YouTube Model Builders eMag

A Free YouTube Model Builders e-Magazine
Produced by YouTube Model Builders.

Be Part of the Community
YTMB Live! Shows
YTMB Hangouts

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ARTICLES YOUTUBE CHANNELS COMMUNITY TIPS & TRICKS

SIGNALS

Simulated Reality

Be Sure To Check Out Columns From Jack Hykaway, Geno Sharp, Harry M. Haythorn, And Shane Mason!

INSIDE THIS ISSUE:

Cover Photo:
Jack Hykaway

Be Sure To Check Out
YouTube Model Builders Live!
Join Us Live Every Month

Welcome YouTube Model Builders!

We are excited to present this special **SIGNALS** issue of the **YouTube Model Builders eMag** to the community. The YouTube Model Builders "Team" is committed to putting the "eMag" together with the assistance from the model railroading community at large.

We deliver a useful and informative publication for model railroaders who travel this vast net of information. In this publication, we include many informative, tutorial-based articles, information on happenings in the community, listings of up-and-coming YouTube channels, information about the **YouTube Model Builders LIVE!** show, **Hangout Presentations**, along with general information that is inspirational in building of our model railroads.

Our Vision:

To establish free, online resources as a primary source for model railroad techniques and inspiration in an ad-free, selfless service environment.

Our Mission:

The mission of YouTube Model Builders is to inspire individuals for sharing model railroad building techniques through the use of YouTube and other free online resources. Our goal is not only to share knowledge in a community but also assist individuals who are learning or looking for inspiration through the online model railroading community.

— The YouTube Model Builders Team

Editor's *Note...*

As of late, there has been much chatter and many questions regarding railroad signals. This was also the case with the January 2016 edition of the YouTube Model Builders Live! Show, during which many viewers asked about signals, their placement on the layout, signal control, and how they can be used on a model railroad.

For this reason, we have chosen to concentrate on this very topic in this issue. On the cover you will notice the words "**SIMULATED REALITY**" just under the title "**SIGNALS**." When the discussion turns to use of signaling on a layout, many are simply looking to create, what I call, a simulated reality. What this means is that modelers are looking to create as much prototypical realism as they can possibly create given their knowledge, their skills, their budget, and their ability to find additional information. We can't help with the budget part, but we can help in increasing your knowledge, your ability to find additional information, and ergo your skills.

This issue begins with a special message from ModelerManMike entitled "Derailed!" We send his son Skyler our heartfelt prayers and wish him a very speedy recovery.

Modeling signals can become fairly complex. Therefore, we have created an "Additional Resources" page with many useful links to websites for signals and related hardware manufacturers and websites that provide additional information on signals including terminology, definitions, usage, categorizations, photographs, and diagrams of signals from around the world. Lloyd Henchey tells us about the frustrations someone new to the hobby faces in adding operating signals to a layout. He also lists the steps one should take to evaluate if installing signals is something they would like to implement. Well Lloyd, we hope you and others will find plenty of information in this issue to answer many of your questions and that you take full advantage by exploring the links on the "Additional Resources" page and within the articles.

Andy Crawford gives an overview of signals, a bit of history, and some great insight into the operations of signals. Harry's UP-HUB column provides an in-depth discussion on UP's use of various signals and even provides us with what signals to buy and where to find them. Muskoka Steve Juranics and Richard F. Piccuilla write about their techniques for installing operational signals on layouts. They get fairly technical, while Bill Beranek—The Track Planner writes about Doug Geiger's fantastic layout that is fully controlled by operating signals. In addition Bill writes how the era you choose to model impacts track design and planning, in his column "A Perspective on Track Planning."

Yoaman Smith, Shane Mason (in his "The N Scaler" column), and Geno Sharp (in "Geno's Corner") describe how they build their own signals for their layouts, without having to spend a lot of time or money in order to use signals to show turnout direction.

The community collage features Philippe Moniotte and his HO scale Belgian State Railways circa 1950-55. Jack Hykaway (in his column "Jack's Junction"), gives us an in-depth look at the Mallet 2-6-6-2T Articulated Logger steam engine. Be sure to check out the statistics sheet. Blayne Mayfield, in the "Food for Thought..." section explores if it is worth adding signals to a layout. What do you think? Let us know.

– **Loggin' Locos**
Editor-In-Chief

Photo By The Dennison News Company [Public domain], via Wikimedia Commons.
Postcard photo of the Mid Lake rail station at the Lucin Cutoff on the bridge over Great Salt Lake which was part of the Overland Route of the Southern Pacific Railroad.

Contents:

Derailed!

Working with our great hobby, we many times seem to be taken away from our love of modeling on paths that might not be our choice at the time. As many of you know, I have now relocated back to Texas from Korea with an astounding task. Many are aware of the reasons I have been so distant in YouTube Model Builders and with my YouTube Channel as of late, but all is starting to come back together. After several months of working through some of the hardest times in our lives, we (my family and I) are now seeing that bright beacon of light at the end of the tunnel. I wanted to share with the YouTube Modeling community a brief explanation why I have been so distant.

In May of last year my youngest son, Skyler, was diagnosed with cancer; we immediately relocated back to Texas from South Korea to care for him and his year-and-a-half-old baby girl. We have been through many trials and tribulations throughout the last several months. Now, things are really looking up, and we are on the road to recovery. Skyler has been on chemo for several months, is now scheduled for surgery to remove large remaining masses, and will continue chemotherapy for 6-8 additional months. Skyler is in high spirits and is taking it all in stride. My wife and I are really enjoying the time with our son and our granddaughter.

So why share this with the community? So many great people have offered their prayers and concern with our situation, and I wanted to personally thank the many people who have come forward to express their heartfelt concerns. I wanted to let you all know that your prayers and support have been so greatly appreciated by our family. I was really unaware of how many people were following me through my videos and YouTube Model Builders; the support has been incredible, and we thank you so much!

Moving on into the hobby, I am currently planning new videos now, ready to take a breather and delve into some of this wonderful hobby. I have a few videos planned, and I hope to start sharing again with our great model railroading community and actively participate in the many model railroad arenas throughout the web, including YouTube Model Builders. YouTube Model Builders is working hard to deliver so many free-to-the-public activities and Model Railroad inspirations, and I feel the need to immerse myself into this as much as before… a little at a time, though.

YouTube Model Builders is still providing great resources for the community including the LIVE! Show, the eMag, and the hangouts. I am really excited to hear about the new merit program that Geno is leading, and I am working to get melded into this great community activity that will inspire people to step up their knowledge of Model Railroading through this great new program.

Looking forward to getting back on the rails and connecting with my Model Railroad friends.

- ModelerManMike

Additional Resources...

By Loggin' Locos

Throughout the articles within this issue of the eMag, you will find links to various signal and related hardware manufacturers' websites. Below, you will find these and some additional website links to many other signal related manufacturers, as well as several very robust and useful signal related sites which contain signal definitions, terminology, usage, diagrams, classification, and other databases. We hope you, not only find this issue of the eMag a valuable resource but also the listings below of value as you build your model railroads.

Manufacturer Websites:

- Circuitron
- JLC Enterprises, Inc. (C/MRI)
- CTI Electronics
- Digitrax
- Integrated Signal Systems
- Logic Rail Technologies
- NCE Corporation
- New Jersey International
- Oak Tree Systems, LLC
- Oregon Rail Supply
- RR-CirKits
- Signaling Solutions
- Tomar Industries

Informational Databases and Websites:

- Custom Signal Systems — Provides signal planning and customized signal solutions.
- Railroad Definitions & Terms — This web page is another great resource for all types of railroad terminology and definitions. Check out the rest of the website for other railroad related information.
- JMRI Yahoo Group — JMRI User Group. Join and learn from other as well as get your questions answered by other members of the group.
- Mark Vogel's Railway Signals and Signal Diagrams — Mark has drawn and assembled an amazing set of railway crossing and signal diagrams covering a good amount of US and European signals and operating manuals.
- Railroad Signals of the U.S. — Comprehensive guide to signals in the US. Includes definitions, classifications of signal types, and photographs. An excellent learning resource.
- The Signal Page — One of the largest website databases for signal and related information. Check out their database, simulation software, and links pages.

Background Photo Courtesy of Jack Hykaway

Signalization Viewed Through The Eyes Of A Newbie

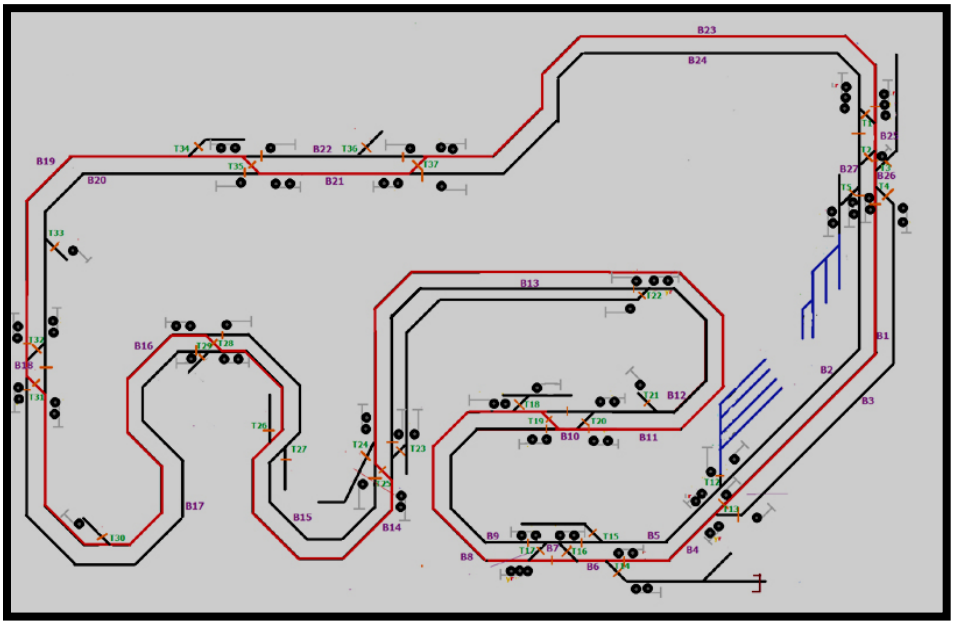
By Lloyd Henchey

Signalization of a layout can be very scary when you have no knowledge of the ins and outs of the whole system. What do the lights mean? Where do we install them? How do we install them? What is required to make everything work? How do we operate them? And so on... Here's my story:

About two years ago, I decided to join this hobby and make it my retirement activity; and just four months ago, I decided to start over and try to make everything right and easy. I had a layout designed by Bill "The Track Planner" and started building it. While doing so, I've been watching lots of YouTube videos. I noticed that some of the layouts I saw had signalization, and I said to myself, "I want that." But after doing lots of searches, I found that not much is available to help achieve the construction of signals. Even though I asked for some help in the last 4 months, information is very hard to come by. I thought that it would be helpful to let my fellow modellers, especially beginners in the hobby, know some of the important steps that I've learned so far.

Here are just a few of the many signal types found on prototype railroads.

Here is a diagram showing signal locations on my layout.



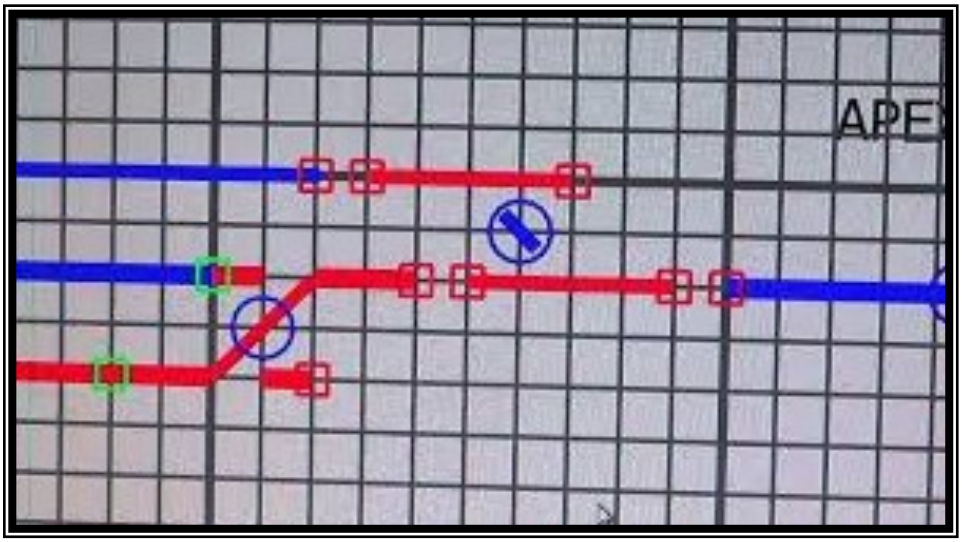
Adding a signalization system is more complicated than other tasks, such as installing tracks or doing a bit of scenery; and signalization will make a dent in your wallet. I would say that the first step is to decide whether or not you want signalization on your layout.

Why would you want signalization? It could be for how it looks, either for your own private operating sessions or because you have people over for huge operating sessions. You might not need it for small layouts, but you most likely should have them for very large layouts. I personally think that signalization is added to layouts mainly to allow

smoother operating sessions take place.

If I decide to have a signalization system, where could I begin? First, I really would need to understand how signalization works. What does all those signal lights mean? Why are red, green, yellow, or even flashing colors used? What are the differences between searchlights, dwarf signal, bridge, semaphore, and position signal lights? Unfortunately, I can't help you answer these questions yet, since I'm still learning about it myself; but I know that if you do a search on signalization for the road name you're modeling, you will find information about the types of lights that road used and their meanings.

Now that we've researched the signals found on our particular railroad, the next question is "where should they be installed?" This part still puzzles me. I have lots of unanswered questions such as: Where on the layout do I install different signals? Are the signals installed on one particular side of the track, or do I need signals on both sides, and maybe facing both ways?



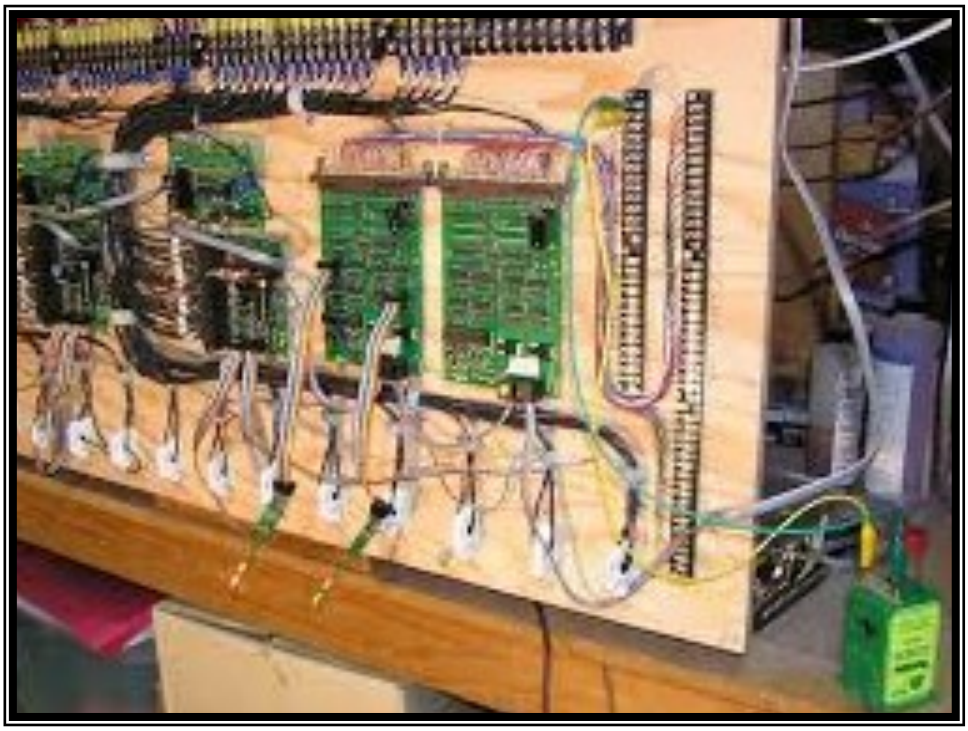
JMRI computer program interface is another option for controlling turnouts and signals.

Once I have learned what each signal type does and where the signals should be installed, I then have to figure out how to make everything work. I have to decide what signal control system will work best for me. I also need to decide how to control the turnouts, whether by toggle switches along the facia, a tablet in my hand, or a computer that lets a dispatcher controls the turnouts during an operation session. For the last two, I would need to have a bit of computer knowledge to be able to program for my layout.

Toggle switches on the facia will activate your turnouts and, therefore,

Fascia-mounted toggle switches are one option for controlling turnouts.

Typical signal control hardware under a layout can quickly become complicated.



also can be wired to activate your signals; but if you want to simulate your particular road's signals, you'll need more equipment installed under your layout. This is another area where I still have no idea of what will be required.

I often hear about JMRI, a computer program that can do many things, including controlling turnouts and signals on the layout; but every video I've viewed on the topic has left me totally lost with all of the technical stuff. Another system that was suggested to me is TrainController, which is another computer control system; but it has the same problem as JMRI: lots of programming is required, with a steep learning curve to do so. I guess if I took the time to learn how to program such systems, it would become easier for me.

> "Signalization of a layout can be very scary when you have no knowledge of the ins and outs of the whole system."

Since my knowledge of signalization was nonexistent and I couldn't get answers to my questions, I found someone (see Richard Piccuilla's article in this issue of the eMag) to design my signal system and take the time to explain to me the ins and outs of signalization. His system is non-computerized; it uses toggle switches on the facia with pre-programmed hardware. The program detects trains on the layout and sends the appropriate signals to the lights.

For now, this is where I stand: I still don't know which signal control system to use. Of course, people will urge me to use the system that they use for such-and-such reasons; the problem is that all of these systems seem to be good solutions. There's so much else I need to learn about the different systems, what is needed to install them, and what would be best for my layout.

If I will be the only person operating the 20' x 40' layout 95% of the time, and full-blown, operating sessions with other people represent only 5% of operations, what is the best system that fits the needs of both?

So here's a little recap of what one needs to figure out before moving forward:

1. Do you want (need) a signalization system?
2. What do the signals mean for your railroad?
3. Where should they be installed?
4. What kind of signal control system do you want?
5. What is needed to make the signals work as expected?
6. Perhaps most importantly, how much are you willing to spend?

And here are some information sources from the Internet that I have found useful:

1. http://jmri.sourceforge.net
2. http://www.freiwald.com/pages/traincontroller.htm
3. http://www.customsignalsystems.com

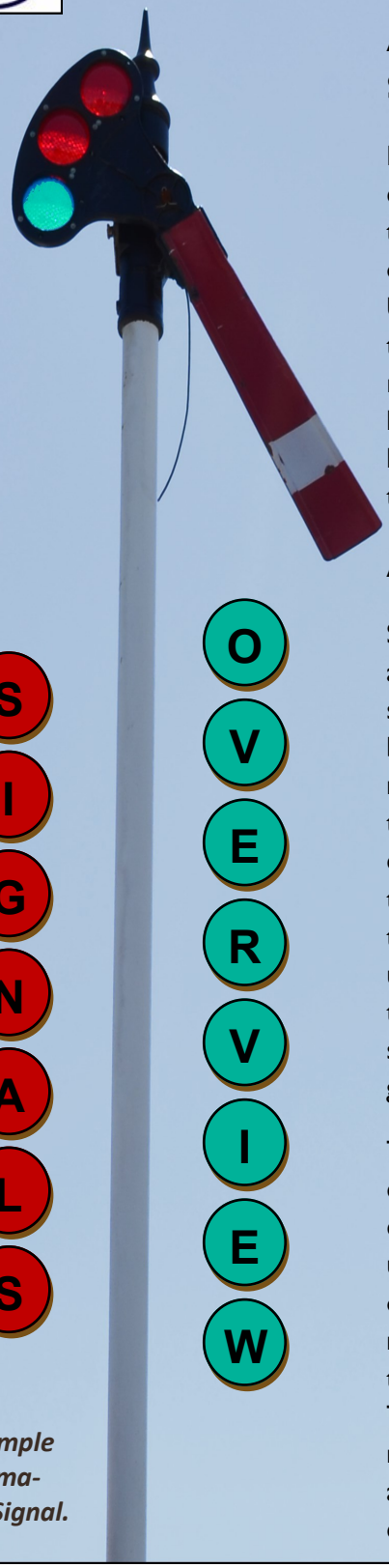
About the Author

Lloyd "Hawkes HO Layout" Henchey is 57 years old. He studied engineering, worked for an engineering firm and – since engineers love numbers – became a financial advisor. He's been in that profession for 25 years, but now is enjoying semi-retirement. Lloyd has been married for 25 years, and he and his wife have a daughter and five grand-kids. You can follow Lloyd on his YouTube channel at Hawkes HO Layout.

Photo Courtesy of Jack Hykaway

Signals - Just The Basics...

By Andy Crawford



An example of a Semaphore Signal.

SIGNALS OVERVIEW

Application of Signal Systems

Modeling a believable railroad can employ many facets of the prototype. Few things bring out the flavor of railroading more than signals. Understanding some particulars of the signal prototypes, the history relevant for your modeled era, and how to apply that to your layout can help you along that track (pun entirely and thoughtfully intended).

A Brief History of Signals

Some of the first train control mechanisms were simply "Mother May I" systems of approval. As operations became more complicated, with more traffic on the route and more trains competing for track usage, changeable control mechanisms had to be invented. Over time multiple types of control mechanisms were used to govern the movement of traffic on railroads that predated signaling systems such as tokens, flagging, train orders, etc.

Train orders are of particular interest because they could be considered the beginning of train control utilizing communication, and is one of the earliest systems leveraging modern-day (for its time of course) technology such as the telegraph. The telegraph was a major advancement to early operations, control, and safety of the railroads. And, of course, this was very important in allowing train orders to work more effectively, and it became an integral part of many signal systems that followed.

Train orders, were used primarily prior to reliable communications between dispatchers and train crews. Train orders can be a fun way to incorporate that control on a model layout, and there are places this mechanism is still in use today in the real world. But orders change, trains break down, and they miss their schedules; to paraphrase John Lennon, "the real world is what happens while plans are being created." So notifying train crews about obstructions and train order changes became very important prior to the turn of the century.

Over time, a few creative solutions were developed, but one popular with many railroads was the ball signal – simply a ball on a pole that was raised and lowered to indicate stop orders by a railroad crewman. The original idea was to raise the ball when a train was required to stop and talk to the station clerk about order changes. A problem quickly was discovered: what if the rope broke on the signal and the train was never notified to stop? Pretty quickly a change was made so that a ball raised, or high ball, meant "clear to proceed," and a lowered ball meant

Photo Courtesy of JD (Loggin' Locos)

"stop"; from this, we get the term "highballing." This came to be known as a "fail-to-stop" system, so that when any component of the signaling system failed, the signal would, by default, indicate a "stop" to allow crews to investigate further.

Unfortunately, this lesson was not learned well, and the first semaphores were developed with this same flaw (see Harry M. Haythorn's column "Harry's UP-Hub" in this issue for more information on semaphore signals); that is, they failed into the "proceed" position. Lights were added to semaphores, running on batteries for the most part, early in the 20th century.

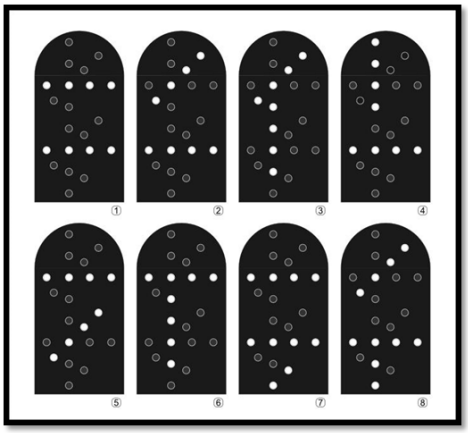
Soon enough, railroads adopted removing the mechanical component in favor of light-only signal systems in a variety of form factors. My personal favorite is the position light signals, which were employed by my beloved Norfolk & Western Railway, among others such as the Pennsy, Baltimore & Ohio, etc. These were large round targets with lights around the ring that illuminated in a pattern matching that of a semaphore's positions: straight up and down for "clear," diagonal for "restricted proceed," and straight across for "stop." Some railroads, like the Baltimore and Ohio, employed additional lights indicating "stop and proceed," "full speed," etc.

Many other signal aspects have been used; for example, the type G was popular for a period. Other signals approximating a traffic light were used later, and many modern railroads have standardized around these aspects.

Control of signals dispensed across the country was critical where Time Table & Train Order (TT&TO) required communication with station operators, tower operators, and clerks to locally change signals. The advancement in communication the telegraph afforded, also provided the ability to remotely control signals. Two major forms of remote signal manipulation and railroad traffic control were developed: Centralized Traffic Control (CTC) and Automatic Block Signaling (ABS). CTC is positive block control; that is a dispatcher gives permission to move; otherwise the signal indication remains red/stop. ABS on the other hand is an automated system, often referred to as permissive, based entirely on the presence of a train (or not) in a given block ahead of a signal and the turnout position. It will normalize to the green/clear indication, and changes simply based on conditions on a line, with an option to override remotely. Given that these descriptions are simplified and generic, please keep in mind that various varieties and modifications of these systems are used in practice. Union Switch & Signal (US&S) is the predominant prototype producer of automated signal systems and CTC control systems (especially in the early years), and they tend to follow more closely to a standard. However, many railroads requested modifications from US&S, made modifications themselves as the systems were installed or matured, or used alternative manufacturers.

Modeling the Signals

First, you need to consider if your layout is conducive to adding signals. Is the layout large enough to represent signal operation accurately? If not, you can consider "scenic" signals, and approximate the operation with some simple tricks. (See the "Scenic Value" section, below.) Does your track plan and track arrangement play nicely with the requirements of block occupancy detectors and the like? If not, you can do a simple job with optical detectors. Do you want to commit the financial and time resources to creating a signaling system? This last question may seem less practical to you if you've decided already, but let



Top: Early Position Light Signals (US); 1-Stop, 2-Approach, 3-Proceed, 4-Approach Medium, 5-Medium Clear, 6-Medium Approach, 7-Restricting, 8-Slow Clear; (Union Switch & Signal Co., Swissvale, Pennsylvania, USA).

Below: Another Position Light Signal.

me stress that completing a signal system can be a significant investment of both time and money. Time and money are precious things and you need to ask some questions about the vision you have for your layout before committing yourself. Are signals important to the operation of the layout? Are you a solo operator, or do you operate with others? Are you trying to accomplish prototype-like operations? Did your prototype have signals that you must replicate, or would a railroad of the size and stature of the line you are freelancing have signals? In what era is your layout set? Era will dictate much about what signals, how many, where placed, and how they are operated. If you are modeling an era earlier than the current one, then some research may be required.

In my personal case, signals are important to the operation of the layout. I do operate with others, and signal indications are important to all operators to operate trains "safely" and appropriately. The prototype (the Norfolk & Western Railway) had converted to CTC by my era (1950). My layout is conducive to good occupancy detection, as I've designed for that. Let me say this as well: it's much easier to implement an appropriate signal system if you've planned for it as you designed and built the layout initially. I would love to spend all this money on more locomotives, but signaling is important, and I see the need to commit the resources to a good signal system. You have to make those decisions before you determine how to go forward and before you start researching the vendors producing signals to purchase them and the required electronics. In my case, it will require some scratch building of signals. There will be a time when you have to determine how much you are willing to spend to get to the place you want with a complete signal system. You will have to consider if you want to, can, or must build them, or what you need is commercially available. And you'll have to consider how much equipment will be required to operate it.

Scenic Value

If your pursuit is simply to recreate signals for "scenic" value, all of the previous questions and concerns about expense can be mitigated. It's simply much less expensive and involved to add signals to a layout for the scenic value of having them. There's a manufacturer, Z-Stuff Signals, that produces signals that can simply be installed on the layout and power provided to them. They have an optical sensor built in, and as a train passes, they go red for a period of time, yellow for a period, and return to green. These will not help you and others operate your layout effectively, but this product (or recreating it with signals from NJ International or Oregon Rail Supply and some simple circuitry), may provide all you are looking for.

Operating Value

If you are trying to recreate an operating signal system with all the operational joy, play value, and true railroad flavor you can muster, be prepared to commit some time to getting there. JMRI and other such control software may help a lot, but there's still quite a bit of electrical hardware required to reproduce the correct operation. Digitrax has a leg up in this arena with LocoNet; however if you have an NCE or other DCC control system, you can add a LocoBuffer to your layout and include it with JMRI to use Digitrax signaling equipment. But there are NCE alternatives, among others, and the specific electrical components required are beyond the scope of this article.

There are things you will want to get right about your installation to reach the operational value you're expecting. Signal placement and understanding the control of traffic flow on your track plan will be important. An understanding of railroad concepts, such as control points, will be important. A control point is simply railroad jargon for a point where the control of traffic is important, such as at a diverging point, a branch line (where a main line splits), or a simple set of crossovers. There are other traffic control requirements, such as passing sidings on a single line route, where a signal on the single track will let approaching trains know if they are continuing on, diverging into the siding ("going in the hole," in railroad terms), or if they need to be prepared to stop at the next signal. Signals will be required for each track prior to the switch at each end, as well, to stop trains in the siding or on the main, and to give clearance to move again once the passing operation has been completed.

Your particular prototype, or what prototype you are trying to approximate with your freelance efforts, will dictate a lot of details of signal placement. If they are post or pedestal signals, they are typically on the right

side of your track in the US. However, many prototypes have opted for signal towers, with both track's signals included; this may be a cantilever, an across-the-tracks signal bridge, or a single large pole with a platform and poles for each distinct track above that. Look at photos online to see what you are trying to reproduce or what you prefer.

Implementing on the Model Railroad

What system you want will determine the requirements for how to model it effectively. Control software such as JMRI or Railroad & Co. will help. But, as I previously stated, quite of bit of electrical hardware will still be required. I have the highest hopes that the new LCC or OpenLCB systems will reduce this, but for building a signal system today, a few things will be required. Think of this in three parts:

Train detection and turnout position indicators, and feeding that data back into whatever you use for the next part.

Logic or control, which determines what to do with signals when a turnout is in a given position, or when a particular section of track is indicated as occupied.

A control system is needed for the indicators you use, either for controlling semaphores or the changing of light indications.

Research and planning are critical to reproducing or emulating a control system for your model layout. Your layout may dictate the desired solution if you are freelancing. If you have few members of your available operating crew, ABS doesn't require a dedicated dispatcher. One nice option is that CTC with most model software solutions (JMRI or Railroad&Co) can be used with a dispatcher, if available to fill the position, or without a dispatcher (switched into ABS mode), when you simply want to run trains and enjoy the layout, or are short on operators and running as a lone wolf. Regardless, some type of control system will be required if you are looking to get any level of "Scenic" or "operating" value from your system; so consider your layout carefully.

In summary, a well-implemented signaling plan may result in a tremendous amount of pleasure added to your model layout operations. However, to avoid the potential pitfalls, good preparation and research are required. Many people see it as well worth the effort, and I fit into that category of people. Remember, being prepared and planning ahead will help you enjoy the process too. As this is true with many parts of this greatest hobby, planning is tremendously important. Just like the prototype, signals can set the flavor of operation for your layout and help infuse a feeling of a particular prototype, era, or class of railroading. Many further details are provided by other articles within this issue of the eMag as well as the wealth of information available to all who search the internet; so prepare and execute. There are many of us that believe it's so very much worth the effort to add operating signals to our layouts, and I look forward to watching your progress, as you post it on our community pages.

About the Author

Andy Crawford, 37 years old, is a technology provider to mid-sized businesses and financial institutions, and a lifetime model railroader. Starting young in the hobby with a train set, like many others, and after spending a decade as an armchair modeler, he returned to the hobby a few years ago, in full force. He models a very exacting replica of a 15 mile section of the Clinch Valley District of the famous Pocahontas Division of the Norfolk & Western Railway in 1952.

His interest in exacting replication of the prototype, fine scale craftsmanship, weathering, and prototypical operation can all be seen in his work. For him, recreating the experience of being a railroad professional, 1/87th the size, in the 50's is all the focus that is needed. You can check out Andy's YouTube channel here: https://www.youtube.com/channel/UC8I2bTYfzVY37328sGPD9Bw.

Want to get your YouTube channel featured or mentioned in the YouTube Model Builders eMag? Contact us at YTMBeMag@gmail.com and tell us about your YouTube Channel.

HARRY'S UP-HUB

Harry M. Haythorn, UPHS #4043

Welcome to the UP-Hub! The theme of this issue is signals and signaling, and I will cover three eras and designs of signaling in this article. I am a steam era modeler, so I will cover that first. After that, I will cover the 1960s-2000s period, and lastly I will cover modern PTC installations that I have seen UP signal crews install. I will not go into great detail on how to control the signals on your layout, as there are multiple systems and ways to do so; but I will provide some basic modeling information on who makes these model signals, including part numbers.

Steam Era Signals

Beginning in 1903 the Union Pacific and all other Harriman lines began using one of three designs. One was the Union Switch and Signal (US&S) Style B, 2-position, lower-quadrant semaphores. Another was the US&S Style S, 3-position and a the Federal Style S for use in conjunction with the Automatic Block System (ABS) installed at the same time; the ABS was the newest and most technologically-advanced system for controlling trains since President Lincoln signed the Pacific Railway Act of 1862. The third style was the Federal or US&S upper-quadrant train order boards that were located next to hundreds of lineside depots. These signals were also displayed in the cabs of locomotives with the use of cab signals, which were just that: a copy of the lineside signal in the cab. It used the same circuits that the lineside signals used to relay the information to an indicator in the cab.

Lower-quadrant semaphores and train order boards move from 90 degrees down to 45 degrees, and upper-quadrant semaphores

Figure 1— Challenger 3977 is shown a "proceed" signal on the Style S semaphore at the Cody Park Railroad Museum in North Platte, Nebraska.

Figure 2 (below left) — The blade and lens side of the semaphore.
Figure 3 (below right) — The details of the relay box are shown.

Figure 4 — The train order boards at a station. This signal is showing a stop indication.

The other common semaphores in use on the UP were, of course, the upper-quadrant train order boards at lineside depots. These were used in conjunction with the Type B and Type S signals used along the mainlines. The train order boards were used by the station agents to relay messages to train crews from the dispatcher. The train order boards were a 3-position board. The clear (green) position meant that the train did not have any special instruction and could continue on its scheduled time to its next allotted location; the yellow position told the crew that they had to slow to pick up orders from the station agent "on-the-fly," without stopping; and the red position told the crew that they had to stop the locomotive at the station to pick up the orders or be told of special instructions from the dispatcher or station agent. (See Figures 4 and 5).

and train order boards move from 90 degrees to straight up.

Both the Style B and Style S signals were installed on thousands of miles of the Harriman System. This included the Omaha-Ogden Mainline, portions of the Kansas Pacific, the Cheyenne to Denver line, the Oregon Short Line (OSL) and the Oregon, Washington Railway and Navigation (OWR&N); the exceptions were the Los Angeles and Salt Lake (LA&SL), which used only the Style S, 3-position signals, and all of the Southern Pacific (SP). These signals lasted into the 1950s on the mainlines, and there were even a few examples still in use on branch lines on the SP into the 1970s. In 1919, UP/SP published an advertisement that stated that 1/3 of all automatic safety signals were installed on the combined properties of the UP and SP.

Figure 5 — Front side view of the museum; note the train order board on the right.

The Style B used two arms per mast with two positions, 90 degrees and 45 degrees, to show "approach" or "diverging" – in effect a yellow (caution) and green (clear/proceed) – with the Style S, 3-position semaphore being used at the ends of blocks to indicate stop (red), caution (yellow), and proceed (green). (See Figures 1 through 3).

These signals can be modeled with semaphores and train order boards

in HO, and are manufactured by Tomar Industries and Oregon Rail Supply. They are available from many online sources like Walthers , direct from Tomar Industries, or your local hobby shop.

The part numbers are:

- 81-845 – Upper-quadrant train order board;
- 81-840 – US&S type S, lower-quadrant semaphore with single blade;
- 81-841 – US&S type B, lower-quadrant semaphore with two blades;
- 81-870 – 3-position blade signal mechanism;
- 538-152 – 2-track signal bridge with upper-quadrant semaphores; and
- 538-155 – 4-track signal bridge with upper-quadrant semaphores.

1960s – 2000s

As the flow of rail traffic and motive power changed in the 1960s, so did the way that the railroad signaled its train movements. Beginning in the mid to late 1950s, the railroad began to replace the once-common semaphores and train order boards with US&S searchlight and 3-position signals at all locations. The searchlight signals have a signal light with colored lenses to indicate the signals, and the 3-position signals are just that: they have 3 lights much like a traffic signal. These types of signals are still in use all over the system and are mounted in multiple ways, including mast, signal bridge, and cantilever-style signal bridge. (See Figures 6 and 7.)

Figure 6 (above) — A modern signal installation at the Pawnee Springs Road near Maxwell, NE. These signals govern a set of crossovers along UP's busy Kearney Subdivision.

Figure 7 (below) — The signals near Maxwell are lit up indicating "stop" on tracks 2 and 3 (left and middle) and "proceed" on track 1 (far right).

As the road moved away from the timetable and train order operations of the steam era and into the more modern era of speed signals, Automatic Block Signals (ABS), Centralized Traffic Control (CTC), and route signals, the need for longer blocks and faster signals led to the widespread use of the 3-position signals that we now see on all mainlines (with snow shields to protect them) and searchlight and dwarf signals on branch lines and yard tracks.

There are multiple designs and uses of these signals and, thus, multiple ways to model them. The grand thing about these types of signals is that they are readily available from a multitude of manufacturers and in just about scale you can think of.

The most common style used by UP are produced by New Jersey International, Tomar Industries and Oregon Rail Supply, with the following part numbers.

Tomar has both 3-light and searchlight styles on single signal masts:

Figure 8 (above) — This is the first PTC signal installation East of North Platte, this is at North Airport Road.

Figure 9 (below) — There is a large array of equipment and structures to make the PTC system work.

- 81-8561 – 3-light vertical, with snow shield;
- 81-8661 – 2-head, 3-light over 3-head;
- 81-872 – Single-head searchlight;
- 81-873 – Double-head searchlight; and
- 81-874 – Double-head, offset searchlight.

Oregon Rail Supply has UP/DRGW-specific, hooded signals:

- 538-121 UP/DRGW 3-position, with snow shield; and
- 538-99 – 3-position mounted on a cantilevered signal bridge; and
- Many searchlight signals in multiple forms and configurations.

NJ International has these offerings:

- 525-1037 – Type-D, bidirectional, 3-position signal, with snow hoods; and
- 525-1341 through 525-1352 – Multiple searchlight signals.

Also in NJ International's line are signal bridges in multiple arrangements, including:

- 525-4007 – 3-4-track standard signal bridge;
- 525-4009 – 2-track signal bridge; and
- 525-4001 through 525-4004 – Cantilevered in 1-track and 2-track styles.

BLMA Models provides some of the most modern block signals used on the Union Pacific; these include signal mast, 3-position signals with modern snow shields, as well as cantilevered and signal bridge installations:

- 176-4036 through 176-4038 and 176-4035 – 3-position signals;
- 176-4030 (Left-Hand) and 176-4031 (Right-Hand) – Modern cantilevered bridge, both with 4 3-position signals; and
- 176-4025 – Modern triple-track signal bridge, with 6 3-Position signals, all with LEDs.

2000s and Beyond

Modern Times on the nation's railroads have brought many challenges. On Friday, September 12, 2008, a UP freight train collided with a Metrolink commuter train in Chatsworth California, after the Metrolink engineer ran through a red signal while texting, causing 25 deaths and multiple injuries. The resulting investigation into the accident led the United States Congress – in conjunction with the Federal Railroad Administration – to pass a bill requiring all railroads to implement Positive Train Control (PTC). This system is not new; it was used in one form or another by many roads, including Union Pacific, Santa Fe, and New York Central – to name a few – as early as the 1940s. The premise of PTC is that if the locomotive/train passes a red signal, it will have its brakes set automatically, and thus be stopped before an accident can occur. Now you may ask yourself why

Figure 10 (above) — Shows the signal bridge and related PTC equipment. Note that the PTC equipment towers between each track and the signal equipment bungalow sits to the left of the right-of-way.

Figure 11 (right) — Note the dedicated radio/cell antenna in the foreground between the signal bridge and the transformer on the ground.

this system has not been in continuous use since the 1950s. The simplest answer is that each railroad's systems were, for the most part, not compatible with each other.

In this modern age of computer technology, the idea should be very simple and very easy to implement – in theory; but in actuality, it is very complex and has multiple variables. This explains why the deadline has gone from an almost unattainable December 31, 2015 to December 31, 2018. The three-year extension also includes provisions for an additional 2 years, if needed, for full implementation.

This legislation has led to changes in the railroad signal landscape nationwide, as the deadline of total implementation ticks ever closer. The nation's railroads are working to make their existing signal locations (some of which have been in place for over 100 years) work with the new PTC equipment. (See Figures 8 through 11.)

Union Pacific is working hard to update, upgrade, and install the required equipment in locomotives and lineside at the existing signal locations. If you are wondering how to model these modern PTC installations, the best source is to use the BLMA Models signals, trackside equipment sheds, radio antenna towers, and cell phone towers; the NJ International signals and signal cabinets; and an assortment of small, modern signal buildings, chain link fencing, and other details from multiple manufacturers. Walthers has multiple detail parts, and Atlas has signal equipment sheds and other detail parts.

Signal Control options

I know many of you are asking yourself, "Well, Harry, how are we going to control all these signals?" There are many control systems on the market, and the most widely-known systems are the ones from Circuitron; they pretty much do anything that you could ask. This includes block occupancy detectors, grade crossing animators, signal drivers, 3-postion signal drivers, and turnout control circuits.

About the Author

Harry is a rancher in Nebraska who works with his father and grandfather to help run their 22,000-acre, 1500-head of mother cow, ranch. Harry has been model railroading for over 20 years and models the Union Pacific Steam era from the 1930's to the 1960's, in central and western Nebraska. Harry is a Sustaining Member of the Union Pacific Historical Society and a member of the UPHS Streamliner 100 club. He is a National Model Railroad Association member currently working on his Master Model Railroader Certificate. Harry regularly posts videos on his YouTube page. You can follow Harry as he works on his 7th layout at https://www.youtube.com/channel/UC6-MPHmYU3Cc2uEVfjZDIcQ.

Implementing A Signaling System On Your Model RR

Driven By JMRI, NCE, and SignalMan From RR-CirKits

By Muskoka Steve Juranics

I've been investigating signal systems and various options for several years. I even designed and built a simple ABS (Automatic Block Signaling) system that would operate as a standalone component. I was hesitant to dive into JMRI and rely on an operating computer to drive the signals. Then LCC appeared on the horizon and added another consideration to the mix.

In January 2016 I decided that I would attend the Amherst show in West Springfield, and I figured that was the perfect opportunity to speak to some manufacturers and pick up the components necessary to install a working signal system. I already had several signal masts in my inventory of future projects, so it was just a matter of getting the hardware to drive the signals and then figuring out how to operate it.

If you want to add a signaling system to your layout, the first decision you must make is whether you want a computer working in conjunction with your DCC system to drive your signals. Several manufacturers make components that will drive simple aspects, like going from green to red when a train enters a block, and it is very simple to wire signals to indicate turnout direction. But these components are not sophisticated enough to correctly indicate block occupancy over various routes and cannot talk to signal masts down the line. Some components are getting more sophisticated, and LCC is designed to have standalone components that are capable of talking to one another.

I was leaning in the direction of a standalone system, but then I tried reading some of the instruction manuals and found the programming of the logic to be extremely confusing. They claim to have some default settings to make it easier to implement, but then you are sacrificing some prototypical operation to get some working signals, or maybe at that point they just become animated lights on your layout and not really an operating signal system.

I chose to let JMRI drive my signal system. I know that Dick Bronson of RR-CirKits had developed hardware for both LCC and JMRI signals, and he was on the programming team for JMRI. Plus JMRI is free, and I already had a computer hooked up to my NCE command station and regularly used JMRI Decoder Pro. I had seen several of Dick's presentations at NMRA National Conventions and was confident that his components represent the leading edge in the industry. So at Amherst I went straight to the RR-CirKits booth and spoke to Dick for quite some time before the crowds arrived. I purchased the components necessary to set up a LocoNet and drive several signal masts.

Here are the steps required to implement a signal system driven by JMRI:

1. Determine WHERE you would like to place the signals;
2. Install gaps in the rails to isolate blocks from one another;
3. Determine how turnouts will be thrown and whether position feedback is necessary;
4. Set up turnouts and sensors in JMRI Panel Pro;
5. Create the layout (signaled sections) in JMRI Layout Editor;
6. Create the signal masts in JMRI and have JMRI create the logic to drive the signals;
7. Determine how JMRI will communicate with your signal driver hardware and program that hardware if necessary; and
8. Install the hardware on your layout.

Breaking down each of these steps will help make this project seem less ominous:

1. ***Decide where to place your signals.*** I chose some turnouts and blocks which were visible to operators and required some protection from oncoming traf-

Figure 1 — Installing gaps in one rail to isolate a block.

fic. I didn't put signals in areas where an operator could not see the aspect or where they were really not functional. Signals are typically located approaching turnouts or protecting long mainline runs. In JMRI you can only place a signal mast going into a turnout or at the break point between two blocks.

2. ***Install gaps to isolate blocks.*** In order to correctly determine the logic to drive the aspects of the signals, gaps must be placed near the signal locations and after any turnouts that create sidings or alternate routes. (See Figure 1.) Many manufacturers make block detection hardware. I prefer coil-type detectors, where you wrap a track feeder around a donut-shaped sensor (like an NCE BD20); there is no drop in track voltage with this type of sensor. (See Figure 2.)

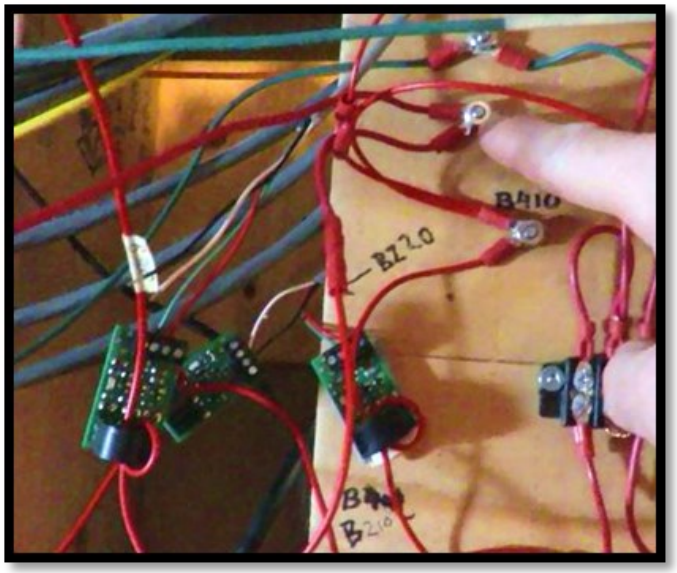
   Almost all sensors operate by closing the loop between a feeder wire (typically a ground) and a signal wire out. The loop is closed when the sensor detects current being drawn through the track feeder wire.

3. ***Determine turnout control and feedback.*** JMRI has the ability to throw your turnouts if you have some method of DCC control for your turnouts. JMRI will monitor the last command sent to the turnout over the DCC network, but if you can also throw a turnout manually or from a panel switch, then it is likely necessary to have some sort of sensor hooked up to monitor the turnout position. This can be very simple and operates the same as a block detection sensor: a feeder wire is hooked to the Tortoise or other mechanical throw, and when the loop is closed, a signal is sent back to a detector. If you are using an NCE system, an AIU-01 (Auxiliary Input Unit) can monitor your turnout positions and block occupancy, and it can feed that information back to JMRI. (See Figure 3.)

4. ***Set up sensors in JMRI.*** Panel Pro defines a collection of tables, and the sensor table is where you assign labels to the various signals that are feeding into JMRI. Once the sensors are set up, you are ready to continue.

5. ***Create your layout in the Layout Editor.*** Your layout does not have to be created to scale in JMRI and does not require any sidings and sections that are not going to be part of the signal logic. You just need to represent the blocks and turnouts in their correct orientation and sequence. Assign the sensors to the various blocks and turnouts and test their operation right on the JMRI panels to make sure everything is being detected properly before proceeding further. (See Figure 4.)

Figure 2 — BD20s with feeder wires to isolated rails.



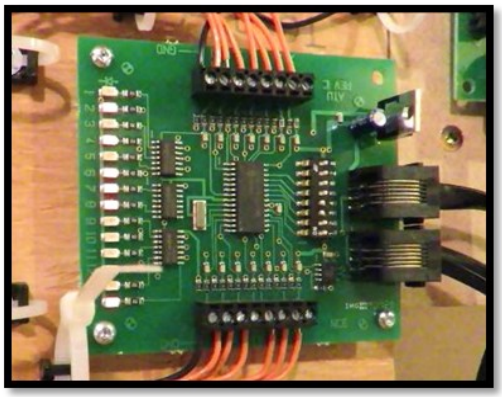
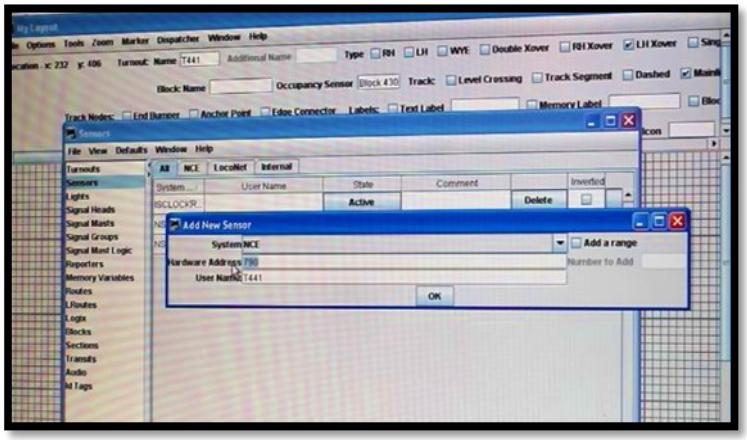


Figure 3 — NCE Auxiliary Input Unit (AIU -01) used to send feedback to JMRI.

Figure 4 — Adding the address that corresponds to the AIU-01 output and the label for that source.



6. ***Create the signal masts in JMRI Panel Pro.*** By this stage, you should be familiar with using the tables in Panel Pro. There is a separate table for setting up the signal masts. This is where JMRI allows you to create a mast and use any one of many preprogrammed logic tables to drive the aspects on your signals. JMRI already has many of the major railroad aspects loaded in the software, or you can choose "Basic Model Railroad" aspects if you just want to keep it simple.

   You may also have to create some "virtual" signal masts in the Layout Editor. These are signals that appear on the computer but won't appear on your layout. They are required to properly communicate the logic between the signals on your panel. (See Figure 5.)

   Once you have the masts placed at all the turnouts and blocks on your panel, JMRI has the ability to discover the various routes and turnout positions and will set up the logic for each of your masts. This is probably the biggest advantage to using JMRI for signaling. With just a few mouse clicks, it learns your layout and will show the aspects based on whatever prototypical railroad you choose.

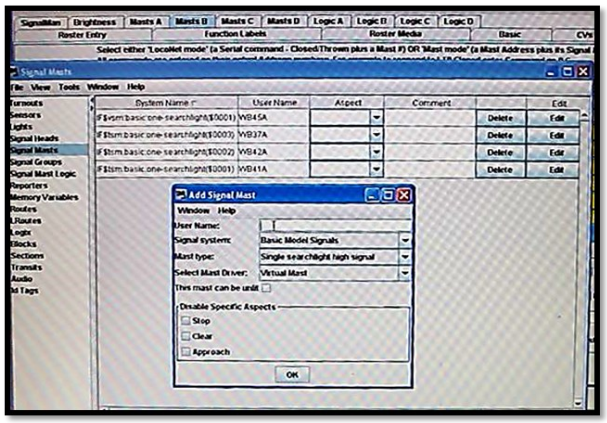
7. ***Send the aspect signal to your signal drivers.*** Now that the masts are working in the virtual space on your computer, it's necessary to send that signal to some sort of signal driver hardware. Several manufacturers make hardware designed to work over LocoNet. I chose the SignalMan-S from RR-CirKits. The SignalMan series operates just like a stationary decoder on your DCC track bus. The SignalMan is set up in Decoder Pro, just like you would set up an engine. You make a roster entry for each SignalMan and there is a series of tabs where you can tell the SignalMan what lamps (or LEDs) to light up when it receives a command from JMRI.

   Each SignalMan has 16 output terminals and 4 common wire outputs, so you can run numerous masts from a single unit, making it a very economical piece of hardware. It is also versatile and has a lot of interesting features, such as fading from one aspect to the next, and flashing lights. (See Figures 6 and 7.)

   Once I learned a few simple steps (which I mention in my YouTube video series "Signals on an NCE Layout") the SignalMan was very easy to set up and operate. It does have the capability to set up the logic right on board, but I was able to avoid those features since I was allowing JMRI to handle all the logic.

8. ***Install your hardware.*** I was able to program my SignalMan

Figure 5 — When adding a signal mast, you can choose from among "basic" or major railroad signal systems, mast type, and driver type.



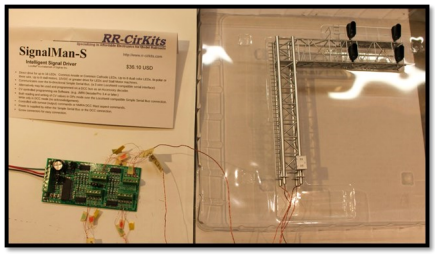


Figure 6 — The BLMA four-head signal mast wired directly to a SignalMan-S to drive the signal aspects.

Figure 7 — Setting up the signal mast logic. By clicking the "Discover" button, JMRI finds all masts down the line on possible routes.

and masts at my bench, using the computer connected to the DCC bus. Once they were working correctly, so that the aspects matched those shown on the computer screen, I disconnected the signals from the SignalMan and installed some four pin connectors to each mast. Then it was just a matter of placing the masts on the layout and running some wires.

Figure 8 shows the completed signals at the entrance to the interlocking. The signal aspects indicate block occupancy and are aware of the routing and turnout statuses.

It was a very steep learning curve, having to figure out Panel Pro and then the SignalMan programming, but after grinding through the setup of the first few masts, the second group of masts took only a few hours to set up from scratch. Technical help was readily available from Dick Bronson (RR-CirKits) and from the JMRI Yahoo Group. I found the LocoNet and SignalMan components to be a very cost effective option for driving the signals. Hopefully this article will help to give you a boost up on the learning curve!

Figure 8 — Two BLMA target signals wired to two outputs from the BLMA; these masts have three LEDS in the single head.

About the Author

Steve goes by the handle of "Muskoka Steve" on YouTube, and his channel is "Muskoka Central". He built his first layout in his early teens and won his first modeling contest at the age of 16.

After 30 years away from the hobby, in 2010 Steve got back in and started working on The Muskoka Central Railroad. He was inspired by the scenery north of Toronto, Ontario, called the Muskoka region. He models a proto-freelance railway based on the Ontario Northland and CN railways, which run through that region. Steve is also the Superintendent of the Western Ontario Division of the NMRA.

Steve was the winner of the YouTube Model Builders Big Build contest, and you will find the details of that build on his YouTube Channel. His channel features many videos full of tips and techniques on a wide range of model railroading topics, including detailed steps on installing signals on his layout.

1980 – My first full layout.

It's Easy Connecting Signals To Turnouts...

By Richard F. Piccuilla

Using a Route-Driven Signal System

Those turnouts on the other side of the layout … which way are they lined up? If only there was an easy way to know without installing an elaborate and complex signal system. Well, there is!

In addition to the important information that signals can provide a model railroad operator, they also introduce another dimension to the layout by providing a level of animation and interest. Signals can be a part of a large and complex signal system or, in a simpler role, they can provide information about the route just ahead of the train.

I'd like to demonstrate to you how signals can be connected to a turnout easily, giving you an indication of the status of the track on both sides of the turnout. And, you don't even need an electrical device to operate your turnouts. In the following examples, I offer the basic information to connect signals to a Tortoise by Circuitron, a Caboose Industries Ground Throw with Contacts, or an Atlas snap switch machine. (Atlas switch machine users: you'll need to acquire an Atlas #200 Snap Relay – $16 retail – for every turnout where signals will be installed; only one Snap Relay is needed for a crossover.)

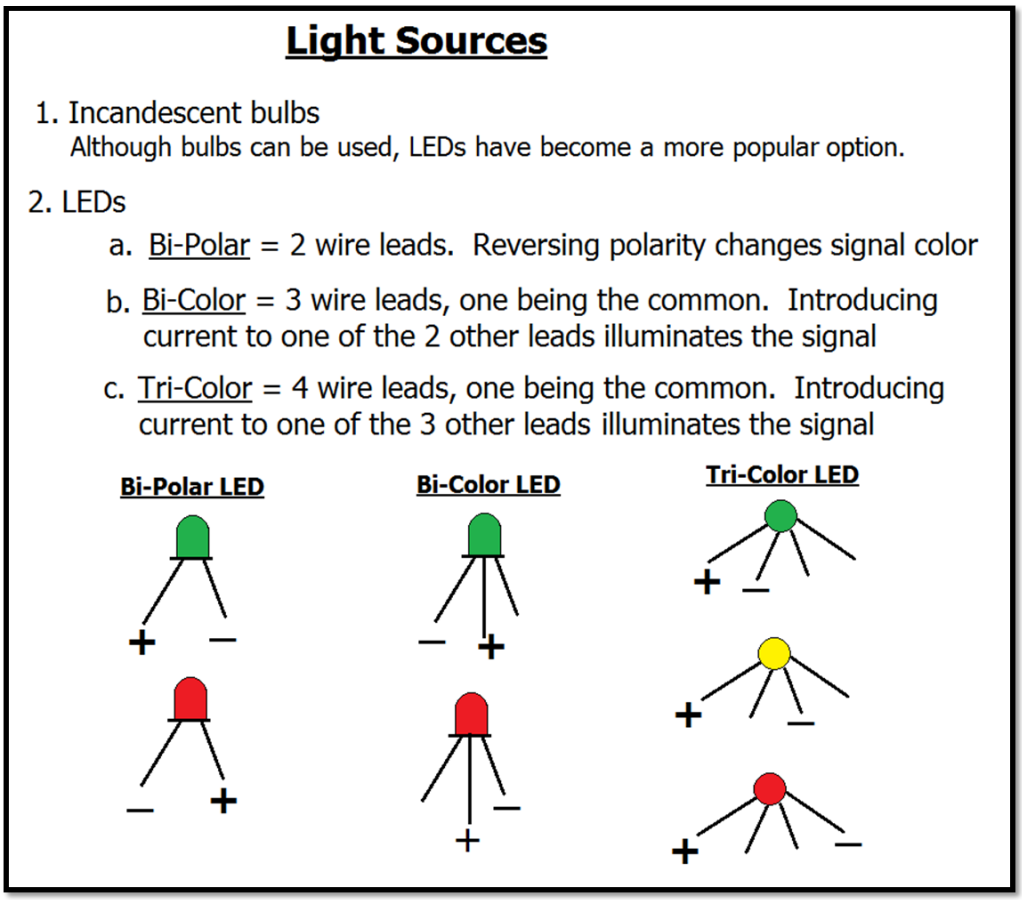


Figure 1 — Different types of light sources used for model railroad signals.

Figure 1 describes the different types of light sources used for model railroad signals. Incandescent lights were common in the past, but today the most common types are LEDs equipped with a common wire (positive), and a wire for each light color the signal is capable of producing (negative). Connect positive to the common wire, negative to any other wire, and the signal comes to life.

Figure 2a describes the function of a relay, which, for our purposes, makes a signal change to a different color to reflect a change in turnout position. As mentioned above, the Atlas switch machine requires a Snap Relay. The Tortoise by Circuitron is already equipped with two sets of inputs and outputs that mirror the function of a relay. The Caboose Industries Ground Throw with Contacts has one set of inputs/outputs. (See Figure 2b.)

The examples that follow demonstrate how to connect signals to a turnout in certain track arrangements. It is assumed that the following already has been accomplished:

- A 12-volt DC power supply is being used and is on; and
- The common wire (positive) for all signals has been connected to the positive connection of the power supply.

So for now, all the signals are connected to the positive and are just waiting for the negative from the power supply to be introduced so that the signals will illuminate. You will provide this negative power via the connections shown in the following examples, which will then be supplied to the signals via the relay, or input/output examples.

Relays

Relays transfer, or 'relay', power from one set of output contacts to the other when energized.

Relay Types:

1. Latching = relay changes position with momentary power (Atlas Snap Relay)
2. Non-Latching = needs constant power to maintain position (Circuitron Tortoise)

Atlas Snap Relay

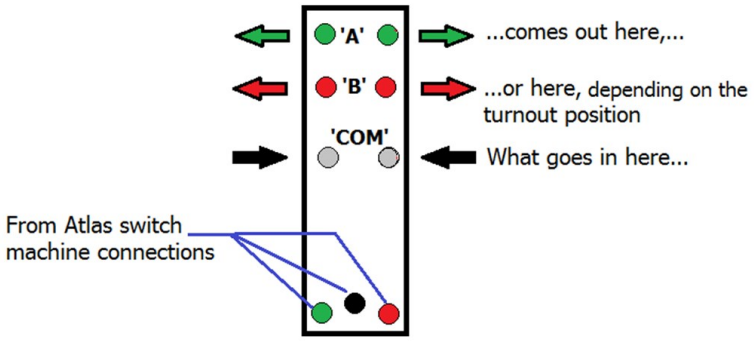
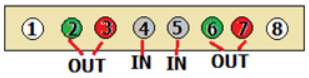


Figure 2a (left) — The Atlas Snap Relay takes input in the "COM" prongs and outputs to either prongs "A" or prongs "B" depending on turnout position.

Figure 2b (below) — The Tortoise Switch Machine has two sets of relay prongs and the Caboose Industries Ground Throw with Contacts has one set of relay prongs.

Tortoise Switch Machine



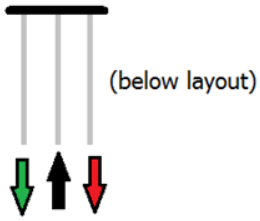
What goes into #4, comes out of #2 or #3, depending on which way the turnout is positioned.

What goes into #5, comes out of #6 or #7, depending on which way the turnout is positioned.

#2/#6 will be the output contacts for one turnout position, and #3/#7 will be the output for the other position.

Caboose Industries
Ground Throw With Contacts

Using this type of ground throw allows you to operate signals without the need for electric turnout control.



What comes into the center prong comes out of one of the end prongs depending on turnout position.

Figure 3 shows how you can connect three signals around a turnout for a passing siding. Figure 4a demonstrates the connections for 2-head signals, and Figure 4b demonstrates the connections for four signals surrounding a crossover.

If the signals are showing the opposite colors of what they should, just swap the signal connections (Snap Relay – swap 'A' for 'B'; Tortoise – swap #2 for #3; Caboose Industries – swap 'left' prong for 'right' prong).

Once you get more comfortable with connecting the signals, you will

come to understand the simplicity of the route-driven signal system you have designed.

Some track arrangements require two independent turnouts to operate signals accurately. While outside the scope of this article, you are invited to contact me and I will provide the wire connection diagrams you need. If more than 2 turnouts (such as a 'tricky' junction) are present for a signal to effectively give the proper indication, custom-programmed circuitry is required, and I can also assist with this. Believe me; it's not as painful or complicated as it sounds! And getting a green signal when those 9 turnouts in that junction are all set up for you is quite a thrill!

I hope you enjoy operating your signals. You are invited to contact me (through my website) for assistance, or any additional information regarding signals and signal systems.

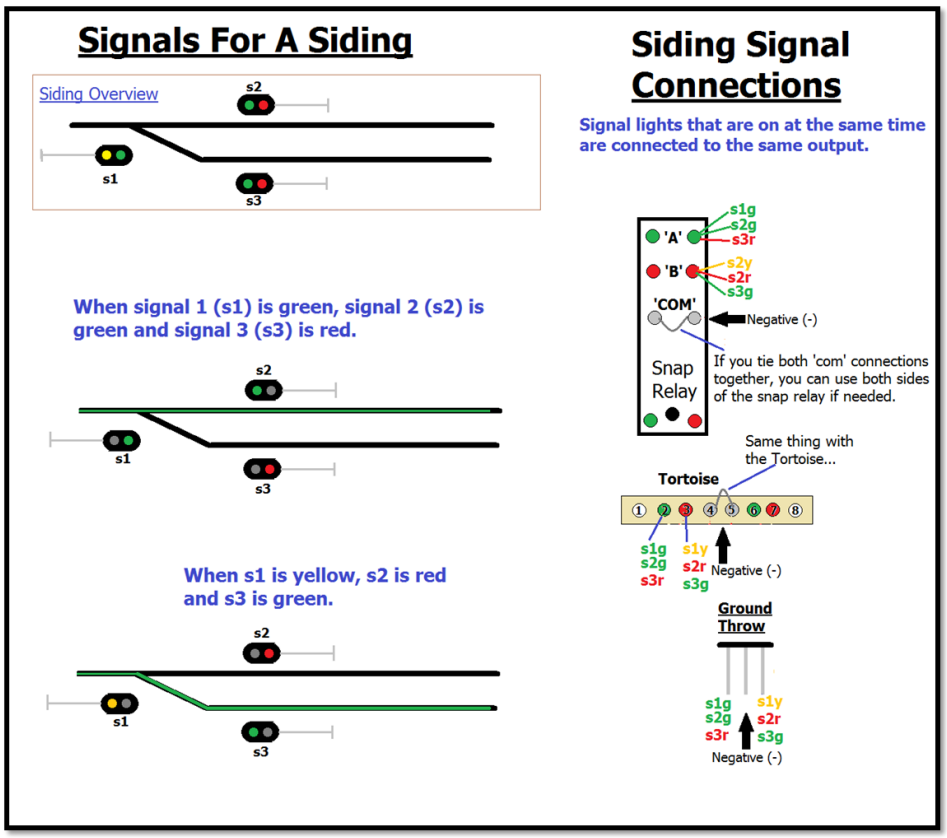


Figure 3 — Setting up connections for three signals for a passing siding.

About the Author

Richard Piccuilla is the owner of Custom Signal Systems LLC. He produces signals in Z, N, HO and S scales. In addition, he designs and assembles customized signal systems. When not at the workbench, Richard is a flight attendant for a major airline.

You can reach Richard through his Custom Signals Systems website at www.CustomSignalSystems.com.

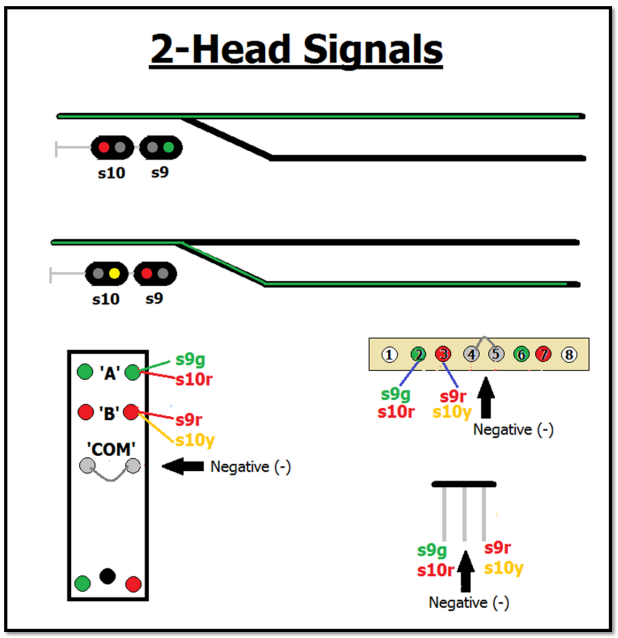
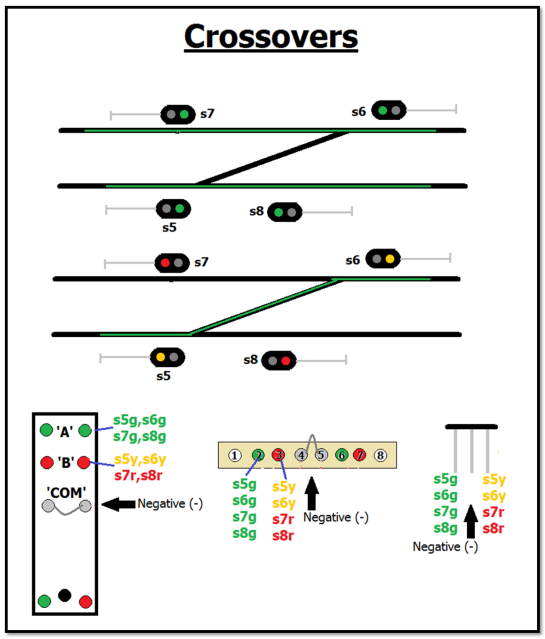


Figure 4a (left) — Connections for 2-head signals for a siding.

Figure 4b (right) — Connections for four signals surrounding a crossover.



Signals in Operation...

Operating on a Prototypically-Signaled Layout

By William (Bill) J. Beranek —The Track Planner

Below is the story of my personal experiences operating on a prototypically-signaled model railroad. I will take you on a trip across the Granite Mountain Railway from the Portland/Seattle staging yards, over the triple-deck, single-track mainline layout, ending in the Chicago staging yard.

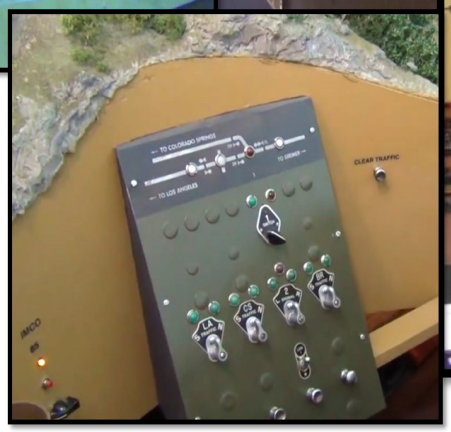
Doug Geiger (the owner) and his wife Barbara have a fantastic HO scale, freelanced layout called the Granite Mountain Railway. The layout consumes the entire basement of Doug and Barbara's split-entry ranch home in Longmont, CO.

Doug is a master model railroader, and he has done an amazing job creating not only a visually stunning layout, but also one that operates in a truly prototypical manner. The layout is fully signaled, and during the monthly operating sessions, a dispatcher sitting in front of a functioning CTC panel controls signals and train movements on the layout. The track plan includes multiple staging yards and multiple helixes. One helix sits in Doug's two-car garage, inside a dedicated room built for the dispatcher. The impressive CTC panel and the helix share this small space.

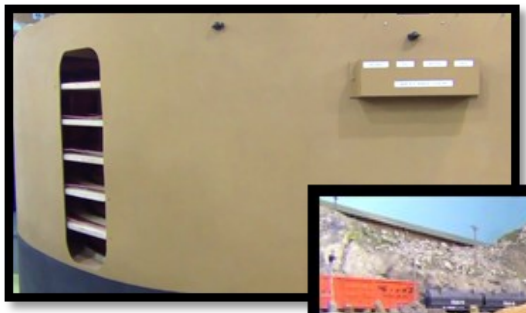
During operating sessions, if you are

The pictures below show Chicago staging (top-right), toggle switches that control turnouts on the yard, and the series of red lights that show progress as the trains traverse the helix (top-left). Notice the hanging car cards and waybills (bottom right).

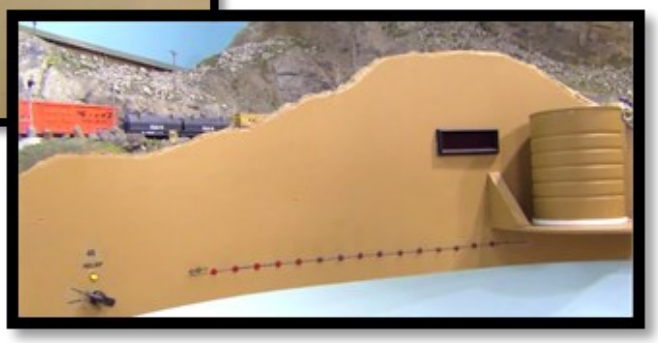
Click here to watch a YouTube video by RioGrandeFan of Doug and Barbara Geiger's impressive Granite Mountain Railway layout tour.



The picture on the right shows the CTC control panel that is used for controlling signals and train movements on the layout .



Left: A side view of one of the helixes on the layout.



Right: Another helix on the layout showing progress lights as a train traverses it.

on the "extra board", meaning you do not have a specific job on the Granite Mountain Railway, you will wait in the crew lounge (Doug's living room) for a phone call from the dispatcher. When the call comes, the dispatcher gives you the number and name of your train and the departure time. There is a train sheet for each train; the sheet gives precise instructions about what is the train's job.

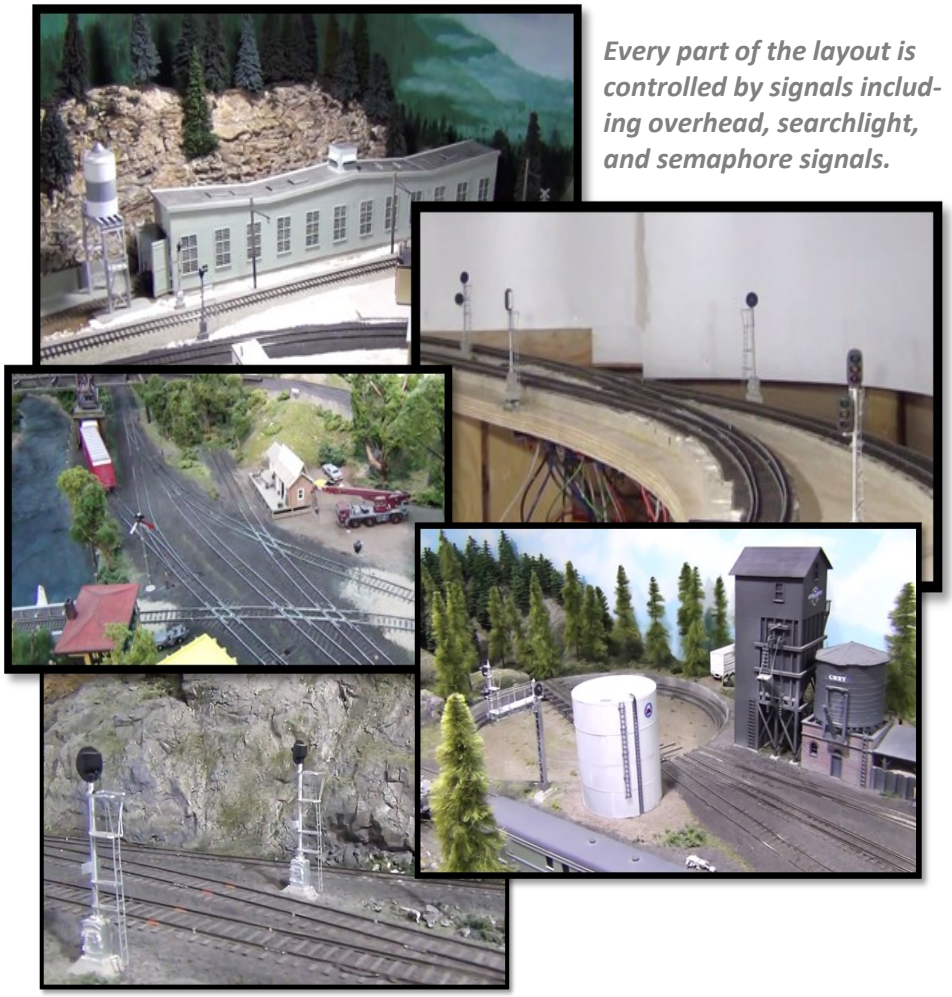
During the last operating session, I was on the extra board. When the first call came, I was assigned to general merchandise freight, leaving Portland/Seattle staging, traversing the layout and eventually entering Chicago staging at the other end of the layout room. The train sheet advised me to check my waybills for cars that needed to be dropped off at various towns or interchanges along the way. I also needed to check with the yardmasters at the various towns along the route to see if I was to pick up any cars bound for Chicago.

After picking up my train sheet, I made my way downstairs and over to the Portland/Seattle staging yard. The yard sits approximately a foot off the floor and consists of twelve stub-end staging tracks. On the front fascia there are a series of small hooks, and each one contains a packet of car cards and waybills, along with the motive power information for each train. After checking my consist, making sure I had the correct number of cars and setting the yard ladder turnouts to their correct positions, I called the dispatcher and advised him that I was ready to leave staging and proceed to Chicago. From this point on the dispatcher and the signaling system controlled all of my train movements.

Shortly after advising the dispatcher, a green light lit up on the fascia, indicating I was clear to leave staging and start my cross-country trip to Chicago.

Immediately, after leaving staging, the train enters a multi-turn, hidden helix. Your train is inside the helix for five to six minutes. To track the progress of your train, Doug has installed a series of photo sensors. On the fascia is a horizontal row of red LED lights. As your train traverses the helix, the LEDs turn on and off, letting you know that your train is still moving through the long helix. As your train exits the helix and enters the visible portion of the layout, you're met with your first signal. The signal is green, which means I can proceed at the prescribed speed limit, making note of where the next signal is. Farther down the line, the next signal is yellow, which means I can proceed, but at a restricted speed. A yellow signal means the next block ahead of you may be occupied. The train operator must be prepared to stop before the next signal to avoid a collision. Sure enough, the next signal

Trains from Chicago staging traverse an helix and enter Union Station.



Every part of the layout is controlled by signals including overhead, searchlight, and semaphore signals.

was red, so I eased my train to a halt just short of the signal.

After a few minutes, the block ahead of me cleared and the signal went green. There were no set-outs or pickups scheduled in the first town along my route. However, the mainline, in this area, comes under the control of the local yardmaster. Before entering the town, I needed to get permission in order to proceed. Once permission was granted, I was given a green signal and was able to proceed.

The next stop along the route was at an interchange. Here, I needed to drop off some cars and pick up two other cars. Prior to entering the interchange, I advised the dispatcher that I had work to do at the interchange and that I would need to use the mainline for a short period while I made my switching moves. The dispatcher advised me there was no oncoming traffic and I was clear to use the main as needed. Once my work was completed, I contacted the dispatcher, advising him I was ready to leave. With permission granted and a green signal, I left the interchange.

As I made my way towards Chicago, a call came over my radio to take the next passing siding and hold for a westbound Amtrak passenger train. When I arrived at the passing siding, I had a red over green signal, which meant I was cleared to take the passing siding and hold until the Amtrak train passed. Shortly after the westbound Amtrak went by, my siding signal changed to green and I continued east towards Chicago.

The rest of the trip was uneventful and, after traversing another hidden helix, I finally arrived at my destination. At Chicago staging, I tied up my train and called the dispatcher, advising him that my run was over. I placed my car cards and waybill on the appropriate hook and returned to the crew lounge to wait for my next assignment.

Hopefully this has given you some insight into operating on a fully-signaled layout using prototypical railroad practices.

About the Author

Bill Beranek - The Track Planner has over forty years in the model railroading hobby. Bill enjoys golfing, travelling, and of course designing "prototypical operations" focused track plans. He has been a member of a local 135+ member model railroad club since 2003 and has served twice as the club's president, twice as a board member, and is currently serving as the club's treasurer.

Bill is currently working on his latest triple-deck HO scale layout depicting the SP&S (Spokane, Portland & Seattle Railway) in southern Washington and the OTL (Oregon Trunk Line) on the upper level in northern Oregon in the mid 50s.

You can find more about Bill—The Track Planner at:

www.thetrackplanner.com.

Building Signals On The Cheap - For Under $3.00!

By Yoaman Smith

I wanted to build a large, real-time operations layout. Nothing against loopers, but I find that for me, going around and around tends to get boring after a while. I have loved model railroading since my childhood. While living in Tennessee, our house was only three blocks from the Depot - seeing trains was just part of life.

Jumping forward many years, I ended up becoming an engineer for the Union Pacific Railroad. During my 20-year career, I loved working on zone locals the most, for several reasons. The main reasons were that I liked switching cars; each day was different from the last, and it was a plus to be home for the weekends. Working the locals was being part of the big picture and getting those cars spotted for industries, large and small.

Figure 1 —The panel for Norfolk and Western's main switching yard.

Figure 2 — Signals leading into the yard make it easy to verify switch alignments.

OK! Back to the signal issue.

There are few things worse than having friends over to run trains, and a train busts though a misaligned switch and derails everything. You can double-tap your switch control to make sure, but why not have signals and panel LEDs instead? All of my signals within the yard limits indicate switch position only.

In this article, I will show you how to build low-cost, LED, 2-color or 3-color signals for under $3 each.

Buying signals from the marketplace for a small layout is easy on the wallet, but I'd rather build them. (Call me cheap, I guess.) As you can see in Figure 2, I like signals; they serve the very important functions of controlling train movements and providing a safe work space for crews in the locomotive cabs. My signals mainly just show switch positions within yard limits. This means that my yard limits rules apply: the max speed within yard limits is 20mph. (More on that later.)

An easy system for building 2-light (or 3-light) signal heads.

When I build signals, I have five goals:

1. The signals should have a low cost;
2. The signaling system should be rugged, so that it can withstand operations for the life of a layout;

3. The signals should be easy to build and repair;
4. The signal lights should have a long life (LEDs); and
5. They can be built as basic or as detailed as you want.

Let's build a bug-type yard signal unit. This can be applied to a tall mast or bridge unit. Here is the list of materials you will need:

- 3mm LEDs in your choice of colors, depending on your railroads needs; I'm using red and yellow. (You also can use 1.5mm LEDs, and the same techniques apply.)
- Signal heads.
- A 3mm drill bit to enlarge the holes within the signal head to accept the LEDs.
- Coded wire from 30 - 22 gauge (your choice).
- A soldering iron and solder.
- Shrink tubing.
- Connectors to wire your signal to your layout control boards.
- Wire cutters, wire strippers, etc.
- Plastic stock of your choice (to build the signal base).
- Plastic or brass tubing.
- Small PC project boards (such as those sold on Amazon.com).
- A cutting tool to cut the PC project board to size.
- Hot glue or rubber cement, and superglue.

Construction

The first thing you need to do is to cut the PC project board into pieces to make the back covers for the signals using something such as a Dremel tool. There will be a lot of waste, but the boards are cheap. Also, make sure to wear eye protection and a dust mask, since there may be flying chips and there will be a lot of dust from the board when you cut.

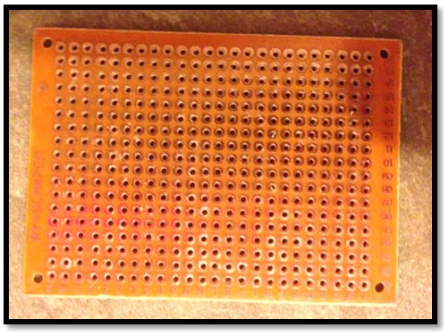


Figure 3 — The PC board before any cutting takes place.

Figure 4 — Signal back covers cut from the PC board.

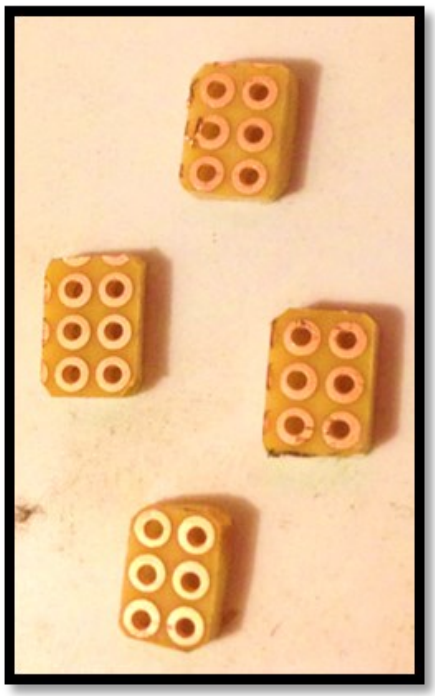


Figure 3 shows the PC board before it is cut, and Figure 4 shows the back covers that have been cut from the PC board. You will need three pairs of holes for a 2-LED signal head and

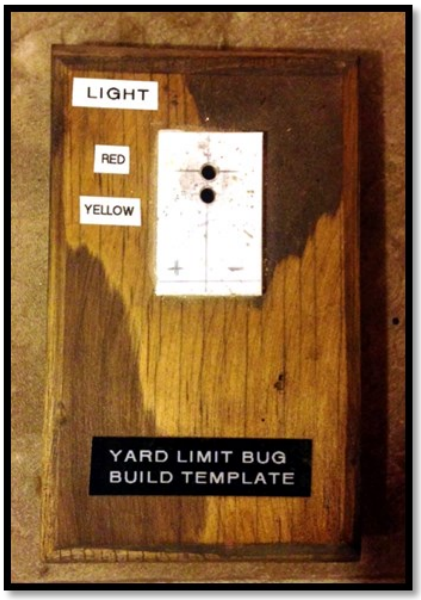


Figure 5 — A template speeds up production of signals.

five pairs of holes for a 3-LED signal head. The spacing provided by the extra holes will prevent the LED leads from touching each other. After cutting out the back covers, file and smooth off the sides and round the corners.

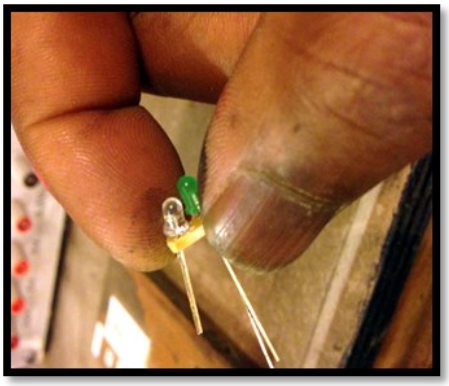


Figure 6 — The LEDs are inserted into the back cover.

If you are going to build a lot of signals, it is worth your time to build a signal LED jig, as shown in Figure 5. The jig makes this job 100 times easier. Label the anode (+) and cathode (-) orientation on your jig and indicate what is up and down.

Note: if your project board only has copper on one side, place the copper side away from the LED; this will aid in holding LEDs in place while working.

Note: if you are new to using LEDs, the long lead is the anode (+) and the short lead is the cathode (-), as

Figure 7 — Insert the LED and back cover assembly into the jig.

can be seen in Figure 6. If you cut the leads and forget which is which, no worries; if you look closely at the

Figure 8 — Solder the LED leads to the copper pads on the back covers.

base of the LED, one side (the cathode) is flat.

Next, insert your LEDs into the back cover, keeping positive and negative leads in the correct position, as shown in Figure 6.

As shown in Figure 7, place the LEDs and back cover into the jig, with the LEDs facing into the holes in the jig. At this point, it is a good idea to check your work! Make sure that your LED leads are oriented correctly.

First, solder each of the positive leads to its copper pad on the back cover, as shown in Figure 8. Be careful not to cook the LEDs; they can take the heat, but you can damage them.

Once both positive leads are soldered, move on to the negative leads and solder them to the back cover.

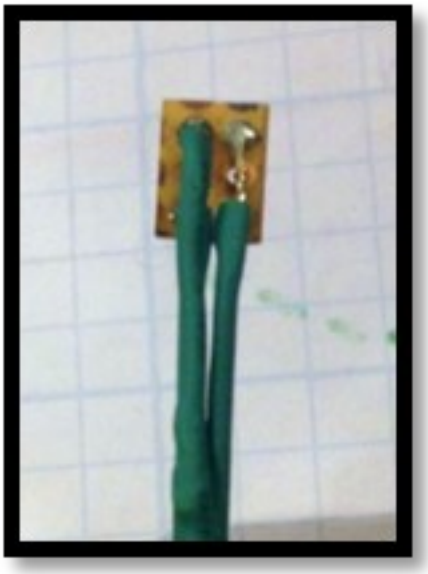


Figure 9 — Bend the leads so the back cover is at the top and the wires lead down toward the benchwork The two positive leads are bent over separately on the left, and the joined negative leads are bent over on the right.

Bend the upper negative lead down over the lower negative lead and trim off the extra length from the upper lead only. Solder the upper negative lead to the bottom one. Leave the three leads (the two positive leads and the connected negative leads) in the vertical position for now.

This is where your soldering skills really kick in. The choice of wire gauge and color are up to you, but make sure to choose a wire gauge that will fit through the hole in your layout deck. Also keep in mind that you have to hook it up under the table, so make the wires long enough. I use a black, green, or white for my common, and I use red, orange or brown for the STOP (the red LED). I use green, yellow, or blue for the PROCEED (the yellow LED).

Figure 10 — Paint the base of each LED.

Once you have the wires soldered to the LED leads, run some shrink tubing over the entire lead, covering the bare metal, and use the soldering iron to shrink the tube. Now bend the leads as shown in Figure 9. Paint the back side of the back cover black to prevent light bleed-through from

the back. At this point it is a good idea to test the LEDs.

Now paint the base of each LED black halfway up to its lighted tip to further prevent light bleed-through, as shown in Figure 10. Again, test the LEDs again after paint has dried.

While this assembly dries, you can build the base and wire tube.

Note: if you are going to place a relay box next to your signal, make sure the base is a little longer. This part of the project depends on the specifics of your railroad. Below, I describe how I build signals for my railroad.

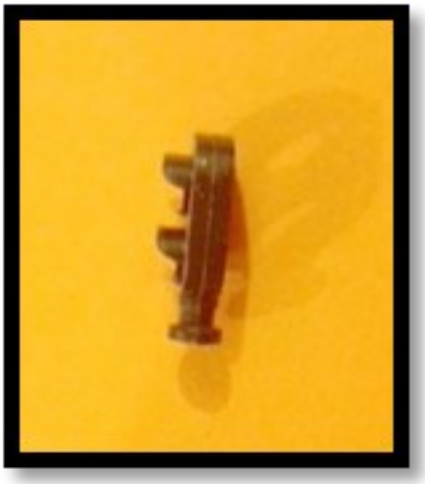


Figure 11— The head removed from a Bachmann signal mast.

First, I cut the head from a Bachmann signal mast at the joint, as shown in Figure 11.

Once the LED unit has dried, it is time to glue it to the head. I use a low-temp, hot glue gun. You could use rubber cement instead; the advantage of the low-temp, hot glue is that there is no dry time. Place a small amount of glue between the LED unit and the head, and press the two parts together. Hold until the glue has set. It is a good idea to set this aside for at least 30 minutes.

It's time to build the base. I use the base of the Bachmann signal mast. It is the perfect size for my needs. It's your choice based on the needs of your specific railroad. Cut the base from the mast and file the top of the base smooth. Carefully sand the base to 0.40" wide (just under 1/2"). The hole that is there will serve as your guide for feeding the wires. You will end up with a base that is 0.80" x 0.40" in size. This is perfect if you are using a relay box. If you are not using a relay box, trim the base to 0.60" x 0.40", which positions the edge just behind the wire feed hole in the base. When you are done, it is a good idea to sand the base to aid in the gluing and painting.

Figure 12— The LED unit is attached to the base.

Cut a piece of plastic or brass tubing to a length that allows it to extend at least one inch below your layout deck. (This makes it easy to spot under the layout among all the other wires.) Align the tube with the hole in the base and glue it (using a good superglue). Let this dry for the recommended time.

After the base has dried, it is time to put it all together. Depending on the gauge of the wire you used, you may need to enlarge the tube's inner diameter with a 3mm drill bit. (When drilling this hole, drill at a slow speed to avoid heating up the tube and causing a joint failure.)

Feed the wires from the LED unit down through the tube, with the front of the signal head facing in its intended direction. Push the head down to about 1/4" from its connection to the base, as shown in Figure 12. It's time to test the LEDs again; sometimes, pushing the wires into the tube can cause a wire to come loose. It's better to check it now than after installation on the layout.

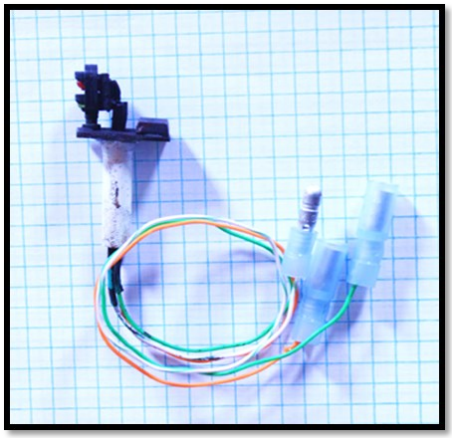


Figure 13— Once connectors have been added, the signal is complete.

Place a small amount of glue on the base and press the head and base together. Let the unit dry for the recommended time.

Once the glue has dried, add your choice of connector. Figure 13 shows my final unit.

Figure 14— The signal looks great once mounted on the layout.

Figures14 and 15 show what the bugs look like mounted on my layout. Note the red over yellow signal. This is one of three configurations within my yard limits:

- A yellow signal means proceed at restricted speed; the switch is aligned to the normal (N) route.
- A red over yellow signal means proceed at restricted speed; the switch is aligned to the divergent (R) route.
- A red signal means STOP!

There is only one case for which a speed over 20mph can be exceeded within my yard limits: for a train on the mainline, and then only if the yard master gives that engine crew a highball. This order must be given twice and confirmed by both yard master and train crew twice. This confirms that all switches are aligned properly for their movement. Also, all yard movement must stop until that train clears the yard limits. (This exception does not apply to the power plant switcher.)

I believe that I have covered both the main reasons why I build and not buy my signals, as well as, how I build cost-effective (cheap), operating signals that are easy to understand and are actually used to govern train movements. So, have fun building them while adding to the prototypical feel of your layout.

Figure 15. Signals add realism to the layout.

About the Author

Yoaman Smith was born in Salzburg, Austria in 1954 while his Dad was in the Army, but spent his early years in Tennessee.

His family lived only four blocks from the Depot in Cleveland, TN, so seeing and hearing trains was a part of life. At that time, some steam locomotives were still being run, but it mainly was GP9s and RS3s; these experiences inspired him to get into model railroading.

Yoaman feels that this is one of the best hobbies in the world, because it encompasses a long list of different skillsets, such as woodworking (bench work), electronics, design (of layouts), construction (building models), and nature (scenery). And, of course, it sharpens one's research skills.

The N Scaler

Shane Mason

Signals In N Scale

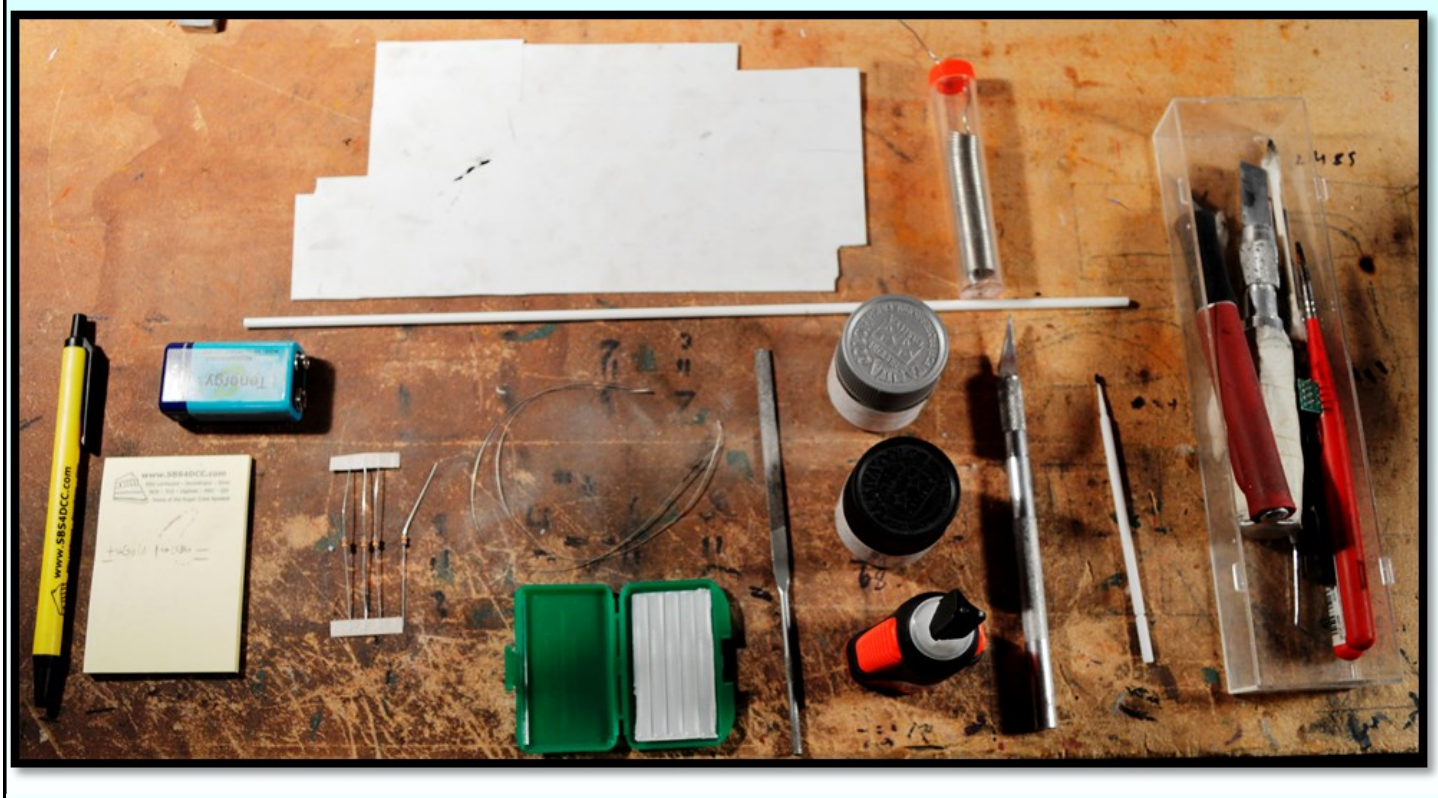
By Shane Mason

Signals are an essential part of any railroad, no matter the scale. They govern train movements and tell train crews whether or not it's safe to proceed down the line.

I noticed that signals aren't a big N Scale thing; please excuse the pun. I was interested in installing a few signals on my layout, and after just minutes of research, I quickly realized why they aren't a common sight on N Scale layouts. Good-looking, ready-made N Scale signals can cost close to $45 a piece! Instead of paying hundreds of dollars for only a few signals, I decided I would make my own good-looking signals, for a fraction of the cost. The results of my experiments were great – I built very nice signals for only $6 - $10.

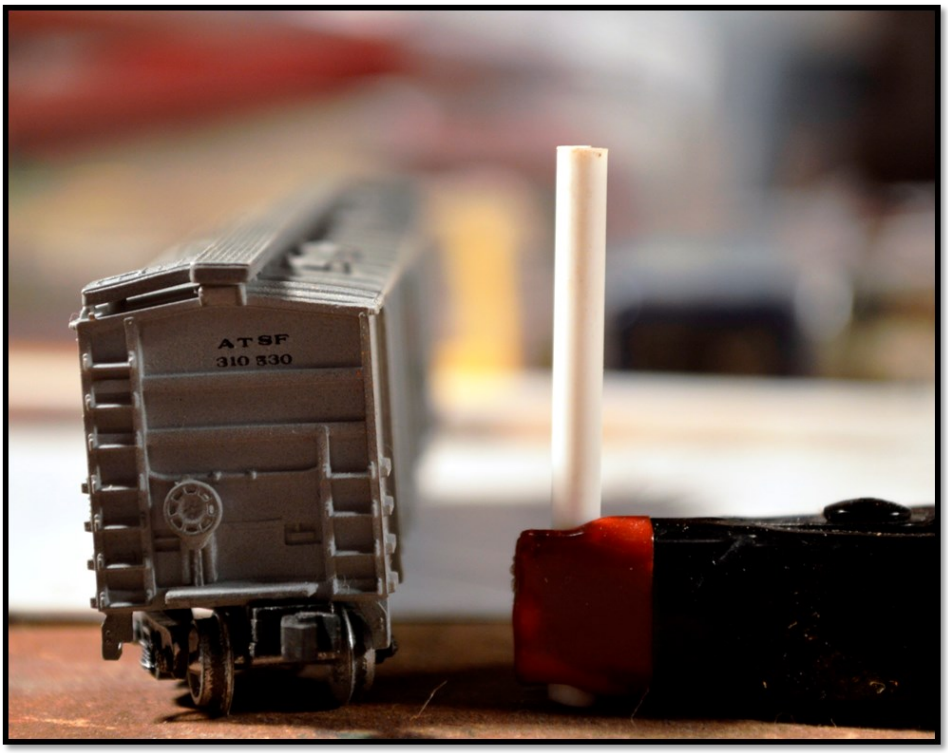
Scratch building a base-model signal isn't hard. It's true that building your own signals will take more time than ordering the ready-made signals online, but building your own signals will leave you with satisfaction and your wallet very happy.

To start, you'll need to figure out how tall your signal will be. I use locomotives on a piece of track to



Materials Required

- 1/32" Sheet Styrene
- ⅛" Tube Styrene
- CA Glue
- Canopy (RC56) Glue
- Red, Yellow, and Green LEDs
- Magnet or 32 Gauge Wire
- Resistors
- Silver and Black Paint
- A Sharp Hobby Knife
- Paint Brushes
- Set of Files
- Plastic Filler Material



A piece of rolling stock is used to determine the scale height of the signal mast.

determine the height of my signals. The same method can be used for sizing any type of signal, from dwarf to standard height. Once you decide on the appropriate height for your signal, cut the styrene tube, leaving room for the signal head. The head will sit at the top of the tube, increasing the signal's total height slightly.

Once you have cut your signal's mast to the desired length, it's time to make the head. I usually make the target about twice the size of the width of the support. This allows for plenty of room to glue the LEDs and sunshade to the target. To create the target, I used 1/32-inch thick styrene. I cut a square for searchlight signals and a rectangle for three aspect signals. Later, we will round off the edges to create the finished targets.

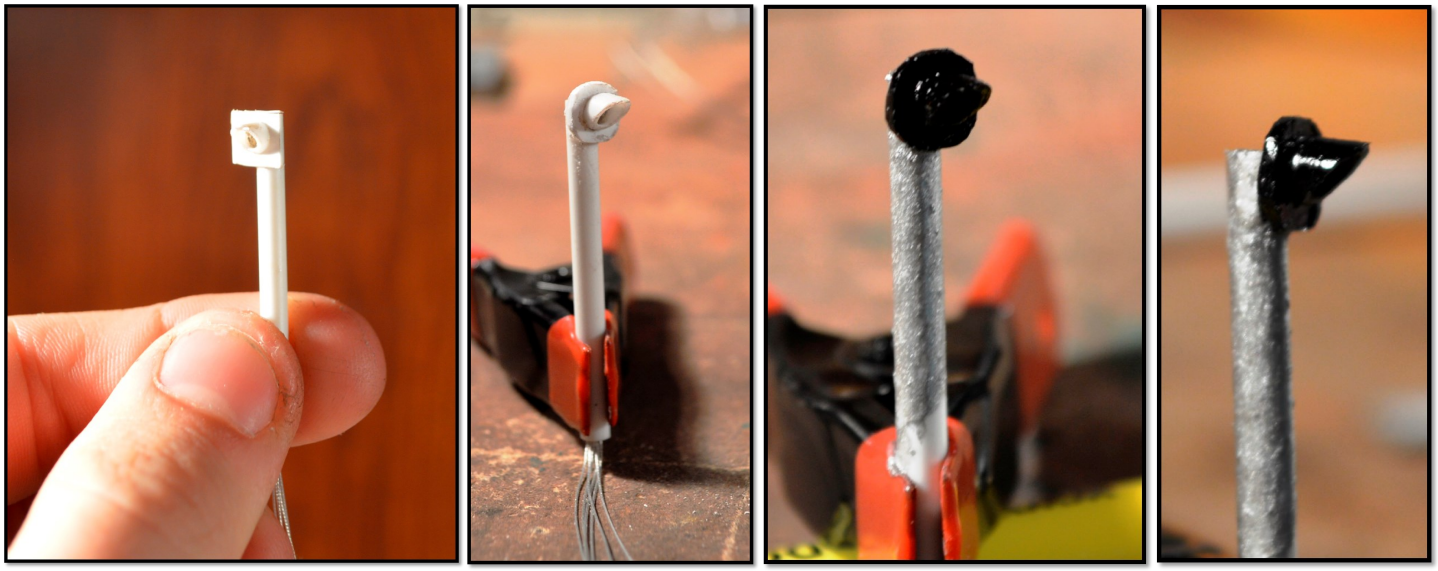
Before mounting the head to the mast, cut a small hole in the target. This hole should be about 2/3s of the way down the target, centered left to right. The LEDs' lead wires should be run through the hole and down the signal's mast.

To mount the LEDs, it is essential that you use Canopy (RC56) glue, which dries clear. Super Glue will not work for holding the LEDs to the plastic. It is always a good idea to test your LEDs before gluing them into place. A good way to do this is to simply hold the positive and negative leads to the corresponding sides of a small battery – just be sure the battery isn't more powerful than your LED to avoid permanently damaging your bulb.

After the LEDs are secured, the last step in finishing the target is to put a sunshade on it. For this step, I use some hollow styrene support tubing and cut a 45 degree angle into it. This creates a wedge-shaped sunshade. Once the desired shape of the sunshade is obtained, it can be glued to the head assembly, overtop of all the LEDs.

Once you have the upper and lower pieces built, it is time to mount them together. To do this, it is important to hold the head level with the top of the mast. Mark where the wires

The sunshade is glued to the head assembly and overtop of all the LEDs.



The edges of the target are rounded using a knife or a small file. The signal head is then painted black and the mast is painted silver. You can add extra details such as ladders, control boxes, etc., and weather the signal mast and head to give it a more worn-out look.

"Scratch building a base-model signal isn't hard. Building your own signals will leave you with satisfaction and your wallet very happy."

come out of the back of the target and cut a hole in the front of the support tube. These holes will be aligned so that you can feed the wires through the mast and out the bottom of the signal. To secure everything, super glue the head to the mast.

The signal is almost complete; there are just a few cosmetic details to take care of. Use your hobby knife and a small file to round off the corners on the target. This will give the signal head a circular or an oval shape. After the filing is finished, paint the signal target black and the mast silver to complete the signal. You may want to go an extra step and weather the signal or add details such as ladders, decals and control boxes to the model.

And just like that, you have a signal you can plant on your layout for significantly less than you would have paid at the hobby shop.

About the Author

Shane is an 19 year old modeler and is a member of the Heartland NTrak of the Greater Kansas City Train Club. He manages the NTrak Facebook page. Shane has modeled in several scales but has settled on the N scale.

Currently Shane is modeling UP, MRL, CB&Q, and many other railroads from the 1940s through modern times. He considers himself an intermediate modeler and has about five years of experience. Shane has quickly become an expert at installing DCC decoders in engines of various scales. He enjoys sharing tips and talk with other train fans.

Shane's YouTube channel, https://YouTube.com/thebrakeman17, includes many great modeling and rail fanning videos.

Geno's Corner

SIMPLE SIGNALS CAN STILL BE REALISTIC

By Geno Sharp

Hey gang! Welcome to the corner! All the talk of late seems to be about signals and their operation. I have seen operating signals on some great layouts; they are neat to watch and add another level of operation to the hobby. But I'm sure there are a lot of modelers out there who – like me – are just not into all of the electronics and knowhow that go into having an operational signal system.

There is another option when it comes to signals, and that is what I chose to use on my Central City Beltline. I have a diamond crossing at Gantt's Junction that is protected with signals, and the aspects of these signals always stay the same color. This is modeled after the NS and CSX crossing at Talladega, Alabama. This part of the NS line is dark territory, which means that there are no signals covering train operations on the line. On the approach to the CSX mainline, there are two very old signals, and their aspect remain a constant yellow, as shown in Figure 1. There is also another set of signals at the crossing itself that remain red; on approach to this signal, NS crews would stop their trains and call for clearance; then they would have to wait for a clear signal to proceed through the diamond.

This setup is what I chose to model. I did this with cheap operating signals that I got off of evilBayz. These are very inexpensive signals that have a toggle switch to change their aspects. The only thing I did was mount the signal heads on new poles, and then paint and weather them. Once they were wired up, I was in business.

Figure 1 — A train approaches the interchange along the track that always presents a yellow (proceed with caution) aspect.

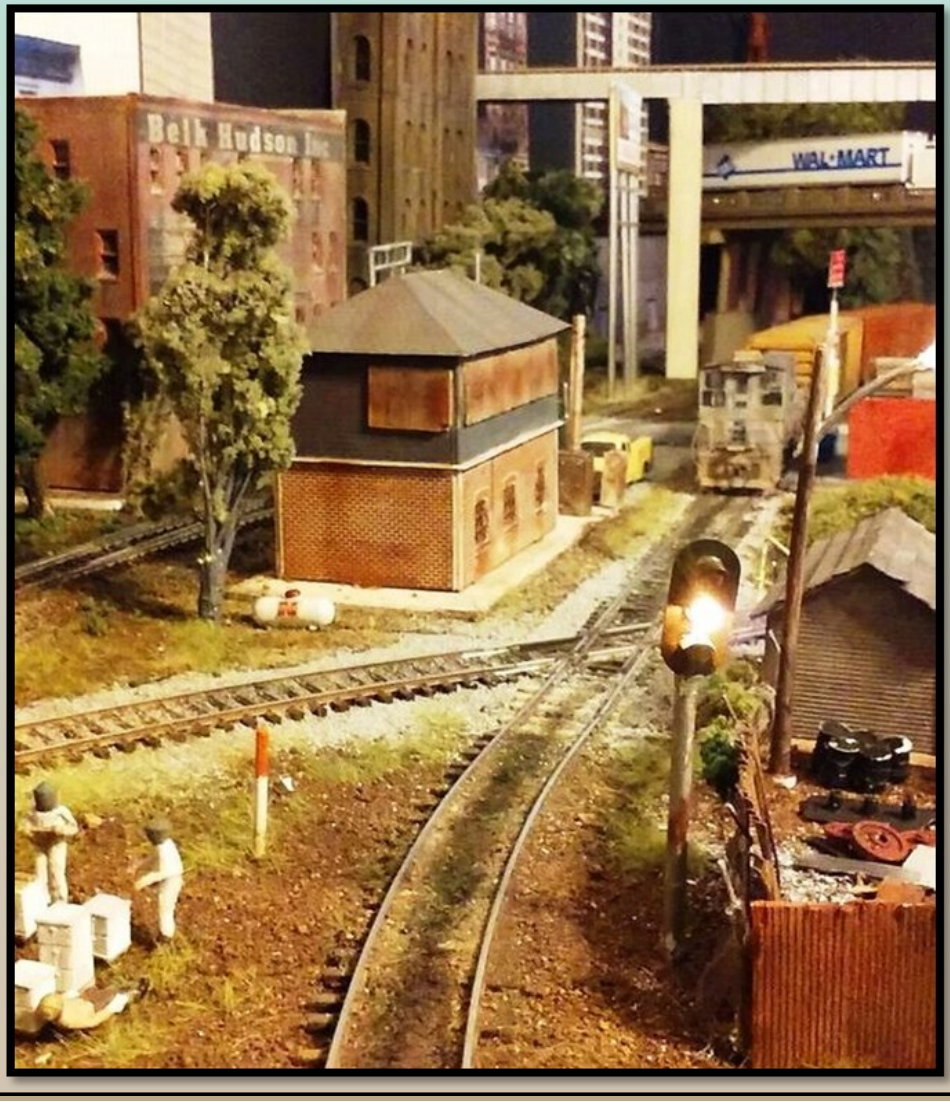


Figure 2 — Along the other track (in foreground), a red aspect will stop the train while the crew calls the dispatcher for clearance.

Now I have added an operations scenario in which the train crew has to stop on approach to the interchange at the red signal and call the dispatcher to get clearance to cross the diamond, as seen in Figure 2. Once the crew has received clearance, the conductor switches the aspect from red to green, and the train proceeds across the diamond. (See Figure 3.) Once the train is in the clear, the conductor changes the signal back to red. This same process is repeated on the return trip.

This approach to signals may not be for everyone, but for those who model short lines or railroads that operate in dark territory, this might be something to consider. It is a very easy and cheap way to represent signal operations without all of the other added expense of many signal systems.

Figure 3 — Clearance has been given to the crew by the conductor and the signal aspect has changed from a red to a green for proceed.

About the Author

Geno Sharp is a retired law enforcement officer with 21 years of service. Geno has been involved in model railroading for over 30 years and is now a YouTube channel owner. He produces a monthly layout blog video for his YouTube channel, Gknos modeltrains, as well as various "how-to" and structure build videos.

Geno is currently working on a 2nd version of his Central City Belt Line Layout. His layout features many highly detailed and weathered scenes. You can learn more about Geno's weathering techniques and about his Central City Belt Line on his YouTube channel Gknos modeltrains.

A Perspective On Track Planning

By William (Bill) J. Beranek —The Track Planner

Choosing an Era

In this issue, I would like to discuss choosing the era to model. For most, that would seem to be a relatively simple task, model what you like or know. For the layout designer, it is not quite that simple.

Modeling What You Like and What You Know

Many of us model what we like, what we know, or what we grew up watching. If you were born in the 40s or early 50s there is a better than an even chance you are modeling the transition era (1940s - 1960s). If you were born in the late 50s through the mid-70s, there is a fifty percent chance you are modeling post steam era (mid-60s through the 80s). If you were born in the 90s, there is a very good chance you are modeling today's modern equipment. Obviously, there will be exceptions to this rule, and I have no scientific data to prove the above claims. All I can go by is what my clients tell me they want when they hire me to design a layout.

Modeling what you know and like has numerous advantages. You have probably spent time studying and researching the era you want to model. You know it, you understand it, and it peaks your interest. Whether it is watching a Big Boy struggle to climb Sherman Hill in the wide-open spaces of Wyoming or watching a lash up of multiple, AC4400s pulling a long string of container or auto-rack cars, it is what you like and know.

However, for the layout designer, it is not about what the client likes or wants. The question is, can we design the layout the client wants within a well-defined series of set parameters?

Typical Example

The best example I can provide is about the client who has the typical 10' x 12' bedroom and wants to model the modern era, with its 89' auto-racks, large modern six axle diesels, inter-modal yards, double track mainlines, etc. Having a room with 120 square feet of useable space and wanting to run modern era equipment in a modern era setting means the client is going to have to make some serious concessions.

What is the maximum radius you can have in 120 square feet? Definitely not 32"! This means those 89' auto-racks and AC4400s are not going to look very prototypical traversing 24" to 27" curvatures. Sure, the equipment will run on those curvatures. However, a lot of other issues come into play, like how far apart do you space parallel curved tracks so you don't have auto-racks and passenger cars side-swiping each other as they traverse the layout. How do you accurately represent a modern inter-modal yard in 120 square feet? The answer is: you cannot. Allowing for yard ladders, unloading and loading tracks, and storage tracks, the modern inter-modal yard needs a minimum of 10 to 12 linear feet. It is hard to represent inter-modal operations when the width of the room is 12 feet!

Now, if you throw in a double track mainline and a decent sized classifica-

Google+ Hangouts! If you like real time video chat with other model railroaders, watch for these LIVE Hangouts to join. Ask questions, help others with their modeling videos, or just join in live chat and simply "Hangout!"

Up-Coming Articles By The Track Planner*

May 2016 Issue

- Computer Aided Design (CAD) software

July 2016 Issue

- Model railroaders who were ahead of their times

* **Proposed topics—subject to update or change.**

tion yard, you quickly reach the breaking point. The most common mistake I see novices make is overestimating how much railroad that can fit inside a given space.

A Real Life Example

Recently, I was asked to design an HO scale track plan for a room measuring 12' 9" x 9' 9", or about 128 square feet. The client wanted to model the transition ear (1945-1960), which was fine, but that was where the good news ended. He wanted me to include the following: 30"-wide "around the room" bench work with a center peninsula, a 130-foot turntable with a large four-stall roundhouse. He also wanted to model both mountains and plains; he wanted freight hauling operations along with passenger service, and branch-line operations. He also wanted to run 4-8-4 locomotives and Alco six-axle PA diesels. Not only that, he advised me he might purchase a 4-8-8-4 Big Boy! He also gave me a list of over a dozen structures he had already purchased.

The client made the correct decision in going with the transition era. His problems started when he did not take into account what he was going to be able to accomplish within 128 square feet. Again, he completely overestimated the room's potential. He "assumed" everything would fit. He was purchasing things he liked, "hoping" they would fit; obviously not the best way to go about designing a model railroad. He did not have a particular railroad or specific modeling interest in mind.

Bottom line: I designed him a track plan, but we had to make numerous compromises; too many to list here. When completed he will have a transition era layout, but with about 50% of the things he originally wanted to include. Much of my design time was spent explaining why I could not do what he wanted.

My Personal Era Story

When I retired in 2001 and moved to Colorado, my wife and I purchased mountain property that had an unattached, 2½ car, finished and heated garage. The house had a two-car, attached garage, so the unattached garage became my train room. The available layout space measured approximately 550 square feet.

Inside of the space I designed and built a single level layout depicting the Camas Prairie RR (UP/BN) in central Idaho in 1979. We ran a combination of four- and six-axle motive power, lots of SD45-2s. The layout was designed for prototypical operations and we held numerous operating sessions, running upwards of 16 to 18 trains per session. The layout operated well with four to five operators.

In 2011 my wife and I moved into town, purchasing a smaller more manageable home. The home had a home-office in the basement; it had one door, no closets, and one win-

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dow. It was perfect for a model railroad, but there was one problem: I was coming from a space measuring over 550 square feet to one measuring barely over 200 square feet. Because of my layout design and track planning experience, I knew there was no way to design a "believable" new version of the Camas Prairie RR in 1979 in 200 square feet of space.

I sold off my old layout and all the equipment and began thinking about what kind of railroad I could build in 200 square feet that would be believable. Using believability as my main objective, I began searching for a new railroad.

After about a year of research, I decided to build a loosely-based representation of the Spokane, Portland and Seattle (SP&S) Railroad in southern Washington state, with a branch line to Bend, OR. To make the railroad believable, I knew I was not going to be able to model the same era as the CPRR (in 1979). The decision was made to backdate to 1955. This would allow me to run 4-axle motive power, mainly, RSs and F7s; all freight cars would be forty footers or less.

By backdating to 1955, I was able to design and build a four-level layout that operates in the same manner as the original CPRR. This layout allows three operators to run trains instead of four or five and we can run about a dozen trains per operating session. These were trade-offs I was willing to make in order to maintain a layout that not only operated well, but also was believable. Because of the era change, I was able to use smaller radiuses, smaller motive power, and shorter wheelbase rolling stock. Another benefit was the size of the industries (in 1955) in that part of the country; they were smaller and took up less space.

Some Final Thoughts

I realize to some, this may seem like a radical way to go about making a model railroad "believable". To my way of thinking, it was the only option.

If you only take away one thing from this article, I would like it to be this: before any bench work gets built, before any track gets laid, and before any trains run, take time to stop, sit down, and seriously think about what you want from your model railroad.

If it takes someone like me to help get you focused in the right direction, the money spent will, in the end, be the least expensive part of the construction. If you have the ability and the desire to design your own layout, great; go for it, but make sure you have a "believable" plan and stick to it!

About the Author

Bill Beranek - The Track Planner has over forty years in the model railroading hobby. Bill enjoys golfing, travelling, and of course designing "prototypical operations" focused track plans. He has been a member of a local 135+ member model railroad club since 2003 and has served twice as the club's president, twice as a board member, and is currently serving as the club's treasurer.

Bill is currently working on his latest triple-deck HO scale layout depicting the SP&S (Spokane, Portland & Seattle Railway) in southern Washington and the OTL (Oregon Trunk Line) on the upper level in northern Oregon in the mid 50s.

You can find more about Bill—The Track Planner at:

www.thetrackplanner.com.

YouTube Model Builders LIVE! Want to see live shows discussing modeling techniques, YouTube resources, and Web resources?

Check out the LIVE show that airs monthly . — Free to you!

Community Collage

In this issue we feature the amazing work of Philippe Moniotte. He models the Belgian State Railways circa1950-55 in HO scale. His layout features a fictional area on the Belgian/French border. It is named Trignolles, after a fictional town described in a saga of popular novels of the era. Almost all of the individual buildings and some of the engines are scratch-built. You can find more about Philippe's work on his blog at http://engaredetrignolles.skynetblogs.be/. (You can use Google Translate to convert the blog to English). All photos published by permission of Philippe Moniotte under Creative Commons 3.0 US Licence.

In each issue we choose one YouTube model railroader and feature a collection of photographs of their layout, building structures, or any other YouTube model railroad related project. If you would like to share pictures of your layout in the Community Collage, please contact us at YTMBeMag@gmail.com.

PICK 3

In each issue we share with you three YouTube Model Builders' channels that provide the community interesting ideas, tips, tricks, and resources. In keeping with the theme of the this issue, here are three channels that can help as you consider or plan signaling for your model railroad. Please check them out!

Stephen Bennett

https://www.youtube.com/channel/UCGN0O1Vkd8GdkzWpbOA0ktQ

Stephen uses his channel to track the progress of his model railroad. Signaling and other aspects of the layout are controlled using C/MRI (Computer/Model Railroad Interface), and his *Model Railroad Update Video* series discusses and demonstrates C/MRI wiring and programming (starting at about update video #36).

Ian Juby

https://www.youtube.com/user/ianjuby

Ian works in the railroad industry, and he has posted to his YouTube channel a very good, 4-part series on North American railroad signals, which he has titled *The Foamer's Guide to Reading Railroad Signals*. He includes lots of prototypical detail, so the series is a great way to get familiar with signaling before adding them to your model railroad.

YouTube Model Builders

https://www.youtube.com/user/ModelBuildersLIVE

Yes, this month we are featuring our own YouTube channel! A number of past and upcoming Tuesday night hangouts focus on JMRI (Java Model Railroad Interface), an open-source computer program that can be used to automate layout signaling, generate switch lists, program DCC decoders, and more. The videos begin with the basics and continue to work their way through this useful and multi-talented software.

Into Facebook?
Check out the YouTube Model Railroaders Facebook page!

We now have three different types of Hangout Presentations each month!

For the latest schedule updates please go to www.YouTubeModelBuilders.com.

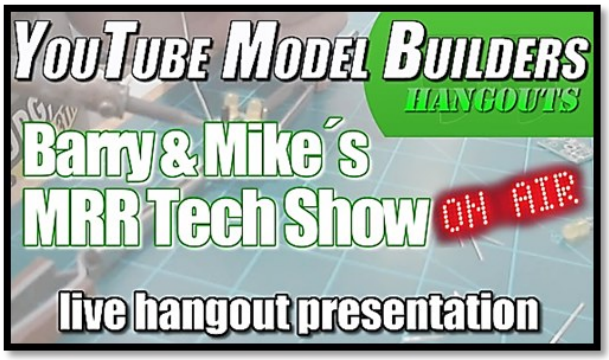
The first Tuesday of each month is Geno's Show!

Geno's show is all about structures, weathering, scenery, and more.

The second Tuesday of the month is an open presentation hosted by Troy Pendzimas.

The third Tuesday of the month is an open presentation hosted by Dude Lindler.

Open presentations are topic driven and fellow YouTube modelers are brought in to present and answer questions from the panel and the viewers.



Every fourth Tuesday of the month is the MRR Tech Show hosted by Barry Rosier and Mike Dettinger.

The MRR Tech show is all about the technology of model railroading. Covered topics include DCC, JMRI, animations, 3D printing, and much more.

Calling all geeks!

YouTube Model Builders LIVE!

Join Us LIVE Every Month

Air Dates

YouTube Model Builders LIVE! show is aired monthly with a great line up of events and panel members. The main focus of YouTube Model Builders LIVE! is to provide a Q&A style forum for YouTube modelers to interact with their favorite YouTube model builders. Come watch and remember to register for great door prizes during the show! For the latest schedule updates go to www.YouTubeModelBuilders.com.

March 19th, 2016

Spring Break is here and we have some good stuff to talk about.
Panel Members: Barry Rosier, William "Big Bill" Graham, and Ron Pare

April 21st, 2016

Spring is in the air. Are you still working on your railroad?
Panel Members: Barry Rosier, and William "Big Bill" Graham

YouTube Model Builders HANGOUTS

Live Chat / Presentations

YouTube Model Builders Tuesday night Topic-Driven presentation Hangouts start at 9 PM CST / 10 PM EST and are scheduled for up to 2 hours so you have plenty of time to ask questions and learn. These presentations are also recorded for later viewing. For the latest schedule updates go to www.YouTubeModelBuilders.com.

Space is limited so make sure you don't miss these popular Hangouts!

The Magic of the Mallet

2-6-6-2T Articulated Logger

By Jack Hykaway

Photo Courtesy of Thomas Wyssmann

There is no doubt that an efficient transportation network is the backbone of any country's economy. For countries in North America, transportation systems are crucial in the process of getting the raw product refined and to the customers in a reasonable timeframe. When the transportation network can't keep up with demand, connections are lost, and the economy takes a hit.

This is exactly what happened to lumber companies in the late 1900s: The companies had enough trees to cut, they just couldn't get them out of the forests fast enough to keep up with the sky-high demand for finished lumber.

In the early 1900s, lumber companies laid temporary, lightly-engineered tracks deep into the woods, and often over forbidding terrain, to bring the trains right up to where they were clearing trees. The trains were loaded within a few hours, and then they were sent back down the line to the saw mills.

Most of the larger logging companies had a small fleet of locomotives to power their trains up the steep grades and around the sharp bends of their temporary track. Shay, Heisler and Climax locomotives made up the majority of many companies' fleets. These locomotives were good pullers at low speeds, they could make it around sharp corners and they could get a grip on the often slippery, overgrown right-of-way. However, these small engines had many disadvantages, many of which would become more apparent as the logging camps moved farther from the saw mills.

The Shays, Heislers and Climaxes were painfully slow, they lacked power and they had next to no range. The companies needed more powerful locomotives so they could make trains longer and faster to keep up with customers' demands.

Unfortunately, many of the conventional, more powerful steam locomotives were too large to make it around the sharp curves of the temporary tracks. Additionally, most engines exceeded weight restrictions on the weak bridges along the lines.

The invention of Jules T. Anatole Mallet was the answer the lumber companies needed. In 1876, Mr. Mallet patented his design of an articulated steam locomotive. The

> T. Anatole Mallet's last name is correctly pronounced as "Mal-Lay." However, many incorrectly pronounce it as "Mal-Let."

Photo Courtesy of
Thomas Wyssmann

rear drivers, just like any steam locomotive, were attached to the chassis of the unit. What made this type of locomotive special was that the front set of drivers was articulated. The hinged drivers allowed the relatively large locomotive to cope with tight corners. The added wheels (up to eight drivers in all) allowed for better weight distribution, enabling these heavy engines to cross the soft roadbeds of the temporary track without derailing.

Mr. Mallet's articulated locomotive had another important advantage over the competition – it had power, and lots of it. The locomotive was powered by two steam engines, one to power each group of drivers. This technique, known as Compounding, changed the way steam locomotives were designed up until diesels took over in the 1940s and 50s.

The compounding design converts steam into energy more efficiently than a conventional steam locomotive's driving system. Steam from the boiler is fed directly into a set of high-pressure cylinders at the rear of the locomotive. These small cylinders power the rear set of driving wheels. Instead of letting the steam escape from the engine after every "chuff", the steam is captured and is sent to a set of low-pressure cylinders at the front of the locomotive. These low-pressure cylinders power the front set of drivers, and are quite large. Recycling the steam was a great way to increase a locomotive's power output without dramatically increasing the unit's size or weight.

The compounding technique was also used on some of the most famous steam engines ever built such as the mighty "Big Boys" and "Challengers", built by ALCo (American Locomotive Company).

Baldwin Locomotive Works was one of the first builders to introduce the Mallet locomotive style to American railroads. In June of 1909, the Little River Railroad & Lumber Company purchased a 2-4-4-2 Mallet-style locomotive from Baldwin. This locomotive, however, turned out to be too heavy for the Little River Railroad's soft tracks, and was sent back in exchange for the smallest logging

Mallet ever built by Baldwin: Little River Railroad No. 148.

Baldwin built its first Tank Mallet the next year for the Booth Kelly Lumber Company. Booth Kelly No. 2 was a 2-6-6-2T model, with rectangular side water tanks mounted alongside the boiler.

Baldwin's logging Mallets didn't catch on until the 1920s. The first decade they were for sale, Baldwin only built a handful of units, most were of the 2-6-6-2 configuration. Business picked up for Baldwin between 1920 and 1929, when the company constructed twenty-seven 2-6-6-2 Mallets, most of which were built for logging railroads in the Pacific Northwest.

Partway through their service lives, many of Baldwin's Mallets were converted to burn cheap oil instead of expensive coal. The locomotives could be loaded with 1,000 to 1,500 gallons of fuel oil for their journeys. The large fuel tanks combined with the 2,000 to 2,500 gallon water tanks made it possible for these Tank Engines to have outstanding range.

The water tanks came in a variety of styles, and were an identifying feature on the Baldwin Mallets. Split side tanks, rectangular side tanks, saddle tanks, split saddle tanks, and tender tanks were the five tank styles Baldwin offered for these engines.

As the great depression set in, demand for new locomotives deflated rapidly. The Weyerhaeuser Timber Company was the last company to place an order for a 2-6-6-2 Mallet from Baldwin, in 1937. From 1909 to 1937, American logging companies ordered a total of 42 logging Mallets from Baldwin – thirty-seven of which were of the 2-6-6-2 wheel arrangement, all of which were standard gauge.

Biles-Colman Lumber Company was the only company to place an order with Baldwin for a narrow-gauge 2-6-6-2T Mallet locomotive. Unfortunately, the Great Depression began before construction started on the locomotive, and she was never built. See the table for statistics on the Biles-Colman #103.

Baldwin had great success with their lineup of logging Mallets. The units were well-built and could easily cope with the steep grades and tight corners of the temporary tracks. Many of Baldwin's Mallet-style locomotives operated in revenue service well

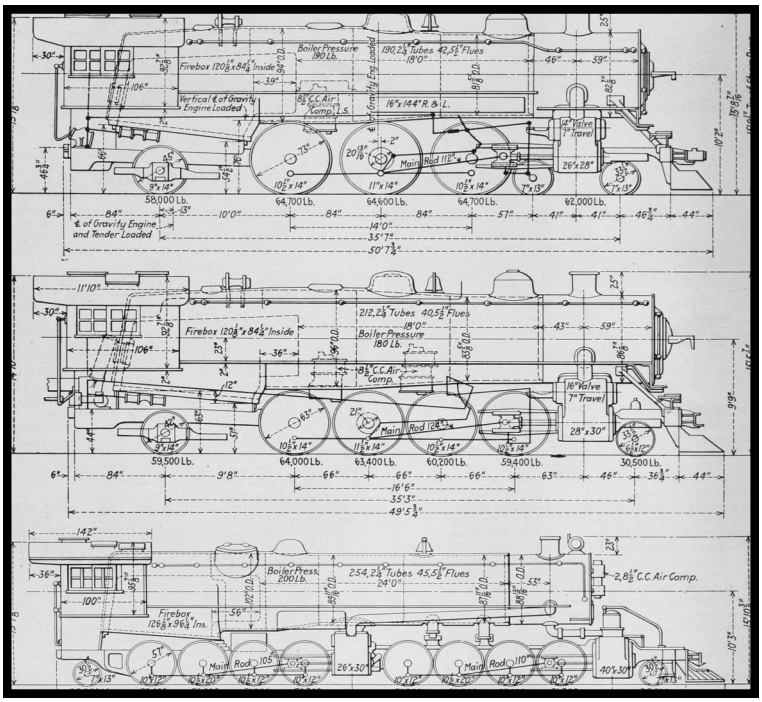


Diagram from the book Railway Mechanical Engineer Vol. 95 (1916) , shows a sketch of an articulated Mallet engine (bottom sketch).

Click on the image to go to public domain source for this image.

into the 1950s and 60s. However, after logging trucks replaced the trains in the 1970s, the majority of the Baldwin-built logging Mallets were scrapped.

Fortunately, two Baldwin 2-6-6-2T locomotives have been saved from the scrapper and were lovingly restored back to working order. Weyerhaeuser 110, a 2-6-6-2T with split saddle tanks, operates on the Black Hills Central Railroad in Hill City, SD, regularly pulling tourist trains the 12 miles to Keystone, SD and back. The second preserved 2-6-6-2T also does tourist runs, from Sunol to Niles, CA.

About the Author

Jack Hykaway is 16 years old and lives in Winnipeg, Canada. Model railroading and rail-fanning are his favorite hobbies. He spends his free time working on his HO scale layout, or trackside waiting for the next train to roar past. Jack has been in the model railroading hobby since he was seven years old. Like most people, Jack started with an oval of track, and a rugged train set.

He built his present layout when he was 11 years old, and he is constantly upgrading it. However, there is still a long ways to go. Climb aboard and follow Jack's progress on the Silver Lake Junction layout on his YouTube channel at https://www.youtube.com/user/WinnipegRailfanner1.

For more information on the Baldwin Logging Mallets, please visit:

- http://loggingmallets.railfan.net/
- http://www.steamlocomotive.com/2-6-6-2/?page=ur
- http://rattlerjones.deviantart.com/gallery/55186033/Uintah-Railway?offset=0
- en.wikipedia.org/wiki/Sumpter_Valley_Railway
- en.wikipedia.org/wiki/Uintah_Railway

Sources For Statistics Sheet (Next Page):

1. "Biles-Colman Lumber Company's Reservation Narrow Gauge" by John E Lewis (Statistics Sheet and other information).

2. "A brief history of the Baldwin 2-6-6-2 Articulated Saddle Tank Locomotive" By Bachmann Trains https://www.youtube.com/watch?v=JmAiOQaqygc

Statistics Sheet
Biles-Colman Lumber Company #103
Baldwin 2-6-6-2T, 36” Gauge

Class	16 21/36 1/4DD
Gauge	36”
Length over Pilot Beams	83’3”
Total Engine Wheelbase	33’3”
Total Driving Wheelbase	20’9”
Front and Rear Wheelbase	7’0”
Diameter of Truck Wheels	24”
Diameter of Driving Wheels	38”
Number of Driving Wheels	12
Weight on Drivers (Tank Empty)	105,000 lbs
Weight on Drivers (Tank Full)	115,000 lbs
Weight on Front Truck (Tank Full)	12,000 lbs
Weight on Rear Truck (Tank Full)	13,000 lbs
Total Weight in full working order (Tank Full)	140,000 lbs
Total Weight Dry	112,500 lbs
Tractive Effort	23,100 lbs
Factor of Adhesion	4.98
Number of Cylinders	4
High Pressure Cylinder Diameter	13.5”
Low Pressure Cylinder Diameter	21”
Cylinder Stroke	20”
Boiler Pressure	200 psi
Boiler Diameter	48”
Tubes	68 (2” diameter)
Flues	10 (5 ¾” diameter)
Tube and Flue length	13’0”
Firebox length	72 1/8”
Firebox Width	23 ¼”
Fuel Capacity	700 gallons
Water Capacity	1500 gallons
Brakes	Westinghouse Air
Draft Gear	Automatic

Google+ Hangouts And Etiquette

Dude Lindler

YouTube Model Builders works very hard to bring YouTube model railroaders together in what is called Google+ Hangouts. Google+ has many free resources for us to use and we look forward to taking full advantage of these resources.

What is Google+ Hangouts? It's an application that runs through a web browser that allows up to 10 people to connect with webcams. Using this forum for model railroading discussions is great! It builds friendships, inspiration for model railroad building, and most of all, a great place to air your designs, models, and share in your building adventures with others in real-time. Many of the YouTube video producers you know "Hangout" in these Google+ Hangouts.

Many builders simply place their webcam on their project they are working on and show others what they are doing; it may be they are building a model, laying track, or working on anything model railroad related. Many look for feedback from the group, get questions answered, and elaboration on the many projects on which they are working. It's simply a great place to interact in real-time with other YouTube model railroaders.

These Google+ Hangouts are posted most every day on the Google+ YouTube Model Railroaders Community page. You are not required to use a webcam or even a microphone; you may only use the provided chat box if desired.

With the utilization of Google+ Hangouts by many model railroaders, YouTube Model Builders is now scheduling specific types of events for the community members. Here are two Google+ Hangouts that we have arranged to help bring more model railroaders together.

Topic Driven, Tuesday Night Hangout Presentations:

YouTube Model Builders invites specific guests to explain techniques in model building, and many times these individuals are invited to our topic driven hangouts based on videos they have produced. Showing the progress real time, the topic driven hangouts are moderated by YouTube Model Builders staff which keeps these hangouts on subject and informative. The Topic Driven Hangouts are much like clinics as they are more so for instruction and techniques shared by a presenting individual or individuals.

We now have three different types of Tuesday night hangout presentations. The

first type occurs on the first Tuesday of each month It is Geno's Show, which is hosted by Geno Sharp of Gknos Model Trains. The second type of hangouts are moderated presentations that are hosted by Troy Pendizmas of Pacific North Central and Dude Lindler on the second and third Tuesdays of each month respectively. The third type of moderated hangout presentation is the Barry and Mike MRR Tech Show which is moderated by Barry Rosier and Mike Dettinger. This show is presented on the fourth Tuesday of each month and focuses on the more technical aspects of model railroading such as DCC controls and JMRI. There are plenty of opportunities to learn from many experts in model railroading through these hangout presentations and shows. So come and join in the Hangouts!

General Moderated Hangouts: Thursday Nights

Where many hangouts posted through the Google+ YouTube Model Railroaders encompass many subjects and often have many people showing their layouts, and discussion varies from model railroading to just general conversation, YouTube Model Builders has a weekly scheduled, Thursday night, general moderated hangout, to specifically keep on the subject of model railroading. The Thursday night hangout is moderated by Johnny of Southeast Rails and the topic selection is really driven by community feedback.

YouTube Model Builders as a team helps drive these Hangouts, to spread the word, and get the YouTube Model Railroaders involved. Many people participate and as these numbers have grown, a simple etiquette is followed for the hangouts posted on YouTube Model Railroad resources.

Below is a simple guideline for participating in any YouTube Model Builders hangout event:

- Always keep the conversation G Rated.
- Refrain from political/religion based conversations.
- When not speaking, mute your microphone.
- Keep the hangout fun and on model railroading subjects.
- Remember, you're in a room with others, try not to monopolize speaking time. Allow others to get in their input.
- If you have your camera on, please be presentable – remember others can see you!

Following these simple etiquettes will make hangouts fun, and most of all, suitable for anyone who might want to join! We hope to meet you in a hangout in the near future if you don't already participate! If you have any questions on this subject, feel free to ask any one of the involved YouTube Model Railroaders to help get you into the fun sharing in the Google+ Hangouts.

Food For Thought...

In our feature called "Food for Thought," members of the model railroading community are invited to write an opinion editorial on some matter relating to the model railroading hobby. Topics may range from simply thought-provoking to downright controversial.

Please read it over, and then share your thoughts with us. Do you agree with the statements in his article? Do you disagree? Do you wish to add another point of view that you feel should have been made? You can send your response to us at YTMBeMag@gmail.com. We'll pick some of the more interesting responses we receive and publish them in our next issue. Please include the text "Food for Thought" and the issue date in the subject line of your email, and let us know the name you'd like us to use if we publish your opinion. If you would like to submit an opinion piece of your own, please contact us at the same email address above. Submission guidelines can be found at www.YouTubeModelBuilders.com.

Our authors this month are Blayne Mayfield and Loggin' Locos, and their thoughts appears below. We look forward to hearing from you!

A Signal of Extravagance?

By Blayne Mayfield

The introduction and evolution of signaling systems on prototype railroads helped increase the safety of travel and rail shipment, both in reality and (perhaps as importantly) in the eyes of the public and lawmakers. So, it makes sense that this would be an aspect of real-world railroads to which model railroaders would be drawn. But, could it be that the siren song of signaling systems may lead many model railroads onto the rocks?

One reason I ask this question is that many model railroads are only a very few scale miles in length. In these cases, a working signal system may be a bit of overkill. The compression of the signaling blocks on such layouts could actually cause the railroad to look more toy-like. (Much like the "realism" of a Lionel crossing gate that drops every 20-30 seconds on a loop of track.)

Another trait of signaling systems is that – because of their shiny, nifty nature – modelers may be lured into spending time adding signals to their layouts early, ignoring some of the other aspects of the railroad that, arguably, are at least as important, if not more. For example, a friend of mine who went on the layout tours offered at the most recent NMRA national convention was surprised to find that some of the more famous layouts (the ones pictured inside and on the covers of some model railroad magazines) consist primarily of track on bare bench-work – except for the sections that were photographed for the magazines. The temptation may be to add details such as working signals before addressing the basics of scenery and such.

Also consider that it is not just our time, but also our funds, that can be pinched by adding a signaling system. As much as we'd like to think otherwise, the amount of money many of us have to spend on model railroading is a (somewhat) limited resource. So, if one purchases that new, laser-cut structure, the additional rolling stock will have to wait. When funds are tight, signaling hardware becomes yet another modeling mouth to feed.

In information technology (the profession that pays my model railroading bills), we have a couple of rules regarding code optimization: rule 1 is, "don't!" And, rule 2 (for those who choose to ignore rule 1) is, "not yet!" Perhaps the same rules apply to adding signaling to a layout. Even if one decides to take the plunge and install a signaling system, maybe it would be better to wait. And, as in some other areas of the hobby, signaling technology is in transition. While optical sensors have been in use for several years to trigger signals, more recent sensing technologies, including RFID (Radio Frequency ID) and NFC (Near-Field Communications), are being rolled out. Perhaps it is best to wait for the dust – and standards – to settle a bit.

While signaling systems are cool looking if done well (especially in their modern, LED-based incarnations), I sometimes wonder whether they really are worth the cost, time, and effort as compared to other areas of the hobby.

What do you think?

About the Author

Blayne Mayfield is a university professor by day and an HO engineer by night. After a 20+ year absence from the hobby, he currently is working on a proto-freelance layout based on the Frisco Railroad in southern Missouri. Blayne lives in Stillwater, OK, and volunteers as an associate editor on the YouTube Model Builders eMag. You can follow him on his YouTube channel by clicking here.

Photo Courtesy of Jack Hykaway

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