint separation lines, etc. On the high-center cab version, I did the sample model through first paint, then applied handrails. On the slope cab model, I did just the reverse – put on all handrails, then did first paint. You can also apply some handrails that aren't in the way at all, then paint, then finish the job! But in any case, don't make the same mistake I did on one of my early efforts – in my haste to show the handrails, finished them, then discovered it was virtually impossible to apply clean paint separation lines behind them. That being said, we'll follow both models through completion now.
The slope cab version only requires TWO soldered connections. YOU CAN DO IT!

SLOPE CAB HANDRAILS

61. Check the photos and drawings of your preferred unit for handrail layout. There are many variations! Begin the handrail process by marking out drilling locations with a straight pin to 'center punch' the drill sizes. #80 (.012) drills work for .010 wire. Use reference points on the body shell as the best measurement tool.

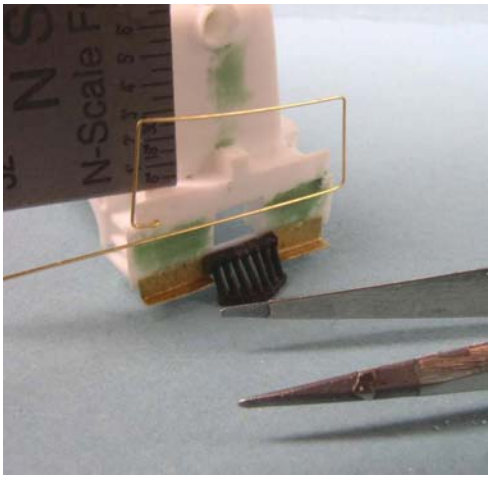


62. Signature Whitcomb features include the odd 'hood edge' handrails on the RH side of each end hood. The tiny steps were between the end door s and are almost too small to see.
63. You can use a hand pin-vise for drilling holes, but I like a Dremel tool with a speed control on low speed.

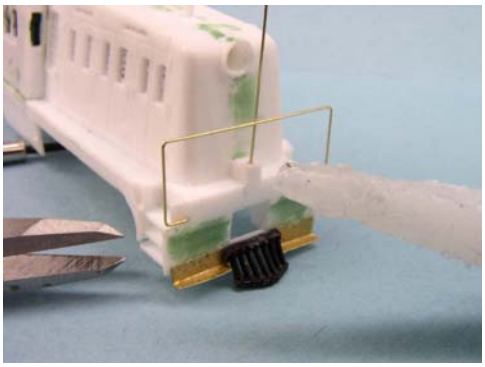


64. I prefer Detail Associates wire products .010 wire if I can find it, but K&S metals also has straight brass wire that works fine. On all products, you MUST CLEAN the wire using fine sandpaper – 600 grit or better. If there is a secret to doing wire handrails, this is probably it! The wire absolutely must be clean to get small, tight, and solid joints.

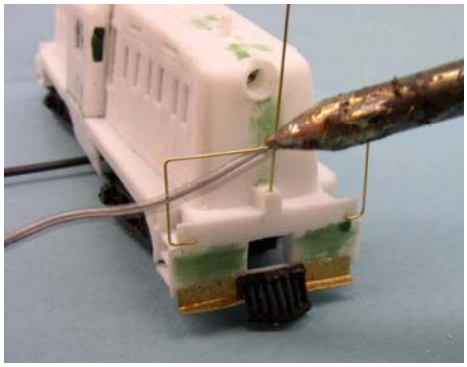
I use Radio Shack thin rosin-core solder, a Radio Shack dual-heat soldering iron (with a tip in good condition), and regularly clean the tip by both scraping and wiping with a cleaning sponge. It also helps to have a collection of 'props' to support the body in various positions while working. The Whitcomb body fits quite nicely in the inside of the plastic solder roll, and that is a good and sturdy holding tool when working on the ends of the locomotive.



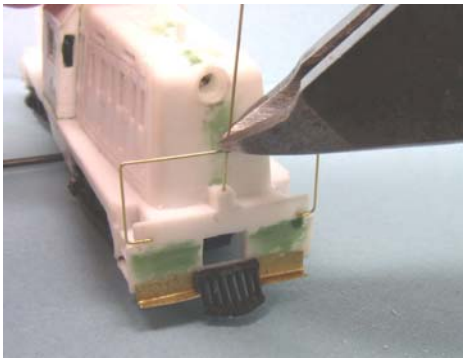
65. The beat-up old tweezers in this shot show the perfect type – sharp enough to be accurate yet thick enough to twist the wire over without twisting the ends over. The missing chrome means it only grips easier on the steel.
66. .A typical end handrail starts with this pattern – end bend drilled in the sill, 36" above the actual frame (this seems standard for this unit as handrail height) , over to the other side, around, and down.
67. You can successfully rebend the Detail Associates wire 2-3 times without snapping it – one of the reasons I prefer it – so if you bend it wrong, just bend it flat and try again.



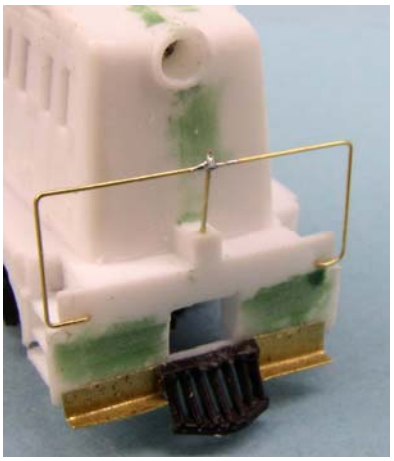
68. Bend around the other end to fit it in the end sill hole, check for straightness, and ACC in. The vertical handrail is drilled in the MU box. The key to getting straight vertical handrail stanchions is to work with LONG pieces of wire on the verticals – long enough for you to hold and adjust them before cutting. Verticals always go behind the horizontal wire. ACC them in place to the shell before you solder them, making sure they tightly contact the horizontal members. You can always bend them back straight when you are done, but when soldering they must be together TIGHT.



69. I used a 25-watt iron with very thin rosin-core solder. Feed the solder infrom the bottom or back, iron coming in from the top. When you heat and melt the solder, pull the iron away from the work and it will make a waste chunk of solder AWAY from the handrail that can be cut off. The direction and movement of the iron is important. If the vertical member isn't straight, reheat and adjust as necessary, holding the upright wire with your fingers.

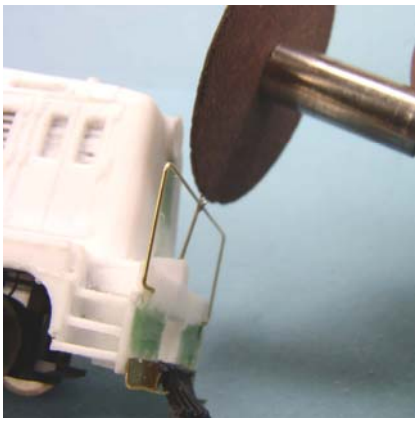


70. Do the first trim of the soldered joint either with flush cutters, or sharp sewing scissors. Don't try to make the cut perfect, just remove as much material as is practical.
71. Usually you'll solder up all the joints first, then grind them last. We'll do this one joint now.

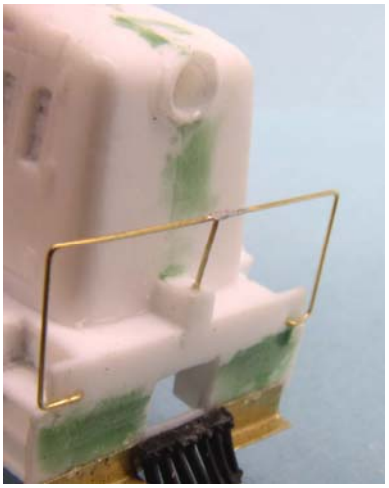


72. This is a fairly typical-looking joint before grinding. It isn't perfect, or presentable. It is strong, shiny in appearance, and incredibly strong for the amount of material present.

73. Now begin the grinding. Use an abrasive disk in a Dremel-type tool. **IMPORTANT!!! YOU MUST USE EYE PROTECTION!!!** I just can't emphasize this enough. You're grinding metal particles, including lead and brass. The abrasive disks can easily shatter and fly into pieces. If you ever had reason to use safety glasses in modeling, this is it. I've lost track of how many times disks have shattered and particles have bounced off mine. If you don't have good eye protection, DON'T DO THE NEXT STEP!



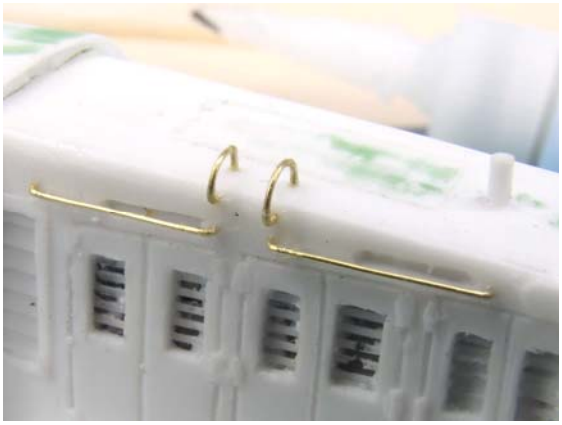
74. Use some kind of speed control, and run at medium-low speed, enough that it is steady but not that it is chattering the work. You should feel comfortable resting a finger on the arbor while it is moving to get precise feel. If it is running too fast to feel comfortable, slow it down.
75. Rest one finger on the handrail wire, and another finger on the disk arbor, so you have a precise feel of the touch. Bring the disk in so you are working from the top and back edge, sanding forward. Use the edge to gently shape the top joint.
76. If you do break a joint, don't panic, resolder and try again. You can also trim the joint with the tip of the Xacto knife, particularly under the handrail and on the stanchion where you can't grind.

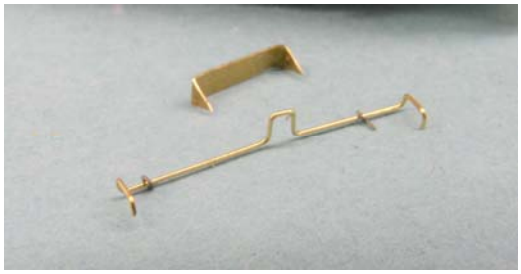


77. The final solder joint should look something like this. See, its not impossible! Resist the temptation to replace all your oversize handrails just yet, we still have a locomotive to finish here….

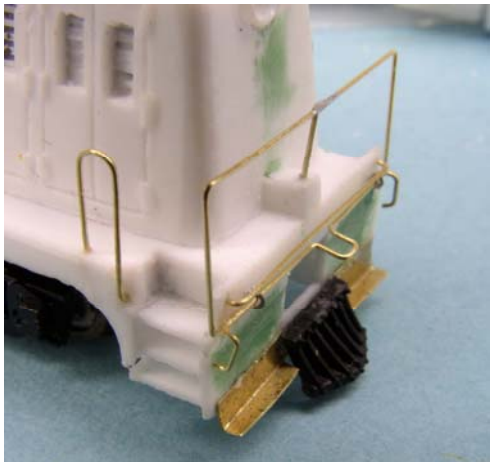
Note – the oddball boiler-tube pilot is specific to the model I was making – Allegheny & South Side 100, and was made from leftover 1970's Atlas steam pilots in the junk drawer. I've never seen another Whitcomb with them and they are not typical. The footboards are thin sheet brass bent over with tweezers and ACC'd to the end sill. Depending on the era, they may or may not be typical, as footboards were banned from non-industrial locomotives in the early 1970's.

78. Rooftop and hood side handrails are also done with .010 wire. Check photos for exact placement. Original USATC units did not have conventional side handrails, only the nose ones just above the doors and below the oval-shaped ventilation holes. The top 'grabs' to access the roof seem common to all Whitcombs of various sizes. See photos below for placement. Tiny steps were actually on the hood between the doors that were no more than footholds.





79. Two other details that were typical to Whitcombs are the cab sunshades and the uncoupling levers. I fashioned the cab sunshades from thin brass, cut with sewing trim scissors. The uncoupling lever is .010 wire, and the brackets are Gold Medal Models lifting lugs. Styrene scraps can also be used for the sunshades, and the brackets can be made from wire bent over and around in the tweezer tips.



80. End details here include the installation of the handrail across the sill (just above the uncoupling lever, original USATC position), the rounded-over vertical handrails beside the steps (also original), and the installation of the uncoupling lever on the sill. If you have a unit with striping on the sills (as the centercab example does) these would go on after decals.

PAINTING

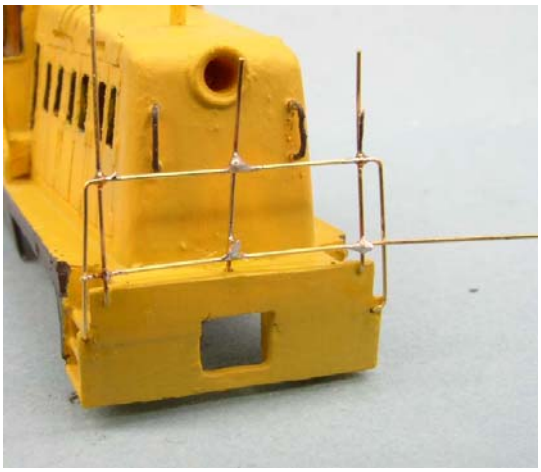
81. Resin is incredibly forgiving for paint, and I've used Polly S, Polly Scale, Badger, and conventional solvent-based Floquil, all with success. Beware however, that you still may want to test adhesion and compatibility with a test area first, the frame, the inside of the shell, etc., before you do the entire locomotive. I've found that certain combinations just don't work – and others work quite well.

82. In these two examples, I've done completely different finishing techniques and paints. The yellow centercab (Grace 2900) was painted with Badger "Railbox Yellow" as a primer, and then a light coat of solvent-based Floquil "TTX Yellow" over top to get a more weathered and faded appearance. All the black details, frame, and trucks were brush painted first with Polly Scale Grimy Black, then the edges scraped clean, then the final yellow coat brush-painted.

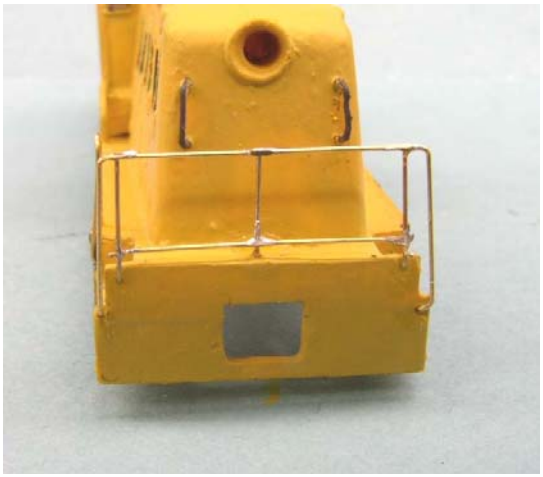
83. The Allegheny & South Side 100 unit was painted with two coats of Polly S "Leaf Green", which has a very flat and grainy finish not particularly well suited to decals. After it dried, it got a coat of Testors semi-gloss prior to decaling.
84. As the handrails are already on the slope cab, they were done with the same Modelflex "Railbox Yellow" by Badger. The brass handrail wire holds paint extremely well and suffers from none of the problems of plastic/delrin handrails from flaking or peeling paint.

CENTERCAB HANDRAILS

Unlike the slope cab, the centercab model with full side handrails is a real 'project' for brass handrails. While it's not an advanced project, it is far more difficult than the slope-sided cab, and after you've done this one, you'll be ready to take on pretty much any other diesel in your roster! The centercab 'probably' wants to be painted, and the hood portions decaled, before you start. The handrails will be brush-painted after you are done, so to get anything done behind the rails you need to do it now. End grabs, top grabs, and smaller wires can be done before paint.



85. Begin with the end railings, just like the slope cab. Mounting points are different than the slope cab, but the 36" height remains the same above the floor level
86. There are three vertical members that get done first, soldered to the horizontal rails. After those are solid, the final lower handrail is worked in between the stanchions and also soldered. I'll put this photo in here to show exactly how rough this looks during the process, so you don't get discouraged!



87. After trimming, clipping, grinding, and some light carving of excess solder off with the tip of the Xacto knife, the pre-paint handrails can actually look pretty good. Note that on this particular unit, the MU box has been removed, and the vertical center member goes right into the frame. Check your individual unit prototypes to see if they were or were not equipped with the MU box, as it affects the handrail shape.

88. Mount the standard curved end rails at the step side first, to the same 36" level at the top as the end rails. After those are done, bend up the side handrail from the cab mount, and align it to the 36" height to the step level. You'll have to tinker with the first one a lot. Check photos, and even photo it, to see if it looks right.

89. The method for vertical stanchions is to 'divide and conquer' Start by establishing the end height first, by bending it down parallel with the step rails, and inserting it in a #80 hole in the frame. When you get it straight, ACC it in place. (note how I had to change the taper portion by the cab from the above shot, too)

90. Remember the 'long wire' idea, so you have enough wire above the rail to hang onto with your fingers and set the stanchion straight during soldering. Insert, glue, and solder the vertical stanchions next. Begin with the center one, and solder in place. Then do the one closest to the cab, and closest to the steps. This will work better than soldering them sequentially.
91. This photo shows all three vertical stanchions after rough soldering and clipping. After you get one horizontal rail right, you can use it as a template for bending the other handrails on the other three spots.

92. Same view after finish grinding of the solder joints, and final brush painting of the rails

FINAL DECALS AND FINISHING

93. You'll have to be pretty creative on the lettering on most Whitcombs, as except for a very few, no commercial decals are available. Judging by the photos I've seen, though, a good many industrial units had little or no identification on them anyway.
94. Some decal ideas: www.dansresincasting.com – Dan and I developed the Allegheny & South Side decals together – contact him directly for N sets for this locomotive – possibly the most politically incorrect railroad herald in history!
95. Microscale (www.microscale.com) that 'might' work – see website for photos of sets:

- Columbus & Greenville lettering on set Trailers -- Stock# 60-347
- Lehigh & New England set Stock# 60-882
- United States Army -- Stock# 60-4391 (this is a good USATC set for the 1940's)
- Industrial Signs -- Stock# 60-289 (several good possibilities for generic industrial names here)
- That's just a sample. You can spend a lot of time on the Microscale site!

96. Decals always work better on glossy surfaces than flat. If you want a flat finish, you may still have to either use gloss paint, decal, and use dullcote, or on flat paint, do a light sealing coat of Glosscote or semi-gloss.
97. Custom decals can be made with the right tools. As conventional computer inkjet printers can't print white, you have limitations. But if you can get around that, consider using a conventional word processor or graphics program to develop lettering. Photoshop has the ability to take photo images and 'de-keystone' them removing perspective, and pixels can be individually edited to make custom graphics. Results can be printed on special inkjet paper available from Micro-mark. If you are only doing black lettering, Micro-mark also has laser printer decal paper. The results will have to be sealed, as most inkjet printers have water-soluble ink. Testors makes a 'custom decal finishing kit' that contains a spray that does an excellent job of sealing inkjet decals. If you have a good idea, and don't mind sharing it (i.e. I can include it on my kit set) contact me and I may be able to print your graphics as a team project with the supplied decals.
98. Beware that Micro-Mark inkjet paper (my decal paper) has a horrible, terrible, reaction to Walthers Solvaset decal solution. You simply cannot use that product combination full strength on that material without ruining it.

99. Weathering is a matter of taste, but I like a mix of solvent washes, acrylic washes, brush highlighting, and chalk-like powders.