Sound across the Railroad Wi-Fi Network

Back to Web Site

The WifiTrax concept will allow you to connect your entire model railroad to your home Wi-Fi network giving you a flexible and versatile method of control from almost any hand-held device or computer on your network. In our earlier WifiTrax Vision Documents we described our Wi-Fi Cab Control of locomotives and Wi-Fi control of other layout features such as Switches (points or turnouts), Signals, Lights and Power. These products are now in production and can be purchased from our website.

Read the first WifiTrax Vision Document here…

Read the Wi-Fi Layout Vision Document here…

Triple Aspect Sound

Now making the journey into a new dimension of model railroad realism, we bring sound to the Wi-Fi model railroad. WifiTrax is introducing a series of products that are sound capable and support a concept which we call *Triple Aspect Sound*.

Why do we call it triple aspect? Because our products – both hardware and software – allow you to add and experience sound from three aspects:

Operator Aspect

The operator holding a tablet or sitting at a desktop computer would like to experience sound as though driving a train, or standing in a signal tower. Operator aspect describes sound generated by the tablet or computer's loudspeaker so that the operator can hear the sound of the locomotive he or she is driving. The sound audible to the operator will be synchronized to the state of the train being driven. Wi-Fi control can achieve this as it has the bandwidth to allow the operator to be tightly coupled to the speed and status of the locomotive being controlled, thus allowing the tablet app to emit the same sounds as the locomotive as its speed and acceleration vary.

Loco Aspect

The locomotive will generate sound via speakers installed within it according to the noise you would expect from its diesel or steam engine, horn or whistle, wheels, brakes etc. Some of this is automatic, dependent on the locomotive's running state and some is manually initiated (such as the horn) by the operator via Wi-Fi control from the operator driving app such as Loco Operator.

Automatic sound generation is controlled by a sound schedule in the locomotive firmware that relates sounds to speed, acceleration etc. Sound schedules are factory installed and may be selected when tuning the locomotive – steam, diesel etc. The owner may also edit or create schedules of their own using our Sound Manager Windows Application.

Layout Aspect

Sound can also be generated from various static sources around the layout. For example, you might have locomotives that do not have sound modules installed – perhaps N Scale or larger scales or DC locomotives. You can still hear sound from them by routing the sound to static Wi-Fi based sound sources, connected to their own loudspeakers. As the DC loco moves from block to block, the sounds will migrate from one source to another. Alternatively, you might just send the sound to a single source hooked up to your own amplifier and speakers to give overall sound to the whole layout.

In another example, you might wish to have platform speakers with train announcements, noise from a factory or livestock in a farm!

Of course, Wi-Fi layout is completely compatible with traditional DCC that uses the NMRA standardized track signals. You can power our Wi-Fi Layout electronic modules from DCC track power, or separate DC or AC as described in the specification for each module. None of our modules care that there are DCC signals encoded in their power.

Wi-Fi Sound Components

In implementing our Triple Aspect Sound initiative, we need to develop quite an extensive set of components with hardware and firmware, make additions to our Loco Operator and Tower Operator Apps and also add a one new software application. The new application is called Sound Manager and can be installed on Windows Machines to allow you to develop your own sound bites and sound schedules, download them to your loco controllers or layout controllers and install them on your tablet or phone. You would also use a commonly available sound editor application to pre-edit your .WAV sound bites before using Sound Manager to organize them and download to your locos and Wi-Wi layout features.

Sound in Silicon

Many sound capable DCC decoders on the market today use a microcontroller, an audio DAC (Digital to Analog Converter) and amplifier. The microcontroller sends the digital audio to the DAC using a serial bus called the I2S bus. This keeps the microcontroller very busy.

Because our microcontroller is already busy handling Wi-Fi communication and controlling the locomotive speed, we have developed a specialized IC (Integrated Circuit) called our Audio Processor Chip. This IC handles all of the low-level tasks of playing the digital audio by getting the samples from FLASH memory and sending them to the DAC. WifiTrax owns the Silicon IP (Intellectual Property) that defines the gates, flip flops, memory etc. within our audio controller IC.

We actually use more than one version of this chip with similar designs in the silicon, but the one used in the locomotive controllers is very small – much smaller than a typical microcontroller – making it possible to keep the size of our harnessed controllers similar to our existing WMH-20 or even smaller.

By placing the low-level control of the sound in dedicated hardware like this, we can use the Wi-Fi microcontroller on our units to handle messaging between control apps and units to allow a tightly integrated experience.

Hardware Components

The hardware components are made up firstly of a set of modules that control locomotives with sound and light control included. These will be our WMH-40 series of harnessed loco controllers and WMR-30 series of Board-Replacement Controllers. The WMH-40 series will be small size controllers suitable for diesel or steam locos that are DCC ready – or that can be hot-wired using our flying lead harness. We expect to introduce more than one WMR-30 series board-replacement controller aimed at more geometries of existing locomotives. All modules will have built-in Capacitive Power Maintenance (similar to Keep-Alive[1] or Current-Keeper[2]) and, like our WMH-20 and WMR-10, feature supersonic motor control with back-emf closed-loop speed control.

Secondly, we will introduce a series of static sound sources that will have one or more outputs for loudspeakers and line outputs to connect to an external amplifier or sound mixer. These will be Wi-Fi controlled and under control of our Tower Operator App which will be enhanced to allow control of static sound sources. We expect such control to allow both one-time sounds – such as platform announcements, or schedule-based sound relating to information about the speed, positioning and state of locomotives.

Thirdly, we will add sound capability to some of our existing Wi-Fi Layout products – such as the WUFP-40 which will generate sound for the DC locomotive that it is controlling.

Lastly, we are introducing a group of "Train Set" products – intended mainly as starter sets suitable for N, HO and larger scale train-sets. These include control of switch machines and DC locomotives on separate blocks of track, and will also have loudspeakers and sound outputs.

When will Triple Aspect Sound be Available?

We already have proven the technology described above and have working prototypes. Now we must refine these into production units. We expect the first products to be announced in about a month or six weeks and to be available for you to hopefully by the end of the year.

Notes

1. Keep-alive is a trademark of TCS (Train Control Systems)
2. Current-Keeper is a trademark of SoundTraxx.