



Toward a Better Crossover



BrickFest 2003

Layout Design Track

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from material and design by:
Jeff Christner



Track Geometry Overview

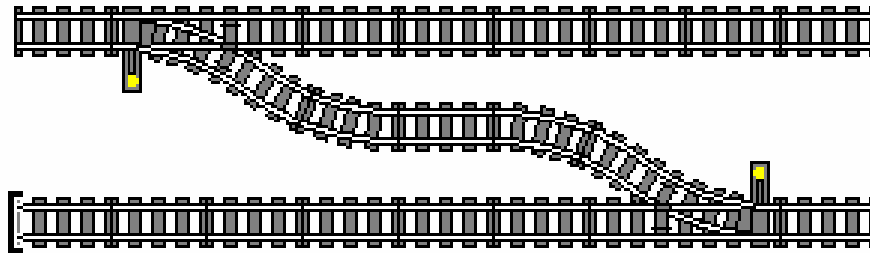
- LEGO track geometry is very simplistic
- Choices were deliberate
 - Make “simple” layouts REALLY simple
 - Reduce number of different parts to minimum
- Switch geometry has issues
 - Includes a recurve or S curve
 - Sidings and crossovers limited in scope



Desirable Crossover Characteristics

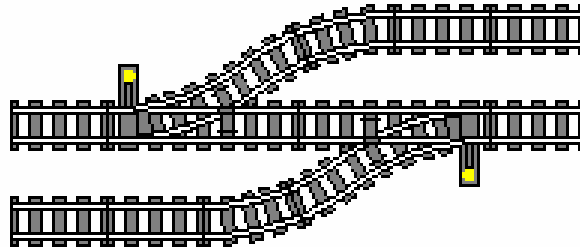
- Reasonable “on center” spacing
 - Natural two track spacing is 16 studs
 - Too wide “looks funny”
- Through tracks should be straight
 - Trains not diverging should not have to navigate tight curves unnecessarily
- Avoid S curves where possible
 - S curves cause derailments

Straight Crossover



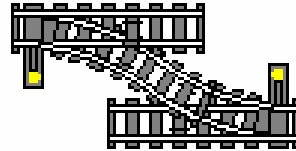
- Through tracks are straight (+)
- S curve in center connector (-)
 - Avoiding S curve can be done (+) , but adds length (-)
- Overall length is high (-)
- Can easily move the switches farther apart, allowing for a “pocket passing siding” at some cost in space. (+/-)
- Track spacing is twice the “natural” 16 stud spacing (-)

“Recurve” Crossover



- Through tracks are S curved (- -)
- Straight alignment in center connector (+)
- Overall length is shorter than Straight Crossover (+)
- Can easily move the switches farther apart, allowing for a “pocket passing siding” at some cost in space. (+/-)
- Track spacing is the “natural” 16 stud spacing (+)
- Ends up shifting alignment one track which can be inconvenient but can make interesting layouts(+/-)

“Ideal” Crossover

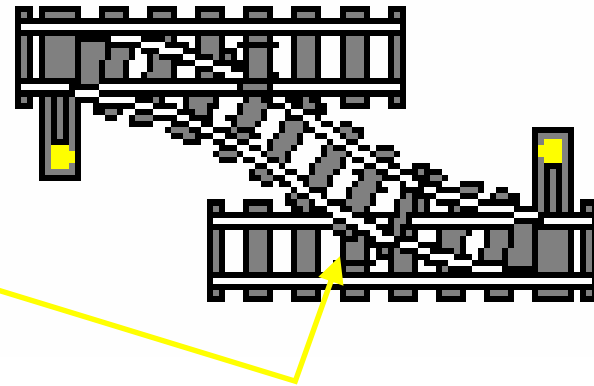


- Through tracks are straight (+)
- Non Straight alignment in center connector (+/-)
- Overall length is shorter than Recurve Crossover (++)
- No “pocket passing siding” (-)
- Track spacing is the “natural” 16 stud spacing (+)
- No alignment shift(+)

“Ideal” Crossover

- One MINOR problem.. This crossover doesn't actually exist!..

(Track Designer Trickery...
Not for the squeamish!)



- Or... does it?



Realizing the “Ideal” Crossover



Exploring what's
been done so far...

Realizing the “Ideal” crossover



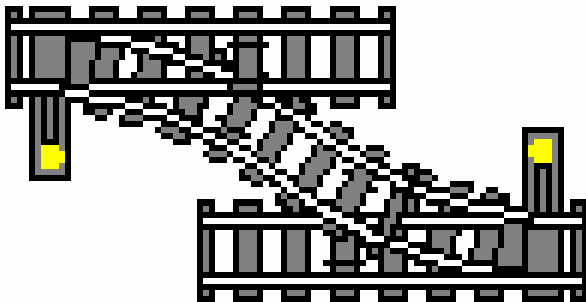
- Developer:
Jeff Christner
- Sold on Ebay
- Has been going for
~85 USD per pair
- These crossovers are
hand made by
modifying standard
LEGO™ switches.



Design Criteria

- Standard spacings
 - Standard track center spacing of 16 studs on centers
 - Standard track end spacing (no “1/2” track needed)
- Electrically conductive
- Solderless construction
- Minimize cutting
- Maximize sturdiness
- Ease of construction

Meeting the Spacing Criteria



- The “trickery” suggests the solution...
- “Merely” cut the overlapping ends away and you get
 - Standard center spacing
 - Standard end spacing
- Interoperability with standard LEGO™ track assured
- Spacing of 8 studs (16 on centers) between tracks is maintained.



Meeting the Electrical and Construction Criteria

- LEGO™ design enables conversion
- Power routing with frog feed allows modified switches to conduct electricity
- Rail mounting technique employed makes this solderless conversion possible



Construction Process

- Each switch has had the top rails removed before the switch is cut to length
- The switches are then attached together underneath with shims and glue



Construction Process Continued

- Shimming: two layers of plastic strip styrene from Evergreen Scale Models
 - .040" x .156" - use this first and press into the area under the rails
 - .080" x .188" - use this second which levels off the bottom of the crossover and adds extra strength and support
- Glueing: all purpose adhesive used
 - actually melts the pieces together and bonds them with the LEGO™ ties / track substructure
 - Similar to Ben Fleskes' technique



Construction Process Continued

- The rails are then cut to length and put back in place.
- There is no soldering used or needed in the construction of these switches.
- It only takes about 20 to 30 minutes to make each crossover.
- Other modifiers do use solder but have more flexible track arrangements



Notes on the Construction Process

- To cut the track, use a regular single edge razor blade with scrap LEGO elements to line up the cut.
- Even then some additional trimming is necessary to achieve a perfect fit. Jeff built a jig out of LEGO so that the tracks always line up correctly.
- Jeff has found that LEGO attached across the joint to join the crossovers after they are cut will normally not line up the tracks correctly. (although this works for Ben)



Notes on the Construction Process

- MEK works to adhere the styrene to the tracks, but Jeff has been using Ambroid ProWeld since the fumes aren't as bad as MEK's fumes are.
- If you don't have a regular workspace, be very cautious even with low fume products.
- MEK is very dangerous, it's narcotic, has toxic fumes, and is poisonous if spilled on skin or ingested



Cautions and Caveats

- Each crossover is hand made
 - there may be some minor imperfections
 - These will not interfere with their compatibility with standard LEGO™ track.
- These crossovers should be handled with care since they aren't as strong or as durable as track manufactured by LEGO™
- But they're pretty close since the rail is continuous across the joint and not soldered



Cautions and Caveats

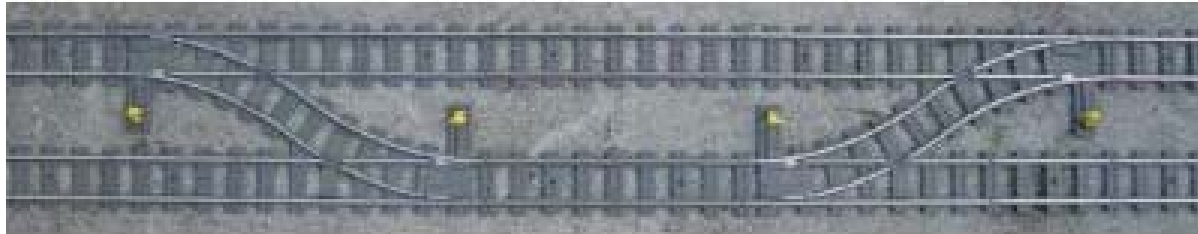
- Normal usage by attaching and removing LEGO™ track from either end of the crossovers should have no effect on them
- Do not stress the joint by bending or twisting it
- Should be stored between layouts carefully to prevent damage

Usages



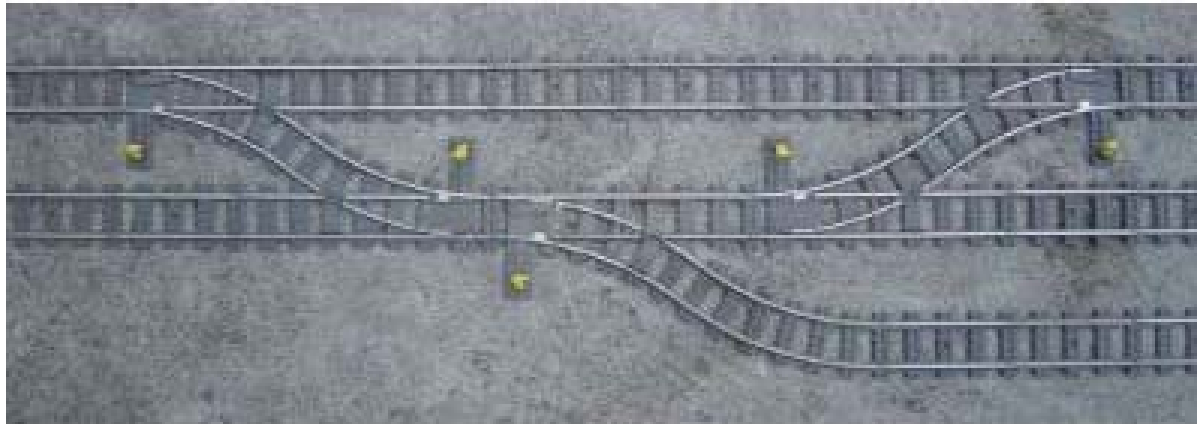
.... Exploring how these crossovers can be used in layouts

Usages – Double Crossover



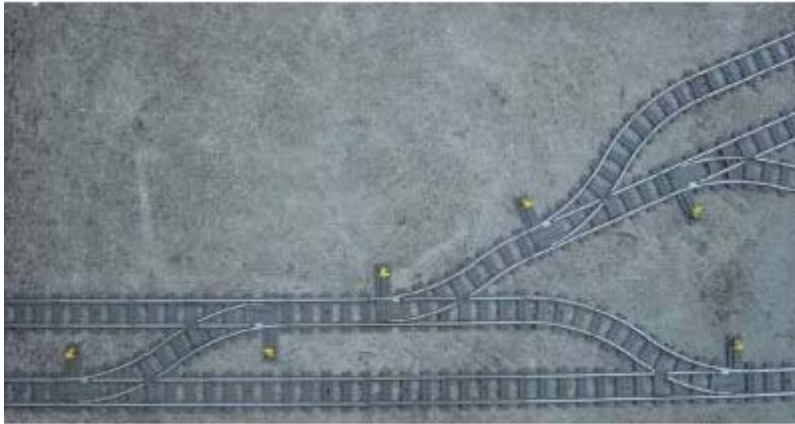
- The first photo is a standard interlocking that you might find on railroads that use two main tracks
- A train on any one track can cross over to the other track without needing to reverse

Usages – Unlimited Junction



- The second photo is a junction where three main tracks combine into two main tracks
- Called an unlimited junction because a train traveling on any track can diverge onto any other track (trace it and see!)

Usages – Yard Lead



- The third photo shows an idea for a small yard off the single main track
- Main track shown at the bottom of the photo.
- Here the crossover can be used as a yard lead for headroom while switching or to store the switcher itself.



Usages – Yard Lead

- If the switcher was stored on the yard lead, this arrangement could also be used as a conventional passing siding
- Mainline trains that set cars off here would shove the cars in their set off onto the passing siding
- The switcher, coming off the yard lead would then couple to the cars the mainline train had set off
- They could then switch them out in the yard without fouling the main track by using the yard lead.
- Obviously the size of the yard and passing siding is only limited by the space you have and the amount of straight track you have.



Next Steps?

- The relative ease of construction suggests others may want to try it.
 - Jeff is considering putting together some sort of instruction book to enable people to make their own crossovers
 - Similar to how people sell instructions for their MOCs

Next Steps?

- Jeff is considering other Solderless Track Mods:
- Ready for production
 - 4, 6, and 8 stud long straight track sections
 - 4 stud long curved track sections
- Undergoing testing
 - Flex Track
 - Compatible with standard LEGO train track
 - Custom radius curves without cutting
 - Able to span odd sized gaps when used as straight track
- Interested? Contact Jeff...

Conclusion

- Crossovers made with standard LEGO™ track components only suffer some shortcomings
- The “Ideal” crossover cannot be made without track modification
- Jeff has developed a simple modification system that works well (see for yourself, a pair is here at the Con)
- The crossover enables many interesting layouts
- Other solderless track modifications are possible and are under development



Credits and Questions

- Crossover development:
 - Jeff Christner
regult@aol.com
Jeff welcomes questions!
- Credit for this presentation:
 - Larry Pieniazek