



DATA SHEET

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INTRODUCTION

Model railroads may simulate prototype train and switching movements of all kinds. As the operator attempts to bring an aura of prototype realism to their model pike, however, they find the inherent differences between scale model and prototype standing in their way. These differences can be partially overcome through careful planning (or modification) of the layout, and through ingenuity in dispatching and operating trains. These are the important limitations for which one must compensate in achieving the goal of realism in operating the model railroad.

OPERATION

Railroads exist to move people and goods from place to place. Model railroads, by contrast, exist for the enjoyment of those who build and operate them. If not well planned and well run, the operating model railroad presents the spectacle of a train chasing its tail over a pattern of trackwork. Its operator hasn't given it simulated traffic.

"Operation" can mean different things to different people, but for our purposes we will use the conventional definition of traffic on a model railroad that is directed by a logical and organized system. (As opposed to train movements at the whim of the operator)

Operation has some key ingredients:

- a) The railroad moves traffic in a direct and logical way.
- b) There is a system to move the traffic.
- c) The railroad creates jobs for the operators.

There have been discussions lately about how to make the best of operation, but this is not a new topic. In the 60's there was a consortium of operating model railroads that identified the elements that made their operation fun. The list of participants reads like a "Who's who", and they discussed traffic and the system, but they emphasized the operators. Operation by yourself is fun, but with a group of operators, a railroad comes alive.

COMPRESSED MAIN LINE

It is all but impossible to scale down a complete railroad into the space available for a model. A respectable switching line may be four miles between terminals, a country trolley 25 miles, a mountain short line 50 miles. and so on up the scale to the transcontinental line. Large home layouts may contain three scale miles of track, or club layouts five to six between terminals. The seven miles between small town stations in the Great Plains may be compressed into 15 feet on the model railroad. The main line, which is to say the running time between stations, will be quite short.

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COMPRESSED MAIN LINE - continued

Perhaps this is the reason most model railroads are built in loop form, even when the simulated traffic pattern is point-to-point.

The compressed main line and the loop may conspire against local freight switching by the peddler. The main line may be in almost constant use by through trains, which interrupt the local at its station work. Planning and modification may serve to overcome this situation by providing facilities for both through and local trains to work at the same time, or the number of through trains may have to be reduced.

CHOOSE YOUR GOALS

Realistic operation is usually achieved through planning before the actual drafting of a layout. The prototype did some of everything, but we can not model it all. You can only choose parts. So choose the best parts.

What are the **best** parts? The answer is: It depends.

If you want to operate with a group rather than alone, then the layout owner needs to divide the work into *jobs*.

JOBS

Jobs are the most important ingredient in planning an operating railroad. It is the operators who make the operation come alive, and they will not continue to attend if they are bored. **Job** here means enough work for an individual *to stay busy during a typical operating session, but not be overwhelmed*. It is not as desirable to have the operators work a series of little jobs from the extra board. It is better to divide the work so that *each* job stays busy for a whole session. It is also important that there be a range of jobs; not everyone will have the same preferences. Some people prefer simpler jobs, but most consider the busy jobs to be the **good** jobs. Another consideration is *flex* jobs. These are jobs that can be added or left out depending on how many people show up for an operating session.

Experience has shown that *a typical model wayfreight with about 15 cars will stay busy during the course of a typical operating session (especially if dodging through trains is included)*. Remember that a 15 car train means about 15 to spot, and another 15 or so to pick up, plus however many other cars have to be handled in the process.

*A typical job needs to have a **minimum** of twice as many spots in the local work area as there are cars in their train.*

So a 15 car local needs to work an area that has at least 30 spots. That area can be two small towns, as long as the spots add up to 30. If a town has 60 spots, (and the aisle space allows) you can create 2 jobs. If you have a town with 45 spots, it makes a very nice single job, but it is not enough for 2.



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JOBS - continued

The "twice as many" spots rule comes from the concept of "loading or unloading". Think of each operating session as a "shift". A car is spotted in one shift, then it spends the next shift being loaded or unloaded. In the third shift, it is picked up.

So in any given local work area, there will be approximately 15 cars to set out, and 15 cars that are held in their spots for loading and unloading. A minimum total of 30 spots are needed. (The 15 pick-ups are leaving town).

As the number of jobs increases, and the number of sources of traffic increases, someplace is needed to sort it all out. That place is a *classification* yard. On most model railroads, a yard is used for staging; complete trains enter and are stored. A classification yard on an operating railroad has special needs. See sheet D3h.1.

Experience has also shown that a *typical yard* (4 arrival/departure tracks and 8 class tracks) *can handle 4 locals and about 8 through trains* during the course of a typical operating session. If there are more than 4 locals, it may be desirable to add another classification yard. When there is more than one yard, then the locals are assigned to one of the yards. That yard then becomes the *Home yard* for the locals assigned to it. See sheet D3h.1.

CONCEPT AND TRAFFIC PATTERNS

The next step in developing a model railroad which operates, rather than runs trains, is to decide on its concept - the imagined purpose for its existence. The concept will set the pattern for its imaginary traffic and will be useful to the builder in making important decisions in regard to planning the scenery, and in choosing the type of rolling stock they will need. The concept may be based on one of these **traffic patterns**.

- a) Between cities.
- b) As part of national systems.
- c) Between railroads--"bridge" and "belt" lines.
- d) Within communities or specific production areas -- short lines, terminal and switching roads.
- c) Between areas of production and areas of consumption, as from manufacturing New England to New York City and environs: from the agricultural Plains States to the mills and markets of Omaha, Minneapolis and Chicago.
- d) From areas of production or origin to river, lake and ocean ports, as from Kentucky coal fields to the Ohio, from the Messabi range to Lake Superior, or from the Pacific forests to Puget Sound.
- e) Passenger traffic is typically determined by a predetermined schedule. (Except that express, mail, baggage, and commissary functions can be directed similar to freight)
- f) Freight traffic can be directed by any of several systems, each with their advocates. The **"car card plus waybill"** system is widely accepted because of their proven ease of use. Other systems such as waytacks or switchlists are occasionally used.



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CONCEPT AND TRAFFIC PATTERNS - continued

- g) The basic freight traffic pattern is between "**spots**" (locations such as industrial spurs on the layout) and "**staging**" (representing locations beyond the layout).
- h) If space allows, other elements can be added, such as branchlines, yards, and more staging. The traffic pattern here becomes more complex, but still goes between **spots** and **staging**. (Again, it is possible to have some traffic go between spots on the layout, but such patterns should be kept to a minimum to remain prototypical.)

It may be desirable to write the concept of the model railroad, as a general statement of planning and operating policy.

Railroad planners work for maximum utility with minimum construction. Railroads favor the most direct route, the minimum ruling grade, the least practical amount of curvature, the use of bridges only when justified by other economies, the use of tunnels only as a last resort. A small amount of prototype railroad is surrounded by a large amount of country. On many model railroads, these principles are reversed; builder ingenuity is used to snake the maximum amount of trackage into the available space and scenery is worked in as an afterthought. This may be termed "track for its own sake". Other models offer a great amount of trackage, but the track is used for the sake of interesting operation.

The layout planner is urged to choose the minimum amount of main line which will serve the traffic pattern which he has selected, and add to his track plan all the yards, spurs, sidings, leads and industry which will make his pike an operating entity.

PLANNING THE LAYOUT

Whether the situation calls for a small, single-station loop or a large, complicated layout, planning for realistic operation is more concerned with leads, sidings, spurs and interchange tracks than with the main line.

Experience has shown that operation is more fun with the concept of *linear* and *walk-around* track plans. These are plans where the modeled locations or job areas are long and narrow (an operator can easily reach the farthest track). Aisles allow an operator to walk-around with their train and the job areas are in a logical sequence along the main line. Two developments have made walk-around operation practical; the reliable coupler that can be uncoupled by hand, and the reliable switchstand. A lot of ink has been spent on making these items "remote control", but it is a waste of effort. In the long run, simple beats complicated every time. Keep them manual, keep your railroad walk-around, and let your operators have the fun of doing the same job prototype brakemen do.

For further discussion of track plans, the reader is referred to books and hobby magazines for information.

Yard Lead Tracks: See sheet D3h.1. To work in a yard without delaying main line action it is necessary to have the classification tracks funneled into a single yard lead as long as the longest



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PLANNING THE LAYOUT - continued

track in the yard. The lead should run generally parallel to the main and be connected to it by a turnout. Separate arrival/departure tracks should be included. At one time it was not unusual to find large, well scenicked model railroads which could not simultaneously run main line trains and work in the yard because the yard lead had been forgotten in the planning. See sheet D3h.1.

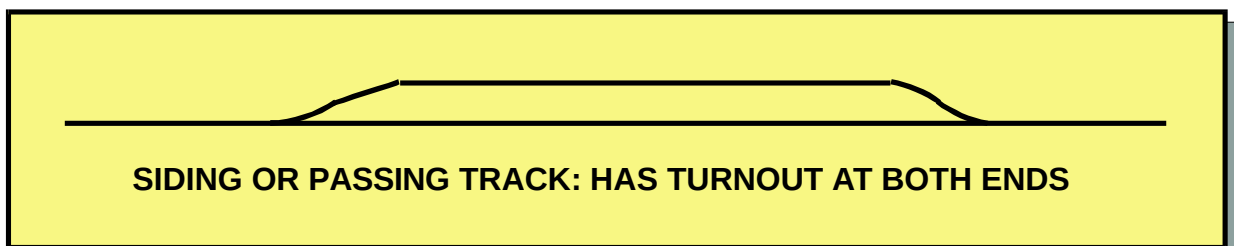
Switching Leads and Branch Lines: In areas of concentrated industry and heavy traffic, all industrial spurs are often connected to a lead running parallel to the main. On the prototype, the cost of the extra track may be justified through betterment of service to shippers without disrupting main line traffic. On the model railroad, it is purely an aid to operation, aimed at keeping the main line active while industrial switching proceeds freely.

Multiple sidings, as considered in model railroading practice, are akin to those long leads which branch away from main railroad lines to serve industry which is not directly on line. Some of these leads run for several miles. Any form of branch line with separate control is an excellent medium for taking the local train off the main without forcing it to tie up completely because of peak main line traffic. Such a branch line permits the local to start and finish its run on the main, doing a great deal of its work while out of the way up the branch.

Passing Tracks: These are especially important because they may have a dual function. The name implies a track with turnouts at both ends, connecting it to the main line so as to allow trains to pass, whether going in the same or opposite directions. In addition, they are useful for route switching, enabling the road engine to run around the train and work from the rear as well as from the head end to push a car into a spur with facing points as well as to back one into a spur with trailing points. If industrial spurs are connected to sidings, rather than to main tracks, it may be practical for locals to work them while waiting for through trains to pass.

It is impractical and unrealistic to locate a passing siding at every station. At stations with spur tracks, switching will sometimes be performed by trains which trail through the points. Spurs with facing points are only switched in those rare instances when the dispatcher orders a train to cut in a car ahead of the engine at the nearest passing siding.

This discussion will explain the need for study of the traffic pattern of a layout before one begins to lay track. Failure to provide enough passing sidings may seriously interfere with the desired operation of trains.



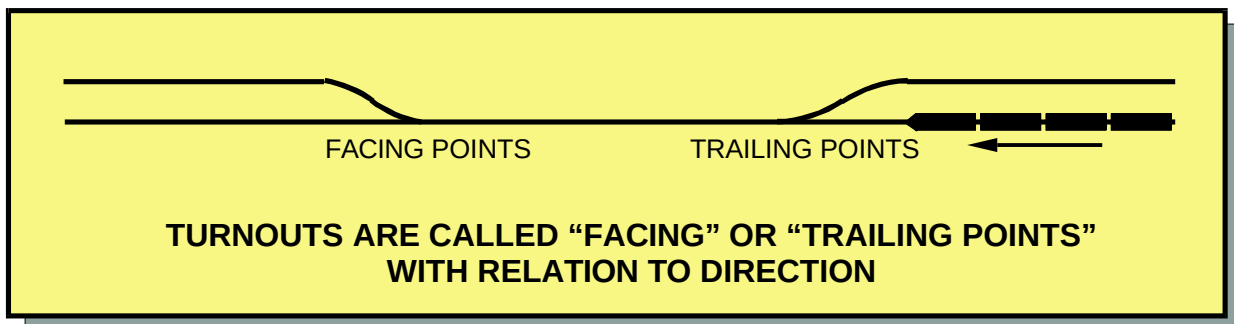
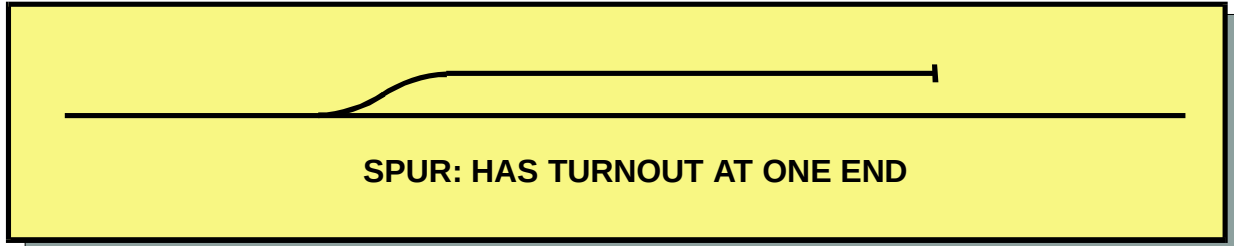


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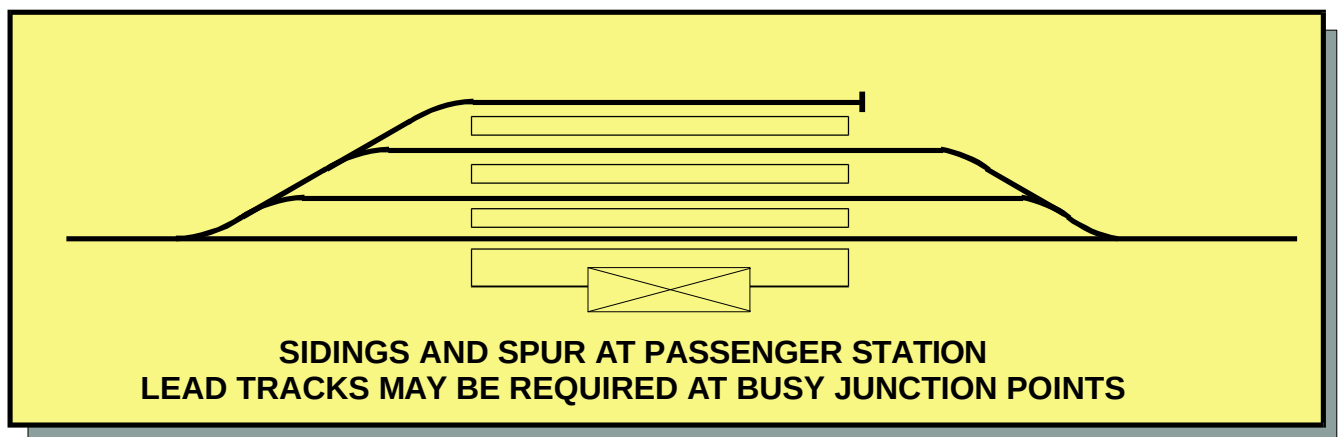
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PLANNING THE LAYOUT - continued



Passenger Sidings: Some layouts have excellent passenger terminals, but lack sidings and spurs at junction and division points. As a result, passenger trains cannot do any switching along the road, an activity which many operators consider one of the most interesting phases of realistic operation.



The number and length of sidings will depend on the layout and the amount of passenger train activity. Large stations should have separate mail and express buildings served by spurs. On most model pikes, such facilities will be found only at terminals. While every type of passenger car might be switched at any large division point or junction, a surprising amount of such activity goes on at small junctions, such as a through car being set out for a resort town branch line, or a business car being routed up a mining branch for inspection. Usually a stub siding long enough for two or three cars at either or both ends of a station will be sufficient for an intermediate station on a model layout.



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PLANNING THE LAYOUT - continued

Freight Sidings: These are important, being both source and destination of much of the freight handled by a railroad. A model layout cannot have too many of them. One well-known layout has 66 sidings, of which 50 are private, industrial sidings.

The golden age of railroading, the 50's, makes the best prototype for operation. All kinds of traffic moved by rail, even small industries had their own sidings, and railroad cars were still mostly 40' long. Today railroads only want to haul 50 car blocks of containers 1000 miles, but in the 50's the customer was right, and they were served by switching "loose cars". If you simply must have a recent prototype, there are still railroads who think the customer is right and will switch loose cars.

House Track: The track or tracks serving the freight house or platform, where LCL (less-than-carload) freight is handled.

Team Track: Track on which a car can be set out for direct transfer of freight to or from a truck. Points too small to have a freight house will have such a siding.

Special Sidings--Service Tracks: Those serving stock pens, icing platforms, unloading ramps or docks, cranes, storage areas, etc. These features will not be found at all stations. Icing platforms are usually found at division points. Stock pens are unusual in the East but the rule on the Great Plains, particularly at stations where cattle trains stop to water and feed stock.

Industrial Sidings: Factories, coal and lumber yards, petroleum depots, feed stores and grain elevators, all are served by railroad spurs. Regional industries include dairies within a few hundred miles of large cities, grain elevators, sugar beet loaders and alfalfa desiccating plants, fruit, vegetable and potato loading platforms and sawmills. The variety of mill and factory buildings is endless. The reader should be cautious, however, about attempting to model a large steel, chemical or refining plant which might not fit the scenic or traffic pattern of his layout.

Interchange Tracks: These tracks, at junctions, crossings and division points, are essential to the operation of both through and local *freights* for the model railroad as well as the prototype. They are particularly useful on the model railroad for creating the impression of traffic connections with other roads and sources of raw material. It is not always possible for the model layout to depict a complete freight cycle, such as coal mine to coal yard to factory, or logging operation to sawmill to lumber yard or factory, or oil field to refinery to bulk plant to consumer. Some of these facilities may be modeled, however, and interchange tracks employed to create the illusion that other parts of the cycle are located "off line," with carload lots passing from the online plant through interchange to a connecting line for delivery to the next processor.

The connecting railroad is usually not modeled in full; the interchange track is simply placed on the layout and used as an operating feature. At least one modeler has gone so far as to provide separate motive power for the connecting line, though, and to run the interchange train. It never passes the yard to which interchange is delivered, however, but picks up return loads and pulls away to a hidden loop awaiting its turn to come back.

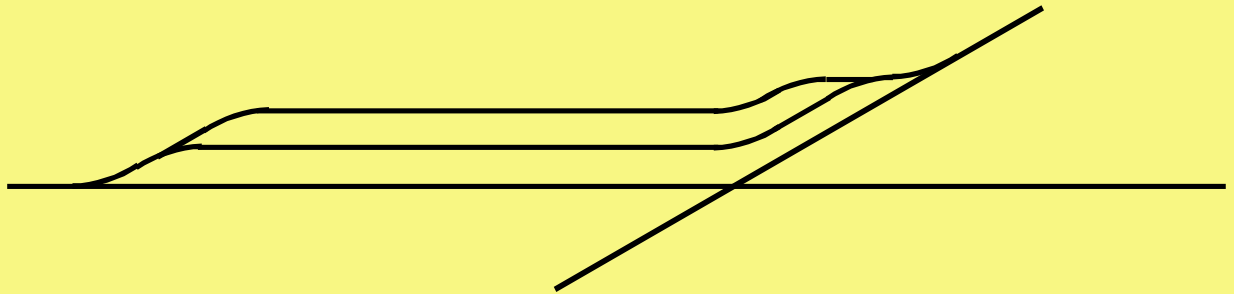


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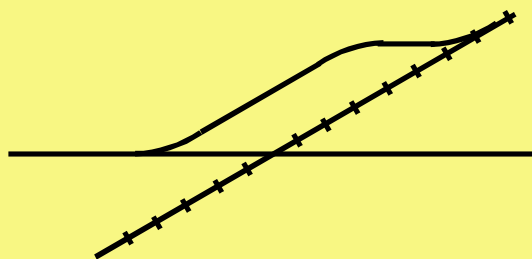
PLANNING THE LAYOUT - continued



TWO-TRACK INTERCHANGE AT A GRADE CROSSING. LEADS MAY BE REQUIRED



PARALLEL INTERCHANGE WHICH MAY BE WORKED FROM EITHER END BY EITHER RAILROAD. SEVERAL VARIANTS POSSIBLE.



ONE CAR INTERCHANGE AT GRADE CROSSING, AS BETWEEN A BRANCH LINE RAILROAD AND A COUNTRY TROLLEY

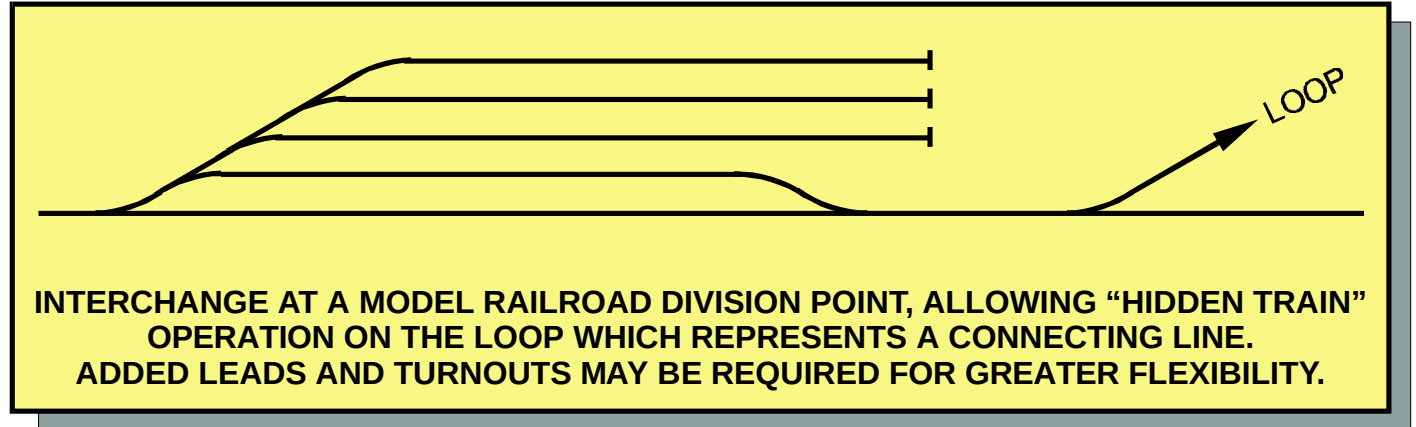


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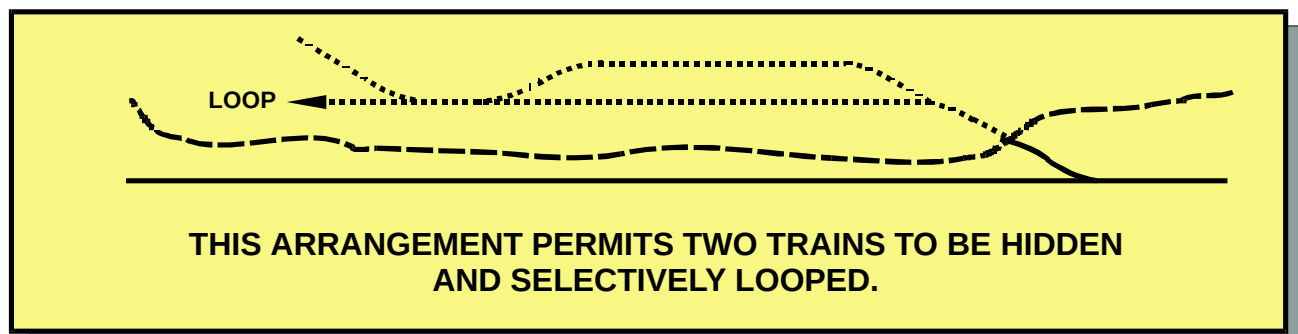
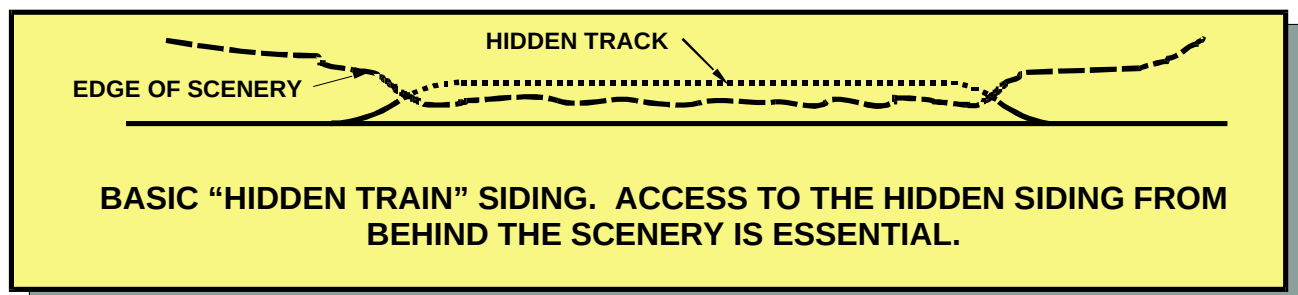
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PLANNING THE LAYOUT - continued



Staging: Two of the special methods to be treated elsewhere in this series require advance planning. One is the *hidden train method* of increasing running time of a train on the main line by running it into a *staging* track located behind or under a range of hills on the layout, in an adjoining room, or on a lower level. The hidden train or trains wait there until needed again. If more than one train is to be stored, a track must be provided for each, and all must be long enough for the longest train. Special control of blocks and turnouts will be required. Staging may also be done "visible" style with scenery, etc., but the function of the staging yard is to hold complete trains and no classification is done.





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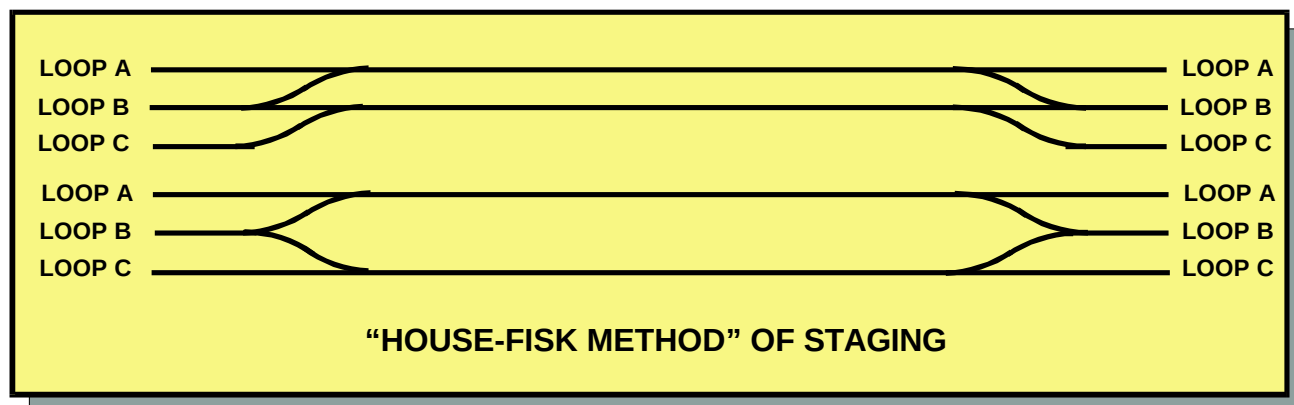
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PLANNING THE LAYOUT - continued

Another is the *House-Fisk Method*, named for its originators, which calls for three loops, so interconnected that trains may run continuously on two of them while a local train switches cars on the third. This system maintains spectator interest by keeping two fast trains in operation, and also permits attention to be given by operators and viewers alike to the peddler, which of itself would attract little attention.

This technique should only be used where a railroad is obliged to entertain the public at the same time real operation is being attempted. Continuous loops detract from ingredient a) under **OPERATION** above (i.e.. the railroad moves traffic in a direct and logical way).

The minimum track connections illustrated in the "House-Fisk Method" will join three loops in such a way that any two may run with little or no attention while the third is being worked by a local freight. One of the three may truly be a branch line, or may be worked as a branch line. The actual arrangement of track will depend, of course, on the layout plan. The assumption is that two loops directly adjoin while the third connects to one or both.



MODIFYING AN EXISTING LAYOUT

Rebuilding a model railroad to provide for either of the special operating methods described above might be a major undertaking. The first, particularly, could involve heavy construction effort. The first phase of any modification, however, would be to review the "story" of the railroad, its traffic pattern and its operating routine. If it doesn't have work to simulate, some pattern should be planned, and the required features added. Other features discussed under "Planning the Layout" should be reviewed. This section will rank modifications according to one writer's opinion of their value. Others may rank them differently.

Because industrial spurs are profitable grass-roots for prototype traffic: every model railroad should have as many of them as may be worked in. Given the choice of a main-line crossover to make operation a bit more convenient or an industrial spur, this committee would install the spur and accept minor inconvenience on the main.



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MODIFYING AN EXISTING LAYOUT - continued

Passing sidings come second, in committee opinion. One siding allows trains to meet along a point-to-point railroad, whereas two are needed for regular running of a bi-directional loop with just one train each way. More trains require more sidings. It may be possible for one train to run loop while the other works point-to-point, using but one intermediate siding for all meets. Review "Passing Tracks" paragraph of this data sheet.

Interchange facilities, however small, justify the appearance of almost any type car or load on any railroad. The train of the fictional connecting line may never be seen working the interchange, but the home road will always have cars to pull and set out at such a point. Switching and interurban lines depend on interchange for their freight, and the interchange should be the first feature added to models of such roads.

Yard and switching leads, if not already in existence or insufficient to individual needs, should be considered fairly early in the program of modification.

It may be feasible to add a branch line or a multiple siding to almost any model railroad. The operating features and advantages of these features are discussed above and in the reference sheets.

Passenger station spurs make it possible for the model to duplicate prototype station work. An extreme example of this is the setting out at Utica, N. Y., of through Pullman and dining cars to and from Lake Placid and New York City. Appropriate facilities at intermediate stations can increase the operating worth of the model line.

By operating with a group, each individual contributes their own personality to the recipe. No two sessions are ever the same, so it keeps your interest. Just "running trains" can get boring, but an operating railroad comes to life and takes on a character all its own. Operation is one part of the hobby that stays fresh.

OPERATION ENDURES!

