How Radio Helps the Lackawanna

End-to-end and train-to-wayside communications on through freights on 260 miles eliminates many stops

As an aid in reducing delays, and thus improving service to shippers, the Lackawanna has equipped freight locomotives and cabooses for end-to-end and train-to-wayside radio communication. This system is now in service on all through freight trains operated on 260 miles between Scranton, Pa., and East Buffalo, N.Y., wayside radio for communication with trains being in service at four intermediate offices—New Milford, Owego, Bath and B. & O. Jct.

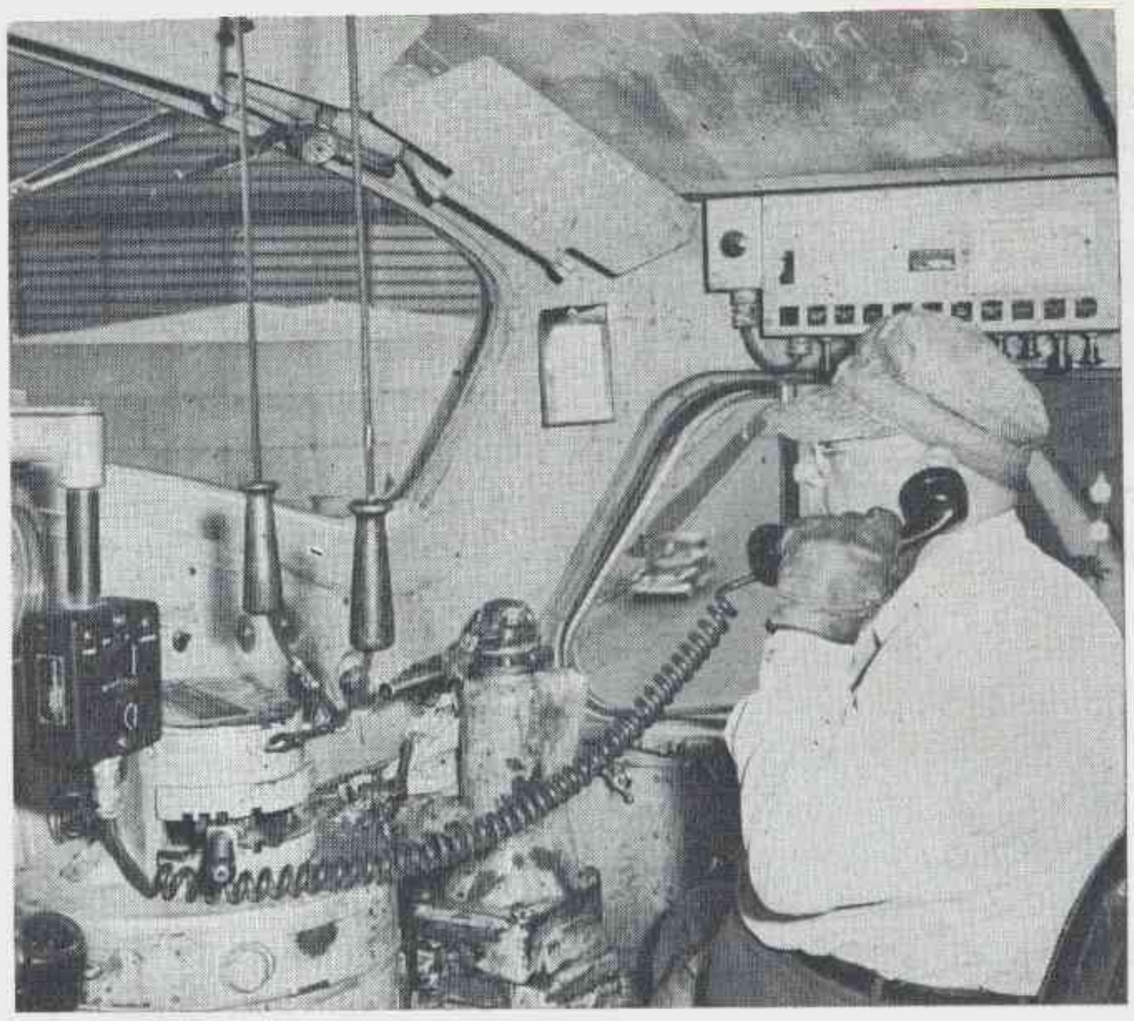
Twenty-eight diesel locomotives are regularly assigned for through freight service in this Scranton-Buffalo territory, on which about 24 to 26 through freight trains are operated daily. Each of these locomotives consist of one intermediate unit and two end units, each of which has a cab on one end. All cabs are equipped with 12-volt power supply, antenna and wiring for radio. The radio transmitter-receiver sets are the plug-in type which are easily transferred from one cab to the other.

Each such locomotive will haul a train of about 4,200 gross tons, either way between Scranton and Buffalo, without a helper on any of the grades. A grade of about 1 1/2 per cent ascends westward for about 7 miles from Scranton to Clarks Summit, then the grade descends westward at about 0.7 per cent for 7 miles to just east of Nicholson. Between Mount Morris and B & O Junction the grade ascends at about 0.65 per cent for about 12 miles. Eastwardly between Groveland and Wayland there is an ascending grade of 1.14 per cent for about 12 miles, and between Nicholson and Clarks Summit a grade of 0.68 per cent ascends for about 12 miles. These are the principal ruling grades.

On much of the remainder of this division the track is along streams or traverses rolling territory. Thus this division is considered a fast track, compared with the more mountainous territory east of Scranton. For ordinary freight, the maximum permissible speed is 50 mph, and the schedule time either way between Scranton and East Buffalo is 11 hours. Several manifest trains hauling perishables, merchandise, etc., are operated at 60 mph in each direction. Train No. 20, made up mostly of highway trucks on flat cars, and other high-class freight, makes the 260-mile run in 6 hours 15 minutes.

How Radio Saves Train Time

In addition to the through freights, a local freight and five passenger trains are operated each way daily, with an additional local passenger train between Scranton and Binghamton. Thus a total of 36 to 38 trains are operated daily on this double-track line. On the through freights, the locomotives, as well as the engine



ENGINEERS USE THEIR radio to talk with the . . .

CONDUCTORS in cabooses and . . .

OPERATORS at wayside offices.

and train crews, run from Scranton to East Buffalo, or return. These freights are given the "high iron." When they infringe on the "time" of important passenger trains, however, the freights must get out of the way, and in doing so, the end-to-end radio is a big help. For example, as the train pulls into a siding, the conductor uses the radio to keep the engineer informed as to what is required to get the rear of the train in the clear; "three more car lengths," "two more," "one more," and "O K." Likewise, when departing from a siding, the conductor can radio the engineer to tell him when the rear end is out on the main track so that the speed can then be increased to normal.

Where there is no siding, a freight must be backed through a hand-throw crossover to wait on the other main track while the passenger train of the same direction goes by. When making such a move, the conductor uses the radio to tell the engineer when the rear of the train has passed the crossover; and when the switches are thrown, ready for the train to be backed. This use of radio saves about 20 min compared with previous practice using hand signals and guessing.

When a passenger train in the opposite direction on the other main track is due to make a station stop, an approaching freight must not pass the station. By using the radio to learn of the progress of passenger trains, the freights can "lay back" and thus keep moving without a stop, which would cause extended delay at some places.

Previously when the conductor saw a hot box or dragging equipment on his train, he would try to use hand signals to tell the engineer to stop. Because of the curves and hills, the engineer would fail to see these hand signals and therefore the conductor was required to "pull the air" to stop the train. Too often this resulted in a "break-in-two" which caused damage and extended delay. Previously there was an avereage of 16 "break-in-two's" per month on this division. In a recent month, since the radio was in service, there was only one "break-in-two."

In one instance an operator in a wayside office saw a hot box on the fifth car from the rear end of a train. He used the radio to tell the conductor. The conductor radioed the engineer to slow down, and stop at a spur immediately ahead of the train. The conductor used the radio to spot the train and make the cut at the correct place, so that the car could be set out quickly and the train recoupled ready to go in a short time. All this was done in 20 min, thus saving 25 to 40 min switching time. Moreover, the train was stopped quickly and at a location where there was a sidetrack.

Three of the intermediate wayside radio stations are in offices where operators are on duty 24 hours every day; the fourth is manned sixteen hours. These operators use the radio and regular telephone lines to know when trains are approaching. Each operator watches every train as it passes, and if he sees a hot box or defective equipment, he uses the radio at once to tell the engineer and conductor so that the train can be stopped promptly for inspection. On a foggy day not long ago, an automobile was stalled on the track at a street crossing just east of Owego. Knowing that an eastbound freight was not far away, the operator used the radio to tell the engineer, and the train was stopped short of the crossing.

When a through freight is to set off or pick up cars at intermediate places, such as B & O Junction, the radio is used between the engineer, the conductor and the operator in the wayside office to exchange information, and thus expedite the work so that the train is again on its way 15 to 20 min sooner than otherwise possible.

At Gouldsboro the Lackawanna has a dock for icing refrigerator cars, which in many instances are scattered through the length of a train. Previously much time was lost in using the hand signals to spot each refrigerator car at the dock. Now, the dock foreman has a walkie-talkie radio to talk to the engineer, so cars can be spotted and iced quickly, saving 10 to 20 min in many instances.

Why Two Radio Channels?

All of the radio equipment on the trains or in the wayside offices can be operated on either of two channels. Ordinarily, channel No. 1 is used for communication between the locomotive and the caboose of a train, and channel No. 2 for conversation between wayside offices and either the caboose or engine of a passing train.

All of the radios normally are set to receive on channel No. 1. If channel No. 1 is busy and the conductor, engineer or wayside operator wants to talk to another party, he breaks in on channel No. 1 to say "Caboose 844 come in on channel 2." Thus when two trains are within range of each other, or within range of a wayside office, two conversations can be handled at once.

A further advantage of the two frequencies is that later, when radio is installed in the terminals, the second frequency can be used for the wayside and switch engines in the terminal area, and the road trains can switch over to the No. 2 channel to call the yardmaster when approaching the yard.

All of the radio equipment on the locomotive and on the cabooses is the same type, and is therefore readily interchangeable—which is important from a maintenance and operating standpoint. This radio equipment is the Bendix type MRT-6BD, including the transmitter, receiver and power supply as a complete unit, equipped with plug couplings so that a defective unit can be easily and quickly replaced.

This radio equipment operates on 12 volts direct current. On the locomotives this 12-volts d-c is fed from the d-c side of the motor-generator, the motor side being fed from the 64-volt engine starter battery. On each caboose there is a set of 9 cells of 260-ah Edison storage battery which supplies the 12-volt d-c for the radio.

This battery is charged by a rectifier and regulator which is fed from a Leece-Neville alternator connected by a Dayton belt drive to an axle pulley. This alternator is rated at 14 volts, 100 amp at 15 mph. In addition to the radio, the alternator and battery are connected to feed not only the radio but also several 12-volt electric lamps on the caboose.

History records that the Lackawanna installed and operated radio communication between moving trains and three wayside offices in 1913, which is claimed to be the first train radio. Two of the men responsible for this development were J. J. Graff, then telephone engineer of the Lackawanna, and a young telegrapher employed by the Marconi Company, David Sarnoff, now chairman of the board of RCA.