The Newsletter of the Potomac Division of the NMRA June-July 2020

THE POTOMAC FLYER

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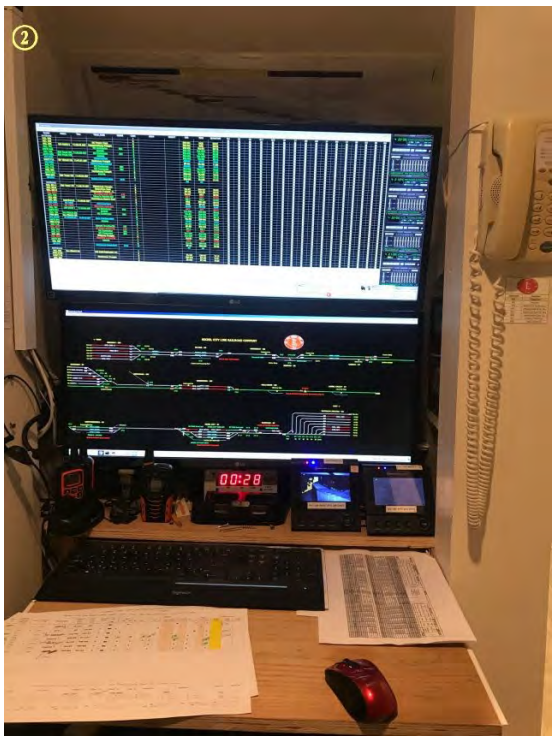
Remote Operations — Creative Option for Holding Operating Sessions in the Era of COVID-19

by Bob Rodriguez

When I was first going to write this article, I had planned to discuss remote dispatching for operating sessions. But now I sit in front of my computer, it is early April, and the world as we know it has been turned upside down. The emergence of COVID-19 across the globe has initiated thousands upon thousands of closures and gatherings worldwide. In the model railroading world we have seen cancellations of meets, conventions, meetings, and yes, operating sessions. And while, at some point, this pandemic will come to an end—and those very smart scientists will develop a vaccine—my thoughts turn to how one might host an operating session while still maintaining the appropriate social distancing.

An engineer operates Train 202 remotely on his home computer using JMRI's Web Access and HD web security cameras installed around the layout.

Let's discuss the position of the Dispatcher. Depending on the layout and era, the role of the Dispatcher may be as simple as writing orders and recording train movements on the Dispatcher's Train Sheet. Or it could involve the operation of a CTC console or even a modern computer aided dispatch (CAD) screen on a computer. So how could this job be done remotely? In the first instance where the Dispatcher issues train orders and maintains a Train Sheet for the session, the Dispatcher and the Operator could be connected by an open phone line (land line or cell). I operated on Roger Sekera's Clinch Valley Line where the Dispatcher, Steve King, was in Pennsylvania issuing train orders while the crew operated on Roger's layout in Maryland. In that instance, the Operator recorded the orders locally and handed them to the train crew. In a complete virtual environment this could be accomplished by the Operator writing the orders he receives from the Dispatcher via telephone. He then takes a photo of the order and texts the order to the train crew. The train crew receives the order and begin their run accordingly.



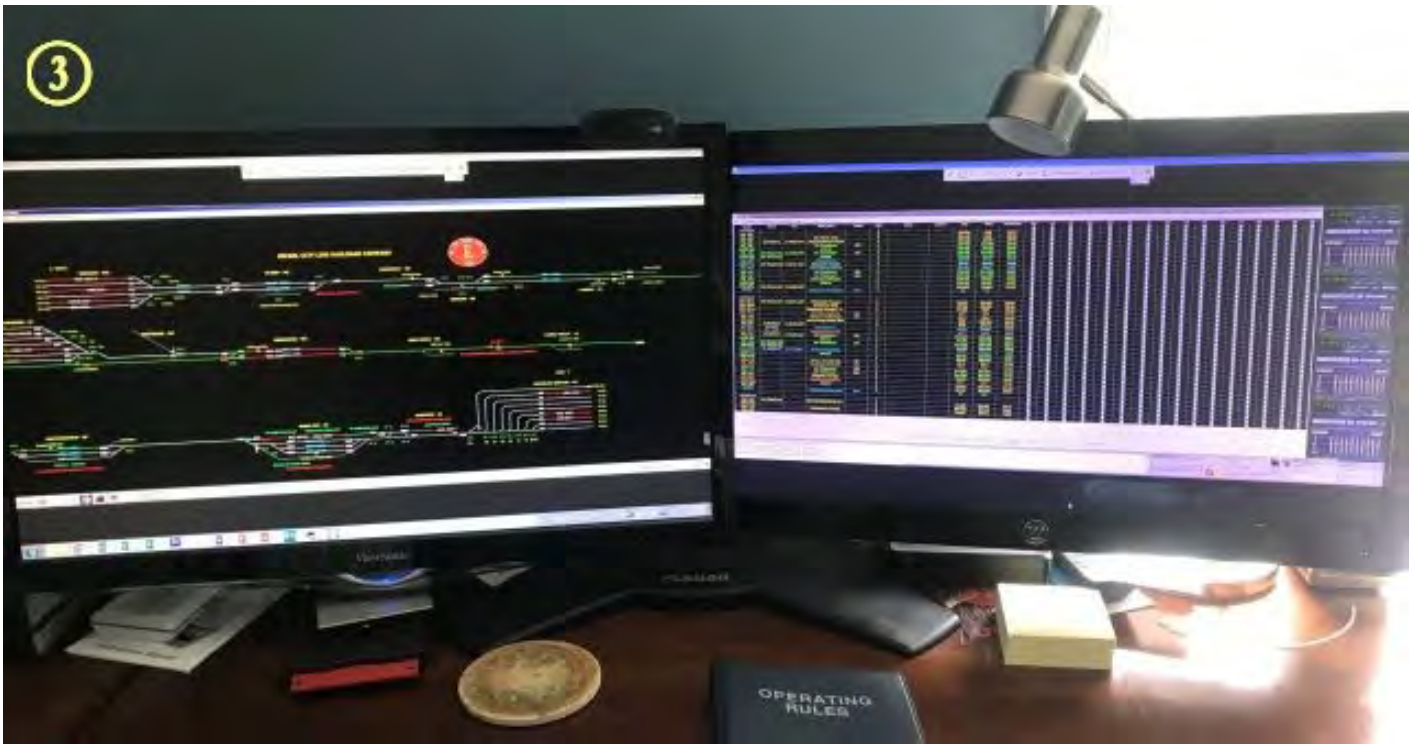
The Dispatcher's Office for the Nickel City Line Railroad.

In the latter instances, the Dispatcher's CTC or CAD screens would need to be created on a computer which is

connected to the layout. The layout would require a number of pieces of hardware to communicate with the Dispatcher's computer, which I will discuss later.

I have been an avid user of Bob Jacobsen's Java Model Railroad Interface software (JMRI) https://www.jmri.org/). JMRI is free and updated twice a year by model railroad enthusiasts who also have great computer software programming skills.

JMRI sets up a communications link between the Dispatcher and the layout. Design and construction of a CTC or modern CAD Dispatcher's screen is pretty straightforward. See photo ②. I discussed the basic process to do this in the January 2015 issue of the *Potomac Flyer*. Once the Dispatcher's screen has been created, the next step is to operate the screens remotely. JMRI has a web interface that can provide a user access to the dispatch computer in order to accomplish that. I prefer to use a program called TeamViewer (https://www.teamviewer.com/en-us/). TeamViewer is a remote desktop tool that permits operation of a computer by another computer via the internet. ③ The software is free for personal use. On my railroad, the Nickel City Line (http://nclrr.potomac-nmra.org/), I have successfully had the railroad dispatched remotely by several of my operators who were miles away. I saw firsthand the benefits of TeamViewer when I operated on Dave Abeles' Conrail Onondaga Cutoff back in the fall of 2016. Dave's layout is located in New Jersey, and his Dispatcher was at home in Philadelphia. In that instance, as with my instances, the Dispatcher had complete control to throw turnouts, allocate track segments, and operate signals along designated routes over the internet. Regardless of which method you prefer, there is a way to dispatch remotely.



The author's office computer, which is connected via the internet using TeamViewer software to control all functions of the Dispatcher's computer remotely.

Let's turn to communications. How would a train crew communicate with the Dispatcher or Operator? Well, in the prototype world it was done via the Station Agent / Operator by telegraph, telephone, or by two-way radio in the modern era. In the first instance, a simple phone call to the Operator as a train passes a control point would work. The Operator could also call the train crew

if they had new orders. As mentioned earlier, orders could be photographed and texted to the train crews as well.

In the modern era two-way radios are the norm. So how does one communicate via two-way radio remotely? Let's look at two options. The first option would be to run a separate web conference using software such as Zoom (https://zoom.us/). Because we are replicating two-way radios, a webcam on the engineer's PC is not necessary. The Engineer's and DDspatcher's audio would default to the 'Mute' setting. When the Dispatcher needed to communicate with a train crew, the Dispatcher would unmute their PC, transmit the message and then mute their mic. The train crew would repeat the procedure used by the Dispatcher to respond to the message. Zoom has apps for iOS and Android smartphones in addition to desktops.

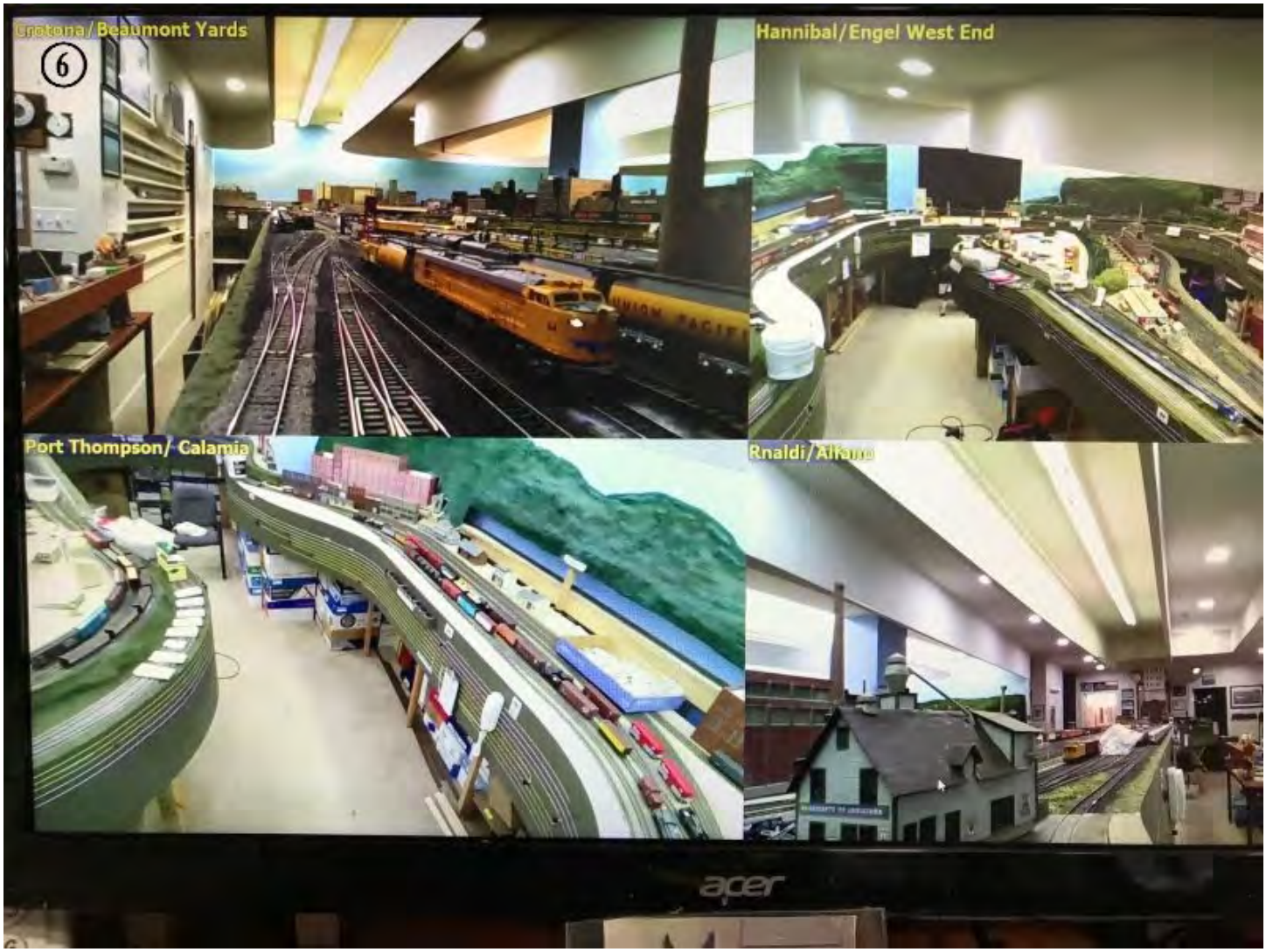
On the Nickel City Line when I use remote dispatching, I allocate an FRS (Family Radio Service) two-way radio to the Dispatcher's PC. I use a Midland radio ④ which has separate mic and earphone jacks. Using audio cables, I connect the speaker jack of the two-way radio to the mic jack of the computer. I connect the mic jack of the two-way radio to the speaker jack of the PC. The radio is set to VOX (Voice Operated Switch), and I adjust the sensitivity to achieve the best result. TeamViewer has an audio component, and I use that feature to connect the two-way radio. At that point the Dispatcher can transmit and receive over the internet and communicate with the train crews in the layout room via two-way radio. In the complete virtual world, a conference call app with operators on Mute until needing to speak would be the preferred method.

Midland FRS radios use two jacks. One for audio and one for voice. It is easy to attach cables from this radio to a PC in order to remotely use two way radio communications over the internet for operation sessions.

With communications established the issue is how to operate trains remotely. Again we need to turn to JMRI and its web interface. JMRI, as mentioned earlier, allows operators to connect remotely via the internet in order to interact with the JMRI software. One of these components includes throttle control. Using the JMRI web connection, an operator can connect, open a throttle, acquire a locomotive address, and operate a train. This means that the operator does not need to be present in the room with the train, or even in the same building. But while that sounds good, the big issue is sight. How do you see the train you are operating?

In today's era of wireless security cameras, you can find a number of High Definition, web-based security cameras to use on your layout. You can purchase them for a reasonable cost from a distributor or find them on eBay. On Pete LaGuardia's New York Central Western Illinois Division, Pete has purchased several web-based cameras ⑤ that he strategically placed around his layout. While Pete's purpose for doing this was so the Dispatcher could see what was going on around the layout during an operating session ⑥, the same idea can be applied to a remote dispatching model. Cameras could be mounted around the layout in sufficient quantity to provide enough coverage so operators had a good view of their trains as they ran across the entire layout. Using the JMRI web access throttle and the web camera app, a train crew would have a very good idea of what was happening on the layout with their train. A separate screen could be developed that would show train occupancy and signal aspects along the route to further enhance operations. JMRI provides these features as well.

What about switching? Magnets are the choice. Uncoupling magnets strategically positioned at each town would permit trains to uncouple and move cars to various industries that needed them.



Pete LaGuardia's NYC Western Illinois Division utilizes several D-Link HD web cams (5) so that the Dispatcher can see what is going on during Pete's ops sessions (pictured right). These cameras can be easily interfaced with the internet to provide remote viewing for operators during a virtual ops session. Photos: Pete LaGuardia

If the locomotives are manufactured by MTH, the DCC locomotives come equipped with DCC operated front and rear couplers which further aid in switching operations. All local turnouts would need to be motorized, tied into a stationary decoder, and provided a DCC switch address so that the train crew could operate them remotely.

Finally we need to look at equipment and paperwork needed. Requirements for the layout would include block detection, automated turnout control, signaling (if required), and transponding (if required).

Block detection is essential in order for the Dispatcher and train crews to determine where the train is. Transponding accompanied with block control is nice to have. Digitrax® offers transponding in all of its newer mobile decoders and as a decoder add-on. If the locomotive is equipped with a Digitrax® decoder that supports transponding and the block detection system has transponding enabled, then the train can be tracked in real time with its actual location reporting to the Dispatcher via JMRI. Locomotives equipped with another manufacturer's decoder can add a small transponding-only decoder inside the locomotive. Another alternative is to equip a piece of

rolling stock with a transponding-only decoder that travels with the train the entire journey and reports the train's location to the Dispatcher.

Automated turnout control is essential for the Dispatcher to perform mainline operations and for the train crew to perform local switching moves. Automated turnout control connected to JMRI will permit the Dispatcher and train crews to control turnouts remotely during a session. JMRI provides remote turnout control locally and via the internet.

If the layout uses signals, then the signals should interface with the digital command system and be able to report their status to the Dispatcher and train crews. Digitrax® provides in-cab signaling ability which can be seen on the Digitrax® throttle. It can also be seen via JMRI applications.

On the Nickel City Line, I use Digitrax® products for block detection, transponding, turnout control and signaling. But most manufacturers offer their own versions of these products, and you should check on what is available for the system you currently use. Also check other manufacturers who offer a product your manufacturer doesn't. In some cases the products are either interchangeable or can be used together through JMRI.

Now that I have gone over some of the opportunities available out there, let's discuss how a virtual ops session could be run. In advance of the operating session, all paperwork, train manifests, switch lists, customer service maps, track diagrams, etc., would be available for the operators to download. On the Nickel City Line I have an Operations Page where I post all relevant material a week ahead of time so my operators can look it over beforehand (http://nclrr.potomac-nmra.org/Operations/OperationsReadAHeads.html) ⑦. In addition, an email with each participant's preferred contact number for the session would be sent out to the group along with the assignments for the session.

On the day of the operating session, the layout host would power up the layout, computers, cameras, and JMRI webserver and have everything ready in advance. The links and passwords for the JMRI interface, TeamViewer Session and teleconference meeting would be sent out in advance by email.

The ops briefing would be held on the teleconference software. Operators would log in at the designated time and the host would conduct the ops briefing. At the appointed hour, the ops session would begin. The Dispatcher would be operating the CTC or CAD Dispatcher's computer screen. Train crews would run virtual throttles and follow their trains on the web cameras and occupancy diagrams. Yard crews would switch cars via virtual throttles and webcams. And the layout host would be touring the layout and addressing any issues that arose.

Operators on the NCL can see and printout paperwork ahead of time by accessing the Nickel City Line's website.

At the conclusion of the operating session, the host would hold a short video conference wrap-up before sending his guests on their virtual way.

Maybe what I described sounds a bit far-fetched; but in reality everything mentioned in this article is available now and at a reasonable cost. Remember back in the early 80s how the thought of DCC was met with skepticism? And who knows what would have been said back then if someone were to mention DCC with sound and light functions.

With a little time and effort, the above example could be achieved realistically. And now you ask "Why would I consider doing this to my layout?" That is a very reasonable question. First off, I truly hope that the COVID-19 pandemic is the last pandemic I see in my lifetime. But there will be other possible events which would make having a layout equipped for a virtual session inviting. Weather is the first thing that comes to mind. I know I have cancelled a session or two due to a serious snowstorm or other serious weather event. In those instances, with a properly equipped layout, the operating session could still go on, and all my guests would not need to put themselves in peril getting to and from the session.

The second thing that comes to mind is when someone cannot fully participate due to an illness or injury. Let's say that one of your regular operators is nursing a bad cold and does not want to pass it on to everyone else. Or maybe that person had a recent surgery and can't stand or move around much. They still enjoy participating and don't want to miss out on an opportunity. In either case, rather than cancel, the guest could log in remotely and fully participate in the session. It also means that the layout owner would not need to do a revamp of the operations assignments due to an absence. The end result is your guest has an enjoyable time, even if it is virtual, and you can run the original schedule you labored to set up for everyone.

In conclusion, the simple fact is that no virtual set up can ever replace the fun and camaraderie that an in-person session generates. But in those cases where we cannot get together, for whatever reason, there are options out there that permit us to gather together, interact, and enjoy the hobby, even if it is through a computer screen and keyboard in the virtual world.

I hope each and every one of you stays safe and healthy during this pandemic. As I sit here in early April, typing on my computer, I eagerly look forward to the day when I can resume my own operating sessions as well as have face-to-face interactions again with all my model railroad friends. Until then, I have projects that await me in the layout room.

Return to Bill of Lading

Bob Rodriguez has been a model railroader for more than 40 years and has built several small and medium size layouts, including assisting with construction of the Prince William County Model Railroad Club's layout formerly in Quantico, Virginia. Bob began operating sessions on his own Nickel City Line railroad in November 2002, and has hosted more than 100 sessions to date, introducing 80 model railroaders to operations on his railroad. He also operates with a round-robin group of model railroaders from Maryland and Virginia. You can view Bob's layout at: http://nclrr.potomac-nmra.org/.

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Remote Operations—Part 2
Applying Practice to Theory

by Bob Rodriguez

In the last issue of *The* Potomac *Flyer* (June-July 2020) I discussed the idea of conducting remote operating sessions in the era of COVID-19. In this article I will discuss applying practice to theory to make remote operations a reality.

Since the writing of my last article, I have successfully hosted eight remote operations sessions on my railroad, the Nickel City Line. As the sessions have progressed, my remote crew has become more proficient in the art of remote operations. Since COVID-19 remains a concern for many of us today, the remote operations format on my layout will be the norm—rather than the exception—for the majority, if not the remainder, of 2020.

Equipment Needed

To recap from my last article, a layout and its operators need some hardware and software components to create a working remote operations system. These include, but are not limited to:

- Physical components for turnout control, block detection, and signaling (if present).
- A software interface to operate the hardware components, such as Java Model Railroad Interface software (JMRI) (https://www.jmri.org/).
- A software app to operate throttles that is compatible with the layout's software interface. My operators and I prefer the use of WiThrottle (https://www.withrottle.com/html/home.html) for iOS devices or Engine Driver (https://enginedriver.msteveto dd.com/) for Android devices.
- A software program to interact with the Dispatcher's computer, such as TeamViewer (https://www.teamviewer.com/en-us/).

WiThrottle for iPhones

An Amtrak passenger train arrives in the town of Sheppardsfield while the local switches industries on the adjacent track. The layout owner is seen to the right on the large screen serving as the brakeman while the operators work remotely via Zoom. Several of the layout cameras can be seen in the smaller Zoom windows above. The large 'S' aids operators in locating passenger stations on the layout. Screenshot by Bill Lyders

- A software program that facilitates video and audio communication between operators and the layout's host, such as Zoom (https://zoom.us/).
- A series of cameras that link into the video and audio software so operators can see segments of the layout remotely.
- Sufficient documentation prepared and sent to operators in advance to aid in remote operations.
- For the operators, a home computer with a microphone and camera connected to a reliable internet provider.
- For the operators, a good size computer monitor, two are preferred.

On my layout I use Digitrax BDL168s for block detection and transponding; and Digitrax SE8c's for turnout and signal control. I use JMRI to communicate with the layout along with Rodney Black's Computerized Assisted Traffic System or CATS (a JMRI overlay software) to run the Dispatcher's console (http://cats4ctc.wikidot.com/).

Video Coverage

I purchased a number of inexpensive webcams from Newegg.com, an internet retailer, to provide visual coverage on my layout. Since the cameras cost around $13 each, I didn't feel bad about purchasing a large number of them. I also purchased several 16-foot USB extension cables to get the reach I needed between the cameras and the computers.

A tripod and rubber bands were used at first to secure a webcam for viewing the town of Canova.

A 3D printed iPad holder for a tripod allowed for an iPad to serve as another camera.

A stool and some boxes elevate a laptop to a level where the laptop camera can be used for viewing the location of Mills River.

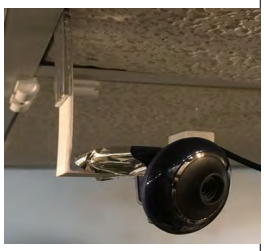
When I started setting up cameras, I used whatever was readily available (a tripod, stool, folding table, curtain rod hook etc.). But soon I designed and 3D-printed a series of ceiling camera mounts and cable holders. This provided better mounting options and a cleaner workspace. The ceiling mounted cameras also displayed a much larger view of each area of the layout, which I needed to aid my operators. I used my iPad and my iPhone to supplement the cameras. I 3D-printed tripod brackets for both which provide a stable platform for each device to be placed during a session.

One of the problems I ran into was how to use multiple cameras when they outnumbered the computers I had on hand. To accomplish this, I use Open Broadcaster Software or OBS (https://obsproject.com/). OBS is open source software for creating streaming videos on the internet. Like JMRI, it is open source, and free to download and use. It is updated regularly by a group of volunteer programmers. With OBS I was able to connect four cameras to a computer and use OBS to set up the scenes. I added labels and overlays in OBS that aid my operators when they view the OBS output. To get the video pushed out onto the internet, I installed an OBS add-on called VirtualCam (https://obsproject.com/forum/resources/obs-virtualcam.539/). VirtualCam simulates a webcam on the computer. It shows whatever scene is set up in OBS. Once I set up the scenes in OBS and started the VirtualCam, I then log into Zoom and tell it that the VirtualCam is my web camera. I can push out four separate webcam images in a single Zoom window. This enables my operators to see a great deal of the layout in one concentrated window.

An unused curtain rod bracket and duct tape made for an easy camera mount.

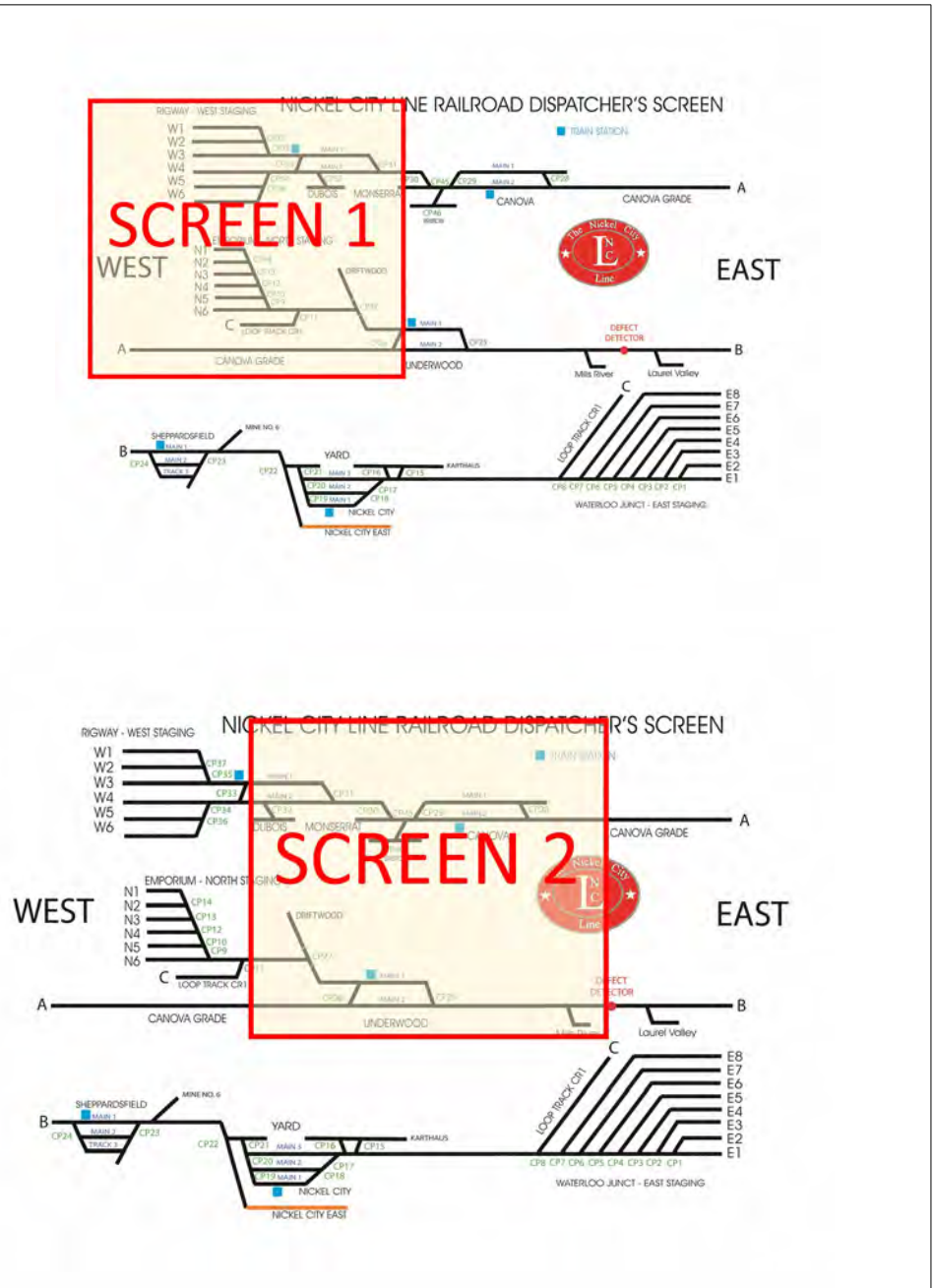
3D printed ceiling wire clips organized the webcam cables to keep them clear of the operator aisles and camera views

A 3D printed ceiling camera mount improved viewing areas of several webcams in the layout room.



My operators also needed to see the Dispatch Console as they follow their train across the layout, especially in areas without camera coverage. On the Dispatch computer I use OBS and VirtualCam to push out the Dispatch Screen as a screen capture. Because the Dispatch Screen is very large, I broke it into six smaller scenes. Each scene rotates from left to right, top to bottom, every five seconds. This allows each operator to see in greater detail the Dispatch Screen and track their progress across the layout. Because the six scenes overlap in coverage, it is fairly easy for operators to track their train's progress from scene to scene.

I use four older desktop computers (three of which were donated by a friend), a laptop computer, an iPad, and an iPhone to provide the camera coverage I need. Each device joins the ops session Zoom meetings separately. When the operators sign in they see six Zoom windows, one for each device, displaying cameras in multiple locations covering the layout.



Screen sequence diagram for the Dispatcher's screen.

Testing and Training

Preparation for the first remote ops session involved several tests of the equipment over a two week period. In each case I had one or two volunteers log into Zoom and TeamViewer to operate either the Dispatch Console or locomotives using one of the throttle apps I mentioned earlier. After each test, I made a few adjustments to the software and procedures until I was ready for the first unofficial remote ops session. The first session was kept small and simple. A Dispatcher, two operators, and I operated for about an hour. I had three trains held over from my last in-person ops session back in early March that needed to complete their runs. With a crew of three, we easily completed all the required work within the allotted time.

The next phase was to train the remaining operators who were interested in participating in remote operations. To do this I needed to obtain each operator's home external IPv4 internet address. An IPv4 external internet address is the address of your home router. Just like your house address, the internet needs an address to send stuff to you. To find out what your IPv4 address is, simply open your web browser and type "What is my IP address." Your search results will provide you with your IPv6 and IPv4 addresses. JMRI and the throttle apps are set up to use IPv4 addresses.

In order for the throttle apps to work over the internet, JMRI uses specific access ports to permit access to layout computers to operate locomotives. JMRI uses a default access port of 12090 for the throttle server. You can change this port to another number if you desire.

Once I have the addresses, I go into my router and set permissions for those addresses to access the JMRI port. I also set my firewall to recognize those addresses. If I don't provide the addresses for either the router or the firewall, the addresses are identified as a threat and are rejected by the router.

With the router and firewall configured, I start JMRI and the JMRI throttle server. Once the server is started, operators can configure their throttles for my external IPv4 address and the JMRI port for the throttle (I provide this info to the operators. The address and port look something like 123.45.678.10:12090). Once the operators are in, they can select any locomotive on the JMRI roster, although we have specific locomotives assigned for each session. The throttle response is fairly quick, with a delay of 1 second during instances of high internet bandwidth usage. Once a locomotive is selected, the operator can control the direction, speed, lights, and sound functions.

With the operators trained, I turned to what the remote operations format would be. I decided that sessions would be limited to only four people at a time. That included a Dispatcher and three operators. Since I am the only one in the layout area, this was the maximum number of people I could interact with during a session. The sessions would run between 90 minutes to two hours maximum. I believed this was the maximum amount of time someone would want to be sitting at a

Regular vs Remote Operations Table

COVID-19 Status		Normal	Phase I	Phase II	Phase III
Operators	In Person	12	1	1	2
	Remote	0	3-4	3-4	4-6
Session Length		4 hrs	1.5-2 hrs	1.5-2 hrs	2 hrs
Schedule Type		Time	Sequence	Sequence	Sequence
Fast Clock		Yes	No	No	No
Trains per Session		10-14	4	4	6
Scheduled Freight		Yes	Yes	Yes	Yes
Scheduled Pass		Yes	Yes	Yes	Yes
Local Freight		Yes	Yes	Yes	Yes
Extra Freight		Yes	No	No	No
Extra Passenger		Yes	No	No	No

The components used for in-person and remote operation sessions.

DISPATCHER LINE UP - VIRTUAL

	Sequence	TRAIN	TYPE	Trick
A-1	1	201	FREIGHT	1ST TRICK
	2	401R	COAL	
	3	501T	LOCAL	
	4	402	COAL	
A-2	5	300	INTERM	
	6	403	COAL	
	7	303	INTERM	
	8	202	FREIGHT	
A-3	9	100	COMM	
	10	601	PASS	
	11	646	PASS	
	12	101	COMM	
B-1	1	502T (a)	LOCAL	2ND TRICK
	2	102	COMM	
	3	103	COMM	
	4	650	PASS	
B-2	5	BF3	FREIGHT	
	6	714	FRIEGHT	
	7	405	COAL	
	8	KS411/12	COAL	
B-3	9	650	PASS	
	10	502T (b)	LOCAL	
	11	X421	COAL	
	12	641	PASS	
	13-EVEN	212R**	FREIGHT	
C-1	1	116	COMM	3RD TRICK
	2	115	COMM	
	3	713	FREIGHT	
	4	117	COMM	
	5	204	FREIGHT	
C-2	6	503T	LOCAL	
	7	X422	COAL	
	8	118	COMM	
	9	622	PASS	
	10	203	FREIGHT	
C-3	11	304	INTERM	
	12	504T (a)	LOCAL	
	13	407R	COAL	
C-4	14	504T (b)	LOCAL	
	15	653	PASS	
	16	BF4	FREIGHT	

The schedule change from regular to remote ops sessions. Under the regular schedule, in person operators worked a single Trick, Under remote ops, each Trick is broken down into 3 or small smaller sessions as noted by A-1, A-2, A-3, etc.

computer for an ops session.

Schedule Changes

The schedule I originally ran for in-person ops sessions had to change. I use ShipIt software to set up my car forwarding. ShipIt depends on cars moving from one train to another in order to get to their final destination. Keeping my freight trains in sequence would avoid having to invent a new operating format. Instead of time-based operations I switched to sequential operations. This meant that when one train was finished, the operator would operate the next train on his or her assignment list. This helped spread out traffic, which was critical to the success of remote operations.

Two of the four computers used for remote operations sessions are ready to join Zoom for an upcoming ops session.

I cancelled all extra trains, since they were not critical to daily operations. I also dispersed the local trains so that only one local operated during certain sessions. Freights that interchanged with the main yard were also limited to one or two per session. Each session, which normally saw 12 to 16 trains running, was broken down into smaller sub-sessions of four or five trains. Passenger trains were redistributed throughout all the sessions regardless of schedule, since we were no longer dependent on time-based operations. This allowed me to fill each sub-session with one or two passenger trains to keep remote operating interest up, while allowing me the ability to interact with the freight trains in the yard or the local on the main line.

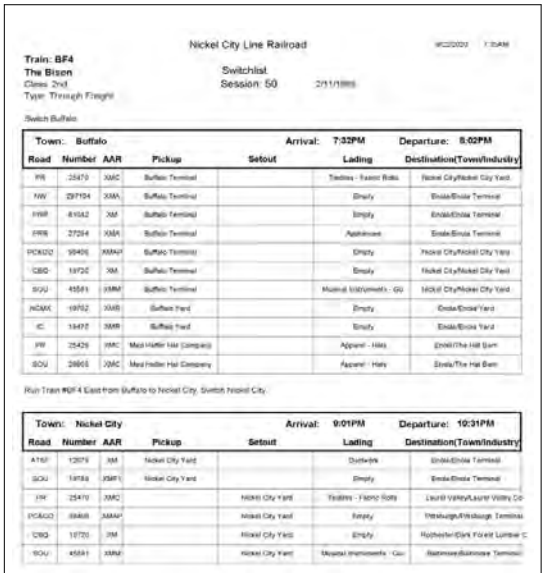
In the main yard, car pickups were pre-staged in advance to minimize switching time. In between sessions, any cars set out in the yard were relocated and blocked for the next session. I discontinued the use of Track Warrants in dark territory in order to simplify operations and keep the sessions moving on schedule.

Because everyone was remote, I prepared a number of documents to serve as visual aids. I created a camera diagram which showed the camera locations and areas covered for each computer. I also provide a Dispatch Screen sequence handout which shows when each of the 6 scenes from the Dispatch Screen is displayed. I send out the switch lists and train line up sheets to all the operators along with train routing diagrams for each train. These aid the Dispatcher and operators so they know the expected route of travel for each train. Of course, the Dispatcher can re-route trains as conditions permit, but having a guide handy that tells you the route you should travel goes a long way towards keeping everyone comfortable during a remote session.

The Remote Ops Sessions

During remote sessions, the emphasis is to have fun. Everyone takes their time and completes whatever they can get done in the time allotted. I usually schedule two sessions a week over a three week period and then take a week off to do maintenance. I schedule a daytime and an evening session so everyone has an opportunity to operate based on their work or home schedule. I add a Saturday morning session here and there as well.

Some of the paperwork sent out to operators in advance to aid them during remote operations:



Nickel City Line Railroad

Train: BF4
The Bison
Class: 2nd
Type: Through Freight

Switchlist
Session: 50

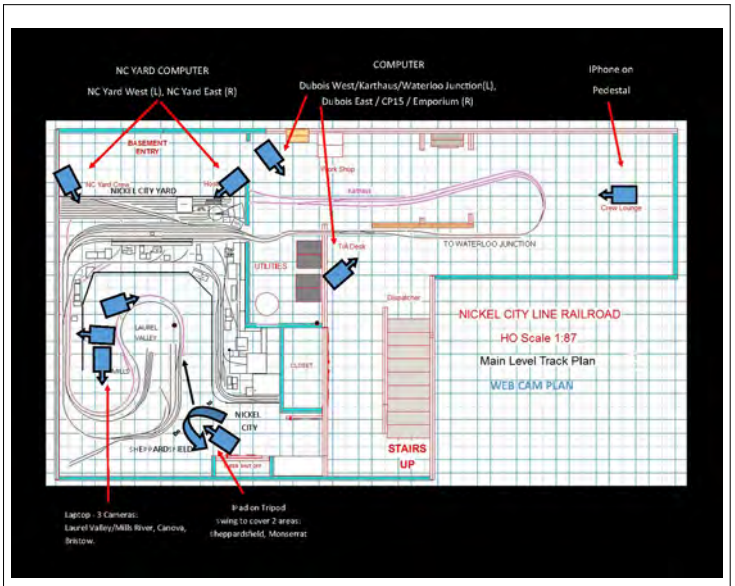
Switch Buffalo

Town: Buffalo					Arrival: 7:32PM	Departure: 8:02PM
Road	Number	AAR	Pickup	Setout	Lading	Destination(Town/Industry)
PR	25470	XMC	Buffalo Terminal		Trailers - Fiberglass Rolls	Nickel City/Nickel City Yard
NW	297104	XMA	Buffalo Terminal		Empty	Enola/Enola Terminal
HWR	81082	XM	Buffalo Terminal		Empty	Enola/Enola Terminal
PRR	27204	XMA	Buffalo Terminal		Appliances	Enola/Enola Terminal
PCKCO	99406	XMAP	Buffalo Terminal		Empty	Nickel City/Nickel City Yard
CBQ	19720	XM	Buffalo Terminal		Empty	Nickel City/Nickel City Yard
SOU	45581	XMM	Buffalo Terminal		Musical Instruments - Gui	Nickel City/Nickel City Yard
NOAX	19752	XMB	Buffalo Yard		Empty	Enola/Enola Yard
IC	19472	XMR	Buffalo Yard		Empty	Enola/Enola Yard
PR	25429	XMC	Mad Hatter Hat Company		Apparel - Hats	Enola/The Hat Barn
SOU	28865	XMC	Mad Hatter Hat Company		Apparel - Hats	Enola/The Hat Barn

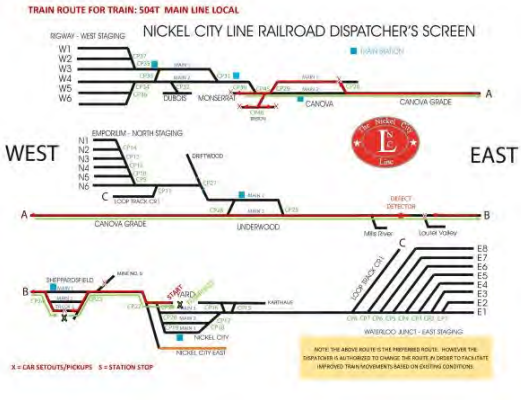
Run Train #BF4 East from Buffalo to Nickel City. Switch Nickel City.

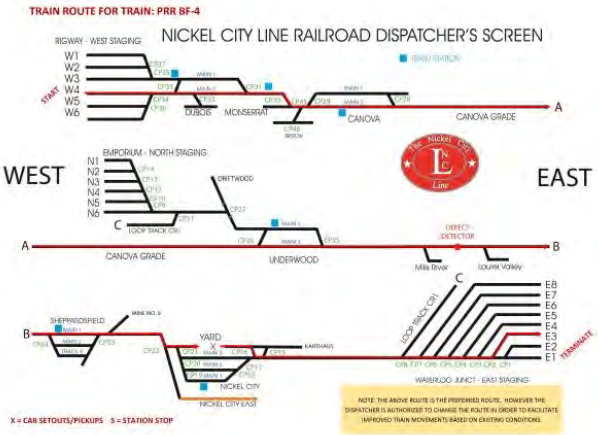
Town: Nickel City					Arrival: 9:01PM	Departure: 10:31PM
Road	Number	AAR	Pickup	Setout	Lading	Destination(Town/Industry)
ATSF	12075	XM	Nickel City Yard		Outbrake	Enola/Enola Terminal
SOU	19788	XMFT	Nickel City Yard		Empty	Enola/Enola Terminal
PR	25470	XMC		Nickel City Yard	Trailers - Fiberglass Rolls	Laurel Valley/Laurel Valley Co
PCKCO	99406	XMAP		Nickel City Yard	Empty	Pittsburgh/Pittsburgh Terminal
CBQ	19720	XM		Nickel City Yard	Empty	Rochester/Dark Forest Lumber C
SOU	45581	XMM		Nickel City Yard	Musical Instruments - Gui	Baltimore/Baltimore Terminal

A switch list details work for each train during a session



A camera diagram helps operators orient themselves to what they see in each camera window.





Train Route Diagrams help guide operators through the layout when they look at the image of the dispatcher's screen remotely.

Operators can sign up for as many sessions as they want. I make sure those with limited availability get first choice on one session. I then work to get everyone else who is interested into at least one session each week. Because the remote ops session format is new to everyone, I decided to hold more sessions than I normally do in order for my operators to gain a higher comfort level. This has resulted improved sessions as we move forward.

Thirty minutes prior to the beginning of each remote ops session, I start up the computers, load OBS, Zoom, and configure the cameras. One computer serves as the Zoom host, and the others simply join the meeting. The host computer is the only computer that uses audio, which is connected to an FRS (Family Radio Service) radio with the VOX (voice operated switch) feature activated. The mic jack on the radio is connected to the computer speaker jack, and the radio speaker jack is connected to the mic jack on the computer. Because I am the only occupant in the layout room, the FRS radio is how I communicate with the remote crews and Dispatcher during the session.

About 15 minutes prior to the start of the session, the operators join the Zoom meeting. The Dispatcher also logs into the TeamViewer connection on the Dispatch Computer. The road crews set up their throttle apps and confirm they are connected to the JMRI software. If there are no issues, everyone has time to socialize a bit.

Once the session starts, operators mute their microphones and only unmute them when they need to transmit a message. As the host, I serve as the Traffic Supervisor of Operations or TSO. I also serve as the Yardmaster and road brakeman. With a properly adjusted schedule, I am able to perform all three roles with a minimum of effort. When the session ends, we have a short wrap-up before everyone signs off.

As the host, I put extra effort in the layout prep beyond what you normally would do for an in-person session.

- Clean and inspect the trackwork completely.
- Do a good look-over of all rolling stock and locomotives a few days beforehand.
- Run each train once or twice before the session to check for irregularities.

This extra prep work pays off when three trains are running remotely on the layout and I can stand back and watch the action while hearing the road crews communicate with the Dispatcher over the radio.

In one of my last sessions I stood and watched several times while opposing trains in the same town safely moved through switching interlocks from single track to double track locations without incident. I could tell the operators were focused on the camera feeds and well aware of their train speeds. It was a great feeling seeing the layout come to life while I was the only person physically present in the room. You can view a video of one of our recent remote ops sessions on YouTube at: https://www.youtube.com/watch?v=eVyo7J3XDy4

The Rails Ahead

So what lies ahead? More remote ops sessions and more people to train! So far I have had a guest operator from Indianapolis attend and operate remotely at one of my sessions. I now have three more operators on the east and west coasts who will be joining my regular operators for upcoming sessions.

I have a few more webcams to install. I am also working with several

A Raspberry Pi Zero W, camera, and power bank loaded onto an old Tyco passenger car chassis will serve as a wireless train cam for upcoming remote ops sessions. The car will receive a special 3D printed locomotive body which will blend in with the powered locomotives. The car will run on the head end of assigned trains and the image will be viewable on a web browser.

Raspberry Pi Zero W's and Raspberry Pi cameras to create some WiFi traincams. This will give the remote operators an in-cab view of their trains on a separate browser tab, which will add greatly to the remote operation experience. And as we begin to ease into Phase III of COVID-19 recovery, I will be adding one more person to the layout room to work the main yard as a brakeman. That will permit me to add a remote Yardmaster and remote Yard Engineer position to upcoming sessions for a total of six remote operators.

While COVID-19 has changed the way we do many things, it has created an opportunity for me to create a safe environment for my operators to continue to interact, operate on my layout, and enjoy the hobby until we can once again meet in-person. I am very grateful to each of these operators for their enthusiasm and friendship during this surreal event in our lifetime.

Return to Bill of Lading

Bob Rodriguez has been a model railroader for more than 40 years and has built several small and medium-size layouts, including assisting with construction of the Prince William County Model Railroad Club's layout formerly in Quantico, Virginia. Bob began operation sessions on his own Nickel City Line railroad in November 2002 and has hosted more than 100 sessions to date, introducing 80 model railroaders to operations on his railroad. He also operates with a round-robin group of model railroaders from Maryland and Virginia. You can view Bob's layout at: http://nclrr.potomac-nmra.org/.