DATA SHEET

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Sheet #:	D3d.1
Title:	STUB TURNOUT CONSTRUCTION
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TABLES FOR STUB TURNOUTS, DATA APPLICATION TO THE MODEL

Most modelers who build stub turnouts are lucky if they work. No commercial stubs are properly made. Other than D&RG Sheet 12 (3') from John Maxwell, no prototype sheets exist. It is the most misunderstood and the only thing it has in common with a regular split turnout is that it's a turnout.

Modelers tend to space rails too wide at the head block and for some reason they think it is governed by "F" (S-3) flangeway which it is not. The N/G prototype spacing is 5" from centerline to centerline of rails at the head block, regardless of the rail code. The space between railheads varies with head width and rail size. The smaller the rail the wider the space. The formulae are flexible. If you decide to change gauge, head block, spacing, lead, turnout length, turnout angle, or radius, this change must be included in the formulae in order to build an excellent turnout. You cannot simply change spacing or length of turnout rail or you upset the turnout curvature. The curve through a stub is a *circular* curve. Its radius is to the *interior* curved rail, not centerline like we are taught. This extends from head block to the frog point. The flexed turnout rail forms the spiral easement for the turnout. If you model 3', 2-1/2', or 2' all will have different radii, lead and turnout rails. If you model a track gauge such as On2-1/2' on HO rail; Sn3 on HOn3; HOn 2-1/2 as 2' on .009 or "N", and Nn3 on Z track then the gauge is not simply 2-1/2" but the actual measurement in feet. Similarly, LGB 1/22.5 must be converted to 1 meter expressed in feet.

You will find that some of the data on frogs is not quite right thus throwing turnout angle slightly off. There is a slight sin of omission in all the turnout tables. All data is given to the theoretical frog point. No formula is given to figure out the actual point placement. This is why commercial turnouts end at #5-1/2 instead of #6 and your carefully made frogs don't match the curve.

There is a simple formula. Since the prototype makes the tip of the frog point 1/2" or .5 wide, multiply the width x the turnout number. Thus .5 x #6 = 3" for a #6 turnout.
This can be transferred to your scale by dividing 1/scale ratio.

Thus: O = 1/48 = 0.0208333
S = 1/64 = 0.15625
HO = 1/87 = 0.114942
N = 1/160 = 0.00625

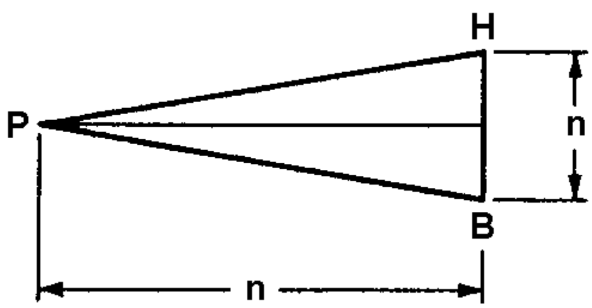
Put this in your pocket computers memory. Change any dimension from feet, inches and fractions to inches and decimals. Then multiply by memory and you have the exact size. Thus a boxcar 34' 4-5/8" long is:

$$\begin{array}{r} 34 \\ \underline{\times\ 12} \\ 408 \\ +\ \underline{4.625} \\ 412.625 \end{array}$$

412.625 x memory recall (HO - 0.004942) = 4.7427942
or 4.743 just a bit short of 4-3/4" long.

Since the points don't always work out to a scale 1/2" width at the tip, simply use a micrometer and measure it. Each time you pick up a frog, mike and then multiply by the turnout number.

TO FIND A FROG ANGLE



F = frog
n = frog number

Cotangent ½ F = 2n
or
Table 3
or
Cotangent F = n/2
or
1/n = Tangent F

TO FIND THE RADIUS OF A TURNOUT

E = lead
R = radius
g = gauge in feet
n = frog number

$R = 2gn^2$
$R = En$

Thus for a #6 turnout:

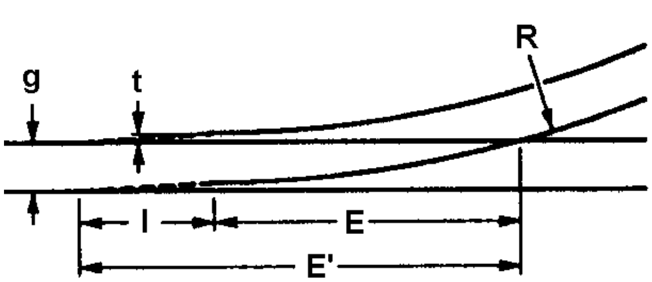
6 x 6 = 36 x 3' x 2 = 216'

6 x 6 = 36 x 2' x 2 = 144'

or

36 x 0.75 x 2 = 54' in On3

TO FIND THE LENGTH OF A TURNOUT FROM THE THEORETICAL FROG POINT TO END OF TURNOUT RAILS



E' = length of turnout
R = radius
g = gauge in feet

$E' = \sqrt{2rg}$

DATA SHEET

TO FIND THE LENGTH OF A TURNOUT RAIL

l = length of turnout rail
R = radius
t = throw of turnout in feet
5" = 0.4166665'

$$l = \sqrt{2rt}$$

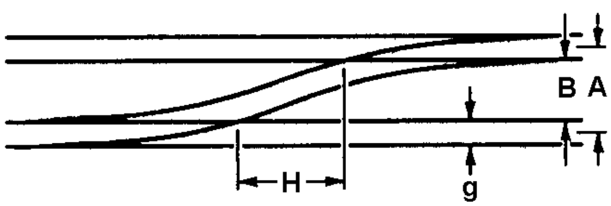
TO FIND A LEAD

E = lead
R = radius in feet
g = gauge in feet
F = frog angle
n = frog number

$$E = (R + g/2) \sin F$$

$$E = R/n$$

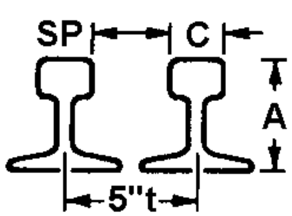
TO FIND THE DISTANCE BETWEEN THE THEORETICAL POINTS OF A CROSSOVER



A = track spacing centerline to centerline
H = distance between points
g = gauge in feet
B = track spacing, gauge side of near rails
F = frog

$$H = \frac{B \cos F - g}{\sin F}$$

TO FIND THE DISTANCE BETWEEN THE THEORETICAL POINTS OF A CROSSOVER



A = rail height or code
C = rail head width
t = 5" throw
SP= space between rail heads

$$SP = t - C$$

Where the stub is standard gauge or rail is so heavy the bases touch, a t of 6" is used. Nn2 + 3 are 6" for this reason. This applies to using heavier than scale rail in any scale. This also applies to turnout rails where heavier than scale rail, being stiffer, requires a longer turnout rail. In this case, I leave the turnout rail unspiked 1/3 longer than called for. The rail is carefully watched when thrown and spiked up to the flex point. This leaves a nice spiral easement. Before figuring the spacing and throw, mike your "C" railhead. The reason is that the rail is seldom to NMRA specifications. Some of these maybe ± figures. With some rails a wide variety of widths may be found. Codes 125, 100, 83, 60, all along this line. The charts below show actual measurements and there is a chart for rail not found in actual NMRA charts.

RP 15.1 PROJECTIONS

CODE	A	B	C	D	F	R	H
125	0.125	0.100	0.044	0.020	0.030	0.010	0.025
100	0.100	0.095	0.043				
70	0.070	0.069	0.029	0.011	0.028	0.004	0.017
60	0.060	0.057	0.025				
55	0.055	0.052	0.027	0.008	0.0205	0.003	
40	0.040	0.040	0.020	0.007	0.008	0.002	

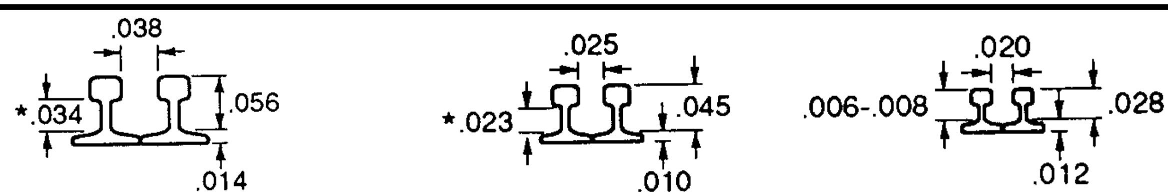
So you can see that there are many discrepencies between specifications and actual sizes.

5" spacing at head block showing spacing between rails. "SP"

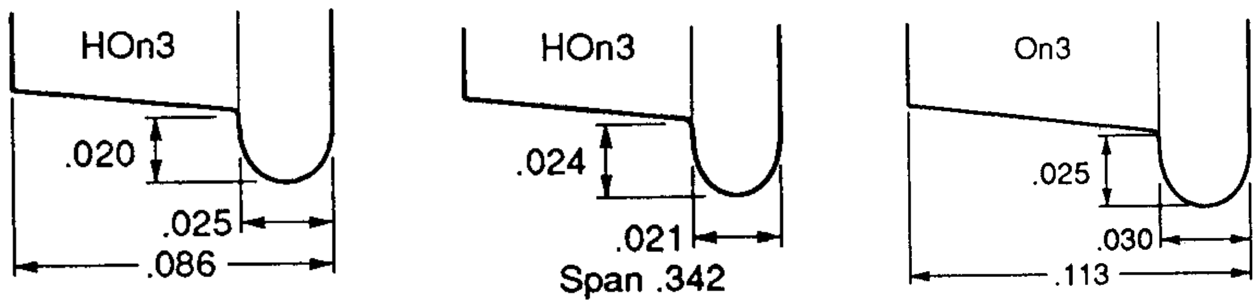
		RAIL CODE					
5"	GAUGE	0.198	0.172	0.148	0.125	0.100	
0.222	LGB/1M	0.107	0.142	0.156	0.178	0.177	
0.208	½" 1/24 3'	0.093	0.128	0.142	0.164	0.163	
		RAIL CODE					
		100	83	70	60	55	40
0.104	On3, 2½, 2	0.61	0.064	0.075			
0.078	Sn3, Sn2		0.038	0.049	0.053	0.051	
0.057	HOn3, HOn2½			0.028	0.032	0.030	0.037
0.375 (6")	Nn3, Nn2					0.018	0.021

Homemade gauges, aluminum finger gauges or a feeler gauge can be used to space rails at head block.

The drawings below show clearances when rails are laid base to base. They show minimum flangeway and head block filler depths. Deduct 0.005" from * for O narrow gauge.



Code 70 Code 55 Code 40



PRESENT MANUFACTURED WHEELSETS

Traditionally, narrow gauge manufacturers have made much finer than standard flanges, only the old Binkley trucks are to exact standard.

When laying flex track along with hand laid stubs, turn your track over. Note that one side has slots between every other tie on one side and a slot at every 10th or 20th tie under the other rail. Lay the every other tie cut toward the ***outside*** of curves. If you lay it the other way, it will tighten the gauge. Expansion joints should be applied about every 12' or 4 rail joints. It is not necessary this be exact but at nearest rail joint. A lap joint is the smoothest. A regular rail joiner can be used. Solder it to one rail, drawing the iron away from the joint. This prevents solder from being inside the joiner. Add the second rail, leave a gap of 0.032", the thickness of an NMRA track gauge between rail heads. Bond the joint.

Stubs are particularly affected by expansion, both thermal and moisture. The rails can grow together causing the turnout rails to catch on the joints adjacent or ahead of the turnout rails. Two expansion joints are put in at both ends of a stub yard, in the center of sidings or yard tracks that are double ended.

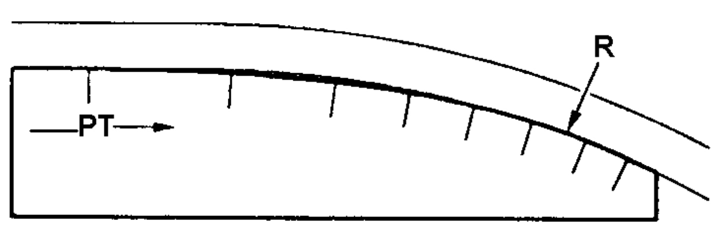
EXPANSION JOINTS IN A STUB YARD

This prevents many of the mechanical problems due to expansion.

Widening the space at the head blocks beyond the advised 5" spacing does nothing. Note that when a rigid wheel base loco goes through that, the end wheels crowd the inside of the rails at head block and at point. The outer curved rail crowds the loco over. The shorter the curve or smaller the turnout number, the more severe. This causes problems with longer 'K' locos. It gets even more severe with EBT's Mikes that are 1-½' longer than a K-37 and 2' Forneys that have 16' wheel base SrRL #10, 21, 22 and 23. These have a 3" shorter wheel base than a U.P. Big Boy!! Because of space limitations, we tend to make our curves sharper and use tighter turnouts. Where the 2' uses #9's and 3' used #6 to 10½ and limited passage of 'K' Class to 9's, we tend to think of #4's and #6's and use curves that are 40 to 60° where the prototypes seldom curves over 30°. On many lines it was closer to 20°. A narrow gauge stub #6 is a 54' radius or 26° and a #4 96' a 70° curve! In order to operate over these curves gauge widening ***must*** be used. To figure this out go to RP.11 and classify your equipment. Caution, 2' coaches and Forneys have a much longer wheel base at 16' and 50' + than 3'. Consult S-3 Note 4 and S-2 Note 1-B. This states that gauge G is increased ½% for every 5" below 20" curvature. Watch out when using RP-11, as the classes are not all in 5° increments. So there is a practical limitation. It is wise to design the gauge widening to the longest wheel base or coach.

If you are going to operate you must play the game. This means gauge widening and spiral curves. The straight side of all turnouts are laid to GMin. But the curved side is gauge widened. A rule of thumb is 1% for #8, 2% #6, 3% #4. This is about the limit without having shorter equipment. The article will show you how to do this without all that measuring each time a turnout is built.

Where curves are tight spiral curves are a necessity. The tighter the curve, the more critical. This allows passage of long locos and reduces coupler swing. But I don't want to do all that measuring to some point way out in the air. Pick a spiral from the October 1969 issue of MR or the ones in the Bulletin. Pick the shortest radius you will use, make it match the sharpest turnout. You may wish to pick 2 mainline and 2 yard radii. But try to pick a radius that matches your turnouts in common use. This way a special gauge widening gauge can be made and it will work on both turnouts, curves and their spiral easements. Take the length of your longest loco or equipment. Pick the shortest radius on the spiral template. The distance between the point of tangent and the point of circular curvature (TS to SC) is as long as or longer than the car. One of the problems with using the spiral template is that their use is not properly interpreted to the modeler.

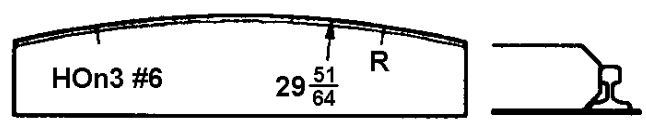


GAUGE WIDENING TEMPLATE

Simply lay out the template on a 3/16" or 1/8" material of plastic, hard board or plywood. Leave a longer tangent or straight side and cut out the curve only, forget the holes and finish the curve accurately. Mark pt or ts and each curvature line and radius on both sides. Since we are working along the inside tie ends with flex track or along inner rail our radius at that point is slightly smaller and will show a 3" smaller R in O and 1½ in HO. Just shove the track against it and lay it to within the radius. If your track is in with no spirals, simply slide the template jig along the tangent track. It will stop automatically against the proper curve. Note that the original track gaps away from the jig. Remove 5 track nails. Shove the track over against the jig and put the center 3 nails back in. Redrill and pin the two end holes. It works like duck soup and is incredibly easy to do. No pain or strain, just hold it in place and slap it in.

Data sheets have been made up for every modeling gauge from Nn2 to 1/22.5 meter gauge. The data is extensive and covers turnouts in ½ number increments from #2 to #14. A layout for trams may include a group of turnouts #2 to #6, a small layout #4 to #8, a mainline only #6 to #14 and a prototype modeler #6, #7, #8½ and #10. Pick out the range of turnouts you wish to use. Keep in mind that the choice of turnouts should match your radii. A #·4 in HOn3 has a 13-¼" R, a 26½" diameter; #5, 20-11/16"; #6, 29-13/16"; #7, 40-9/16"; #8-112, 59-13/16"; and a #10, 82¾". Pick your turnout numbers near or larger than your smallest radius.

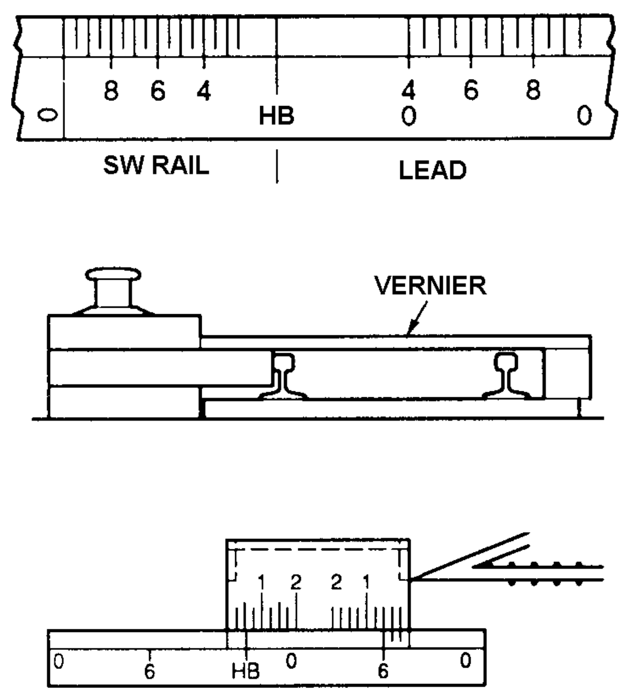
It is much simpler to transfer the data on the sheets once, than to measure it each time a turnout is made. The data on the turnouts you choose is transferred to a jig stick as are radii templates made. This takes a bit of time to complete, but once done the turnout laying is easy. You may wish to make a complete set, so that the data is on your jig stick.



RADIUS JIG

Radius jigs are made as shown to match the tables. They can be made of 3/16" to 1/4" tempered masonite for most scales. Make their total length 2" longer than the data shows. Paint 2 coats of white. Mark with data as shown on both sides. A hole drilled in one end allows them to be strung on a shoelace to keep your set intact. The edges are chamfered to clear the rail base and spikes and the head lays along the arc. Arbitrarily mark the length between head block and theoretical frog point. Correct this in ink when you lay your first turnout. Mark both sides.

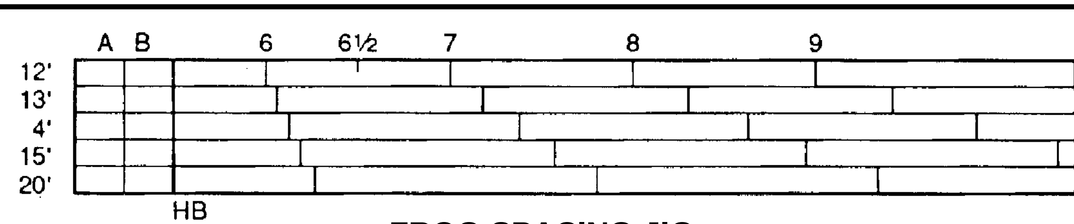
The second jig lays out the lengths of turnouts. It lays out the head block, turnout rail and lead to theoretical point. A vernier of 0.020" increments allows correction to actual frog point. It is laid out on both sides so it rests on the straight side for both R & L turnouts. 3 holes drilled along its edge are for long map pins to hold it in place. Pick and mark the spot where you want the head block. Lay your ties on a piano jig. Ties are closer under frog and at guard rail ends. You may or may not wish to do this. 4 ties under #4, #6, and #7 frogs; 5 under an #8½; and 6 under a #10. Make a plastic vernier that will ride along the outer edge of the ties.



TURNOUT LAYOUT JIG

Cut out any necessary turnout machine hole slot and glue the ties in place. The jig may be made to center the outside tangent rail on the ties if you wish, or can be made adjustable if you wish. Note that on the turnout data each rail is numbered ***1*** etc. This is the order for laying. Spike down tangent rail ***1***. Spike the tangent side of the frog to G min. with 6 spikes. Leave them a bit loose so the point will slide with effort. Mike the frog tip. Pin the jig in place at the head block line. Slide the vernier over. A 0.010" tip x #6 = 0.060" or 3 increments. Match this with the #6 on the jig. Slide the point up to the vernier edge and put a map pin in the crotch so it won't move and spike solid. Spike second side of frog. Lay the interior curved rail with the radius gauge ***3***. Bend wing rail prior to installation. The straight side flangeway is laid to F (0.043" in HOn3). As a rule of thumb a #8 needs 1%, #6, 2%; #4, 3% gauge widening. That is only the curved flangeway that is widened. Thus a #6 turnout is gauge widened 0.413" x 2% (G x 2%) or 0.008" or to 0.421". ½ is added to flangeway and ½ to guard. 0.043" + 0.004" = 0.047". Space the tangent rail ***4*** in and space its flangeway to 0.047" with a feeler gauge. Solder the first tangent rail to pc (printed circuit) head block. Tin the head block by pulling the solder toward tie end. Tin rail bottoms near head block for an inch. Sweat ***1*** rail down. Put a little yellow ochre in a water paste (jewelers supply) along the joint so the solder doesn't shift. Sweat the end of rail ***3*** down. Space with a feeler. If you use code 70 in HOn3 it will be 0.028", see your particular data sheet for spacing. At the head block, the rail spacing is G min. (0.413") with the NMRA gauge set rail ***4*** to one, solder, ochre. Lay out outside curved rail temporarily. This is the only gauge widened rail. The rail at the head block is laid to G min. and rail ***3*** is gently allowed to widen until GW 0.421" is directly across from frog tip and through frog flangeway. Let it gently go back to 0.413" beyond frog. You may wish to pin it in place then spike down. Spike the two guards in place using the flange gauge tips on NMRA gauge. Your turnout will pass any rigid base loco to 16' in length. The prototype also uses gauge widening in turnouts even though flanges are wider. A #6 will be 36-¼" wide on curved side with 1/8" shims behind the filler blocks. Sometimes the curved frog filler blocks were wider castings.

A third jig can be made to space the frogs on crossovers. Pick a 1½" piece of lath 2" longer than widest track spacing for your longest turnout. In HOn3 if your longest turnout is #10 it would be about 22½" long; Sn3, 31"; On3, 37". The "A" figures are to track centerline and the "B" figures to the gauge side of near rails. Start at HB and measure to right, laying out all figures on one line. Mark nos. lines in black and ½ turnout nos. in red or another color. This reduces the confusion and makes it easier to follow. You can make a second vernier and extend its range to 0.4" by 0.020" increments on one end. In larger scales, you may wish to increase this to 0.7". Pick the width between sidings. Lay in the main stub first or its tangent rail and the frog point ***2***. Run the tail end of the vernier to HB position and place it against the point. Measure both frog tips, mark them down. Put in the map pins. Move the vernier along to the given width. A #6 would be 23-33/64"on 14' centers. One of the points is 0.010", the other perhaps 0.012". 0.022" x #6 or 0.132" that is 6½ increments. Increase vernier to this and position second frog. The figures are not rounded off like NMRA turnout data to nearest 1/16". Because the stubs measurements are much more critical, they are to nearest 64th or .1 mm.

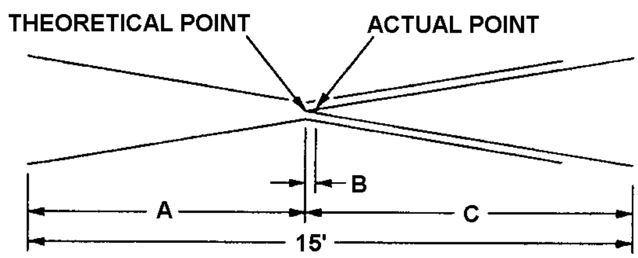


FROG SPACING JIG

There are prototype practices that should be adhered to such as placing harps or turnout machines on the curved side of the turnout. This prevents locos from swinging into them. Clearances should be to standard gauge specifications on curves and in tunnels. Don't forget K-32 class locos were rebuilt standard gauge. Unless you want to replace cribbing and loco goodies take heed.

In 3 way stubs, the position of the crotch frog from the head block is:

MAIN #	CF#	LENGTH
#10	#7	20'-0"
#8½	#6	17'-9"
#6	#4	12'-2"



PROTOTYPE FROG PROPORTIONS

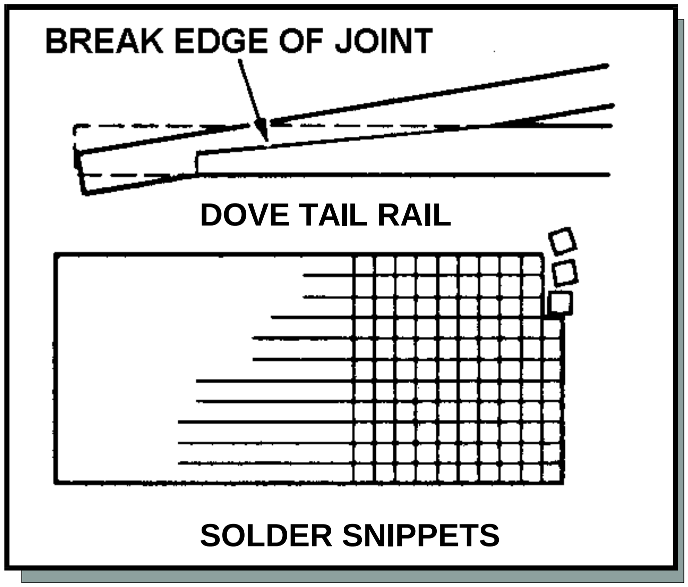
MAIN #	A	B	C
#6	7'	3"	8'
#7	7'-6"	3½"	7'-6"
#8½	6'-3"	4-1/4"	8'-9"
#10	6'	5"	9'

Guards are 16' and 22' long.

A caution in spiking rail. In an effort to get an accurate gauge the beginner places point against the rail base. When set the body thickness shoves the rail over making tight gauge, since most spike outside first. The spike head is designed to 90^0 to the web. Put the spike tip away from the base a bit and spike inside of rail first to widen the gauge if you happen to be close. This prevents too tight a gauge.

There are some mechanical problems in building model stubs. The following shows how to handle them. If you desire working rotary throws, I suggest you use the modified slanser throw by Lou Queyrel from the Dec. '73 NMRA Bulletin. The distance from the rail center should be modified for narrow gauge but it gives positive throw and power routing.

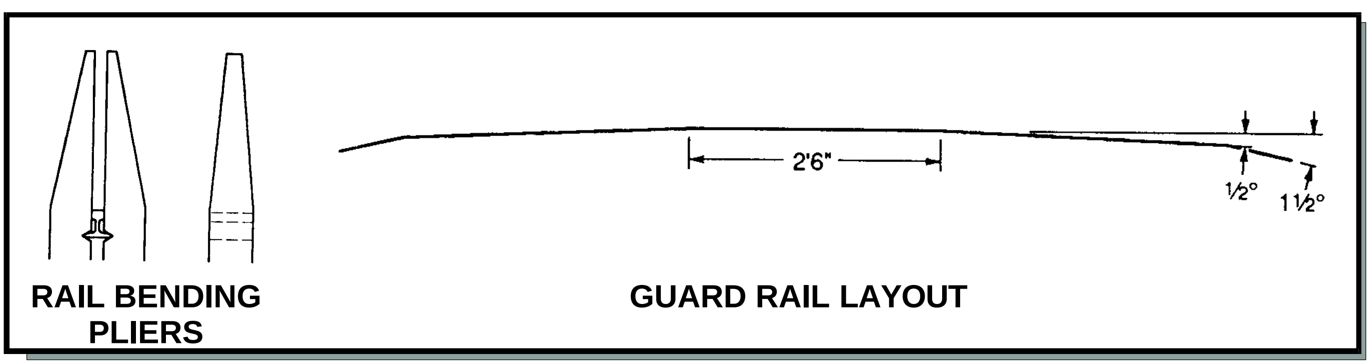
Frogs are hard to hold the angle while laying the wings and filling the frogs. The parts may shift. To prevent this, I make only the points up and silver solder the dovetails in. This is not as difficult as it sounds. In the prototype, the dove tail faces the tangent side. The 3 way crotch frog may or often does not have a dove tail and often looks like a bad modeling job. The reason for the dove tail being on the tangent side is that flanges and wheel thrust on the curve tend to force it closed. The materials used can be found at a jewelry supply house. A perfection soldering pad, hard ceramic soldering block, 2 pair of spring tweezers, jewelers' ring clamp, #4 cut ¾ x 6 flat hand file, hard silver solder, pickle and a Bernz-o-matic torch with pencil tip. Borax flux.



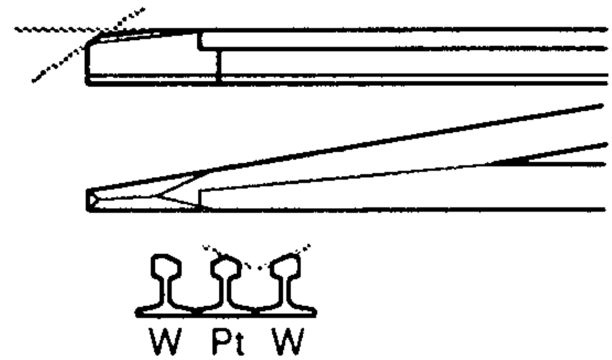
The notched piece of the dove tail rail is held in the flat end of the ring clamp and filed ½ way through the web, carefully making the angle. The other end filed to fit inside. Do not try to bend the tip angle, it is too hard to judge. Check the filing angle carefully. Hold the rails, head up on the soldering ceramic with the joint over the end, so you can heat from above and below. Extend this over the edge of the perfection soldering pad. Do not use easy flow solder, use the high temperature type. Cut in 1/32" strips with shears, straighten the curl with pliers and cut off snippets 1/32" wide as you need them. Mix some borax flux and taper a wood match as a pickup. Apply flux to joint with pickup. Pick up a piece of solder and apply to the cut. Space out 5 snippets on the joint. The joint at the rail head is filed or broken along both edges. This allows easier flowing and neatly shows the joint. Heat in subdued light. Turn bench lamp off. Heat in a circular pattern with a 3/8" long blue flame. Sneak up on it. The solder will raise up on edge, waiver snuggle down, ball then flow. Solder flows toward the heat. Heat from below so solder flows through the gap and excess will be on the bottom. When it looses color, quench in a pickle of 1 part sulfuric acid to 4 parts water. Spare x can be used, but it is not as effective. File excess solder from the back. If there is a slight mismatch, lay the base on a metal block and rap the railhead with a hammer. Bend the tip to the center of the turnout angle and file sides to the tip. You may have to snip off a little length.

For bending frog tip, guards and wing rails, regular pliers tend to distort the rail. Use Bernard pattern (Sargent Co.) smooth jaw, tapered parallel jaw pliers. They have a notch crosswire through the jaws and grip the rail head sides while supporting the base.

The guards are bent with a 2'-6" flat at the center and ½^0 taper with a 1½^0 taper at ends. The flat is positioned across from the throat area of frog, and the ends should be at least ¼" longer than the wing rail tips.

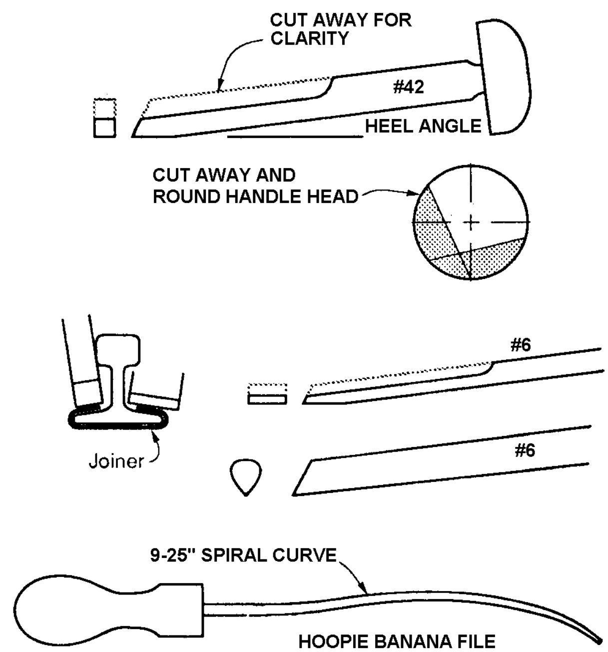


Hard soldering the frog point has a real advantage. There is no reason to spike in the wing rail area and the tip does not shift from uneven spiking pressure or uneven tie placement. The tip is finished by filing a low angle, 45° at point and to an angle at both sides. Since the model has wider flangeways the wheel loses support and rides across flangeway bottom. File the wing rails sloping toward the flange. This way it rolls down the wing across the bottom and up the point with no bump.



FROG POINT

In finishing the frog flanges or rail joiners, I use a rather unorthodox method. No files are used except for the last finish stroke. I use jewelers gravers to cut away excess solder and this works more accurately and quickly than files. The unground graver blanks and ½ mushroom heads are available at a jewelers supply. They come as untapered shaped blanks and must have handles drilled. They are ground then sanded and sharp top edges broken on a 2" drum sander with 220 grit aloxite cloth. The tips are finished on a fine stone and stroped on a leather strop with xxx jewelers rouge rubbed into the smooth side. Each graver and handle will cost about $8 and lasts a lifetime. A foot ground on the bottom at the heel allows you to cut a smooth level chip a bit at a time. Work from both directions and check with gauge as you cut. A series of 4 cuts along each side of a rail joint will quickly clear away excess. A #42 and a #37 can be used for joints and flanges. The #6 flat for railhead. #6 angle to smooth side of rail joint. A few swipes with the #4 cut file finishes the rail head and sides. Use smaller gravers for Nn3.



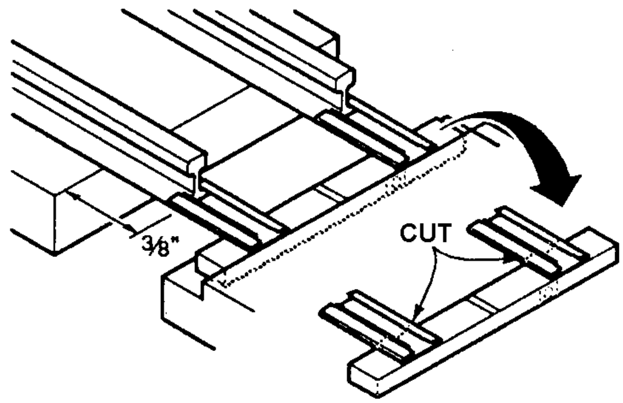
SPECIAL TOOLS FOR BUILDING TRACKWORK

The last tool is a cheap thin 8" fine cut file. I call it a Hoopie banana file. Heat with a torch and bend the end with a pair of channel locks. Throw it in a bucket of water to quench, grind on safety edges and put a #5 skroo-zon file handle on it. It is an incomparable tool for matching rail heads, fudging tight gauge and working on turnouts.

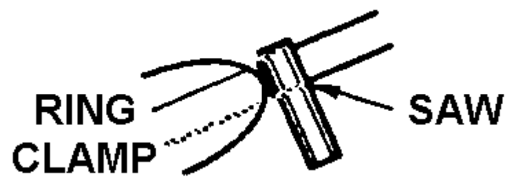
Head and bridle rods are made of common copper clad PC board, fibre glass is too hard on tools. Soldering rails directly to the p.c. "ties" make them too rigid. Some turnout machines won't throw them. The twisting action will finally break the clad away from the phenolic base causing undue torque and the turnout to fail. In larger gauges narrower bridles are sawed. In HOn3 and smaller the bridle replaces a regular tie. In this case the bridle tie replaces every third tie, 6 per #6 turnout and 10 per #10 etc, plus a head bridle. The trick is to make flexible bridles. Find 2 pieces of scrap ¾" pine. Gauge 2 rails on one piece to G min. Don't get it too tight, the gauge should just kiss the rails. Notch the second piece at the end so the ties you use are flush with the top. Mark both tie ends and the centerline on the block. Flux and tin a p.c. tie by drawing iron toward end. Saw through the copper or use a graver to cut an insulating mark at the bridle center. On head rods with electric turnout machines, saw two insulating cuts and drill hole for throw. Make sure you cut the throw slot before you lay the turnout. Tin the bottoms of two rail joiners about ¾ of their length. Slip both joiners ¼ way on rail jig. Put tie on center of other half. Place joiner on top of tie and sweat joiners to tie. Slip off jig. Use a 4/0 jewelers saw blade or 5/0. Hold tie in ring clamp and saw off excess joiner. Slip excess back on jig. You will get 3 bridles from each pair of joiners. File joiners flush with tie sides with #4 cut file.

You may have to adjust the bridles. Slip all the bridles on 2 pieces of rail. They will go on tight. Use a pair of F. Lindstrom needle nose pliers. Gauge each bridle at rail head. Mark to loosen or tighten. Slip them off one at a time. Grasp the same side to open them slightly so they slide on easily. For tight gauge adjust the outsides of both joiners and for loose gauge, the insides.

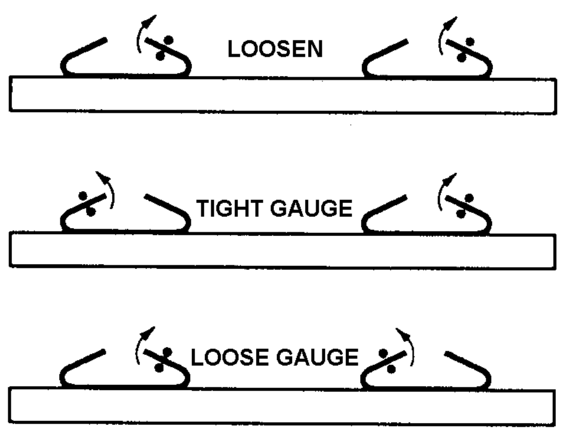
Track work in itself can be an impressive model. The oddball track lengths were cut 1' shorter than the flat cars used at the time thus we get lengths like 23', 29', 33', 39' as rail got



PC BRIDLE ROD

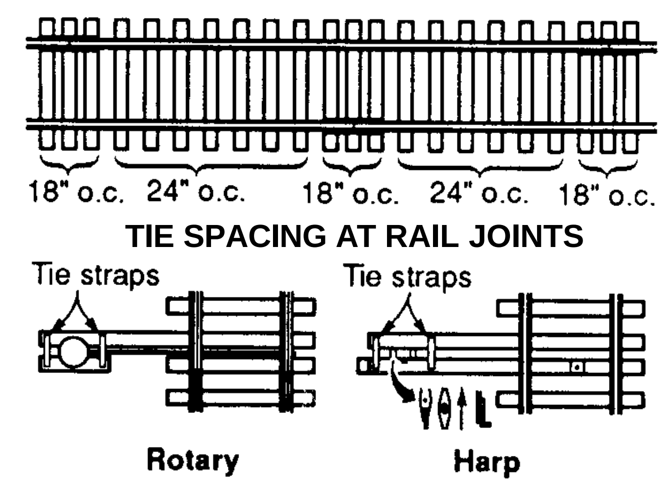


CUTTING RAIL JOINERS



ADJUSTING GAUGE

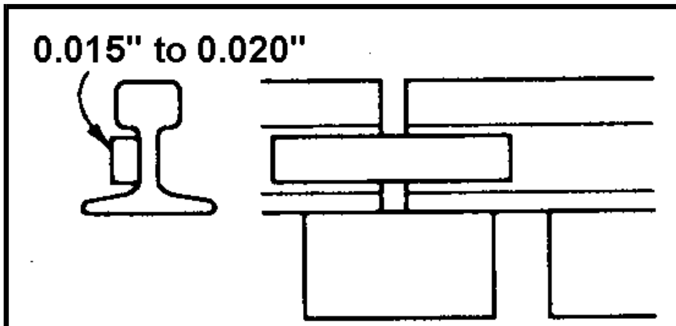
heavier and cars got longer. At each increment, there was a rail joiner. Rails were laid with the joint at the center of the opposing rail. Three close ties are under each rail bar and twice under each length, at both ends and center. Your piano jig can have the slots cut closer at these lengths to model this feature. Cast head blocks were used on rail #55 lb. and under and riveted head blocks on rail 57 and over. Where rotary stands were used, a short piece of tie and two tie straps are used. Where a harp is used there are two head ties. In pc construction where head tie must move, the harp is soldered to the solid tie and a notch and wire throw the target. In larger scales the target key is soldered in the lever and the pivot pin hole in the lever elongated. To throw lift lever throw and push down in the required notch.



TURNOUT THROW LOCATION

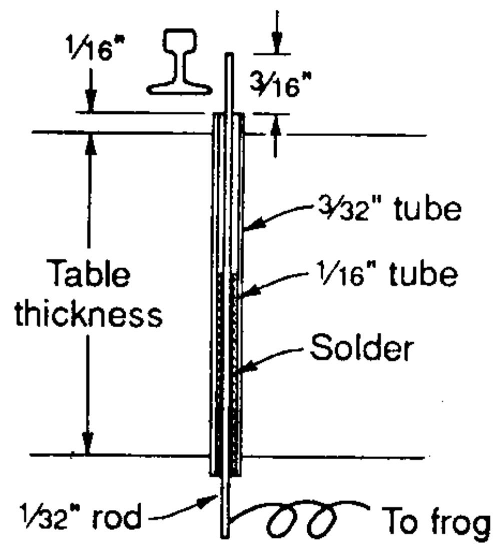
The area between ties where bridles slide is cut with a knife and the Homasote peeled out for clearance. Clearance is left on curved side for throw. The areas around moving bridles and head rods are painted dark grey latex or to match the ballast color. This disguises the fact that there is no ballast around the moving ties. A small wood former will allow you to lay ballast at the tie ends. A 3" x 5"card will straighten the ballast edge. Thin profile ties are in order as much of the trackage was laid in the mud with a minimum of ballast showing.

Rail stops are normally cast on or riveted to the head blocks. In the model you could solder them to the head tie, but if the throw is powerful the thin bases tend to wear rapidly. With turnout machines, solder gets in the stop corners and is difficult to remove. On light rail the rail tends to turn outward. A more positive stop is put on the outside of both rail heads on the head block side of the turnout. Put yellow ochre along the rail bases to prevent moving. The webs of 2 outside rails can be tinned when they are soldered to the head tie.



RAIL STOPS

Electrical polarity for live frogs can be changed even though hand throws are used. Get some K&S 1/32" rod, 3 pcs. Get 2 next larger tubing size that fits over this, 1/16" and 3/32" O.D. Cut largest tube thickness of roadbed and ¼". Cut second tube ½ that length. Cut rod ½" longer than largest tube. Solder as shown. Mark center line of hole just inside edge of rail when turnout is thrown. Slip in the contact with glue. Cut isolation gaps in turnout and wire to frog. The hollow tube section allows contact flexing.

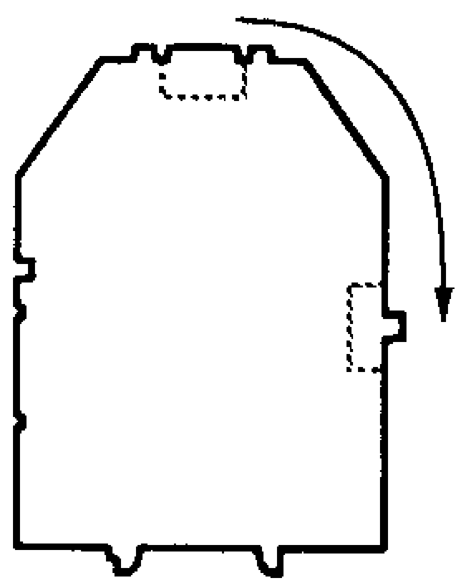


MECHANISM TO CHANGE LIVE FROG POLARITY

GAUGES FOR TRACK LAYING

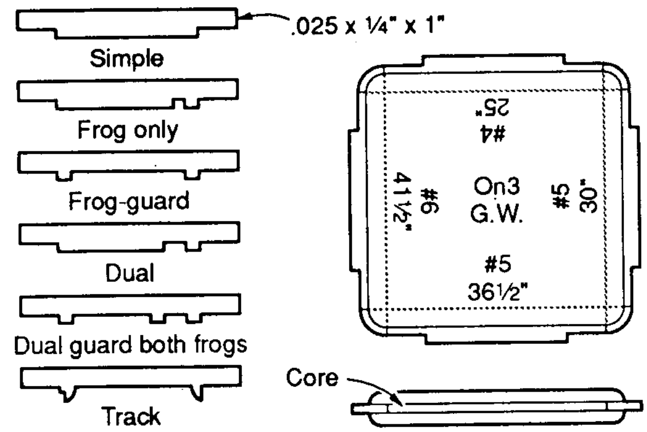
In some scales, no NMRA gauges exist. If you have ever tried to gauge through crossovers, double crossovers or dual gauge turnouts, you will find that the "F" frog flange gauge catches on rails it crosses over. Only on the N(HOn2½) gauge is it in a usable place. On the older gauges, I sawed these out and soldered them in the side with hard solder. For some reason, the new HOn3, Sn3, On3 stainless alloy will not solder. I have not found a proper solder or flux that works either in hard or soft solder. I have ruined some new gauges trying it.

Where gauges of NMRA type III are not available, On2, ½", 1/24 scale, LBB 1/22.5, Nn3, Z; it is possible to make them with a little patience. This also extends to gauge widening gauges. It takes several days to complete one. Instead of measuring each time, you simply use your gauge. I try to pick part of the radii to match the turnout radii used. If the curve falls in between two gauge faces, use the smaller radius gauge using more widening. It's difficult to get all gauge specifications correct, but if you make each one a separate gauge bar and make an error, simply start over. The complexity is limited only to what you want it to do. You can make a gauge wider. Gauge for combinations like On2½, On3, On3-On2, etc. You can make one of the gauge tips to properly fit the G.W. "F" or both tips wide to lock in both F and guard flange. You do the figuring which takes some time. Get some 0.025" x ¼ " brass and coat the surface with blue layout dye.



NMRA TYPE III GAUGE

The gauges are 1" or ¾" long. Figure one side so the gauge is nearly centered. Start at the nearest tenth of an inch. Layout the lines scribing them with a sharp knife always working from the same end. Layout depth. Saw wide of the lines and file to size using a vernier. The four gauge blocks are fitted in a sandwich of plastic. 2 pieces of 0.030" styrene x 1¼" square are cut. 1 piece 0.030" x 1" square and four smaller corner pieces. Round corner and edges of 2 larger pieces and glue to core piece. Try gauges and put in 4 corners. Remove gauges let dry. Replace gauges with 5 min. epoxy. Round corners and clean gauge faces. Scribe the radius, turnout no's. put a dot on the flangeway F, G.W. Fill lettering with india ink, sand smooth when dry and tape off gauge faces with masking tape. Spray center with clear acrylic. This fairly well covers stub turnouts and their construction.



CUSTOM MADE TRACK GAUGE