

Only McKeesport—Connellsville division is without CTC as P&LE puts QA—RK traffic control system into service.

P&LE Installs Multiple Track CTC

THE LATEST installation of CTC on the Pittsburgh & Lake Erie extends from West Aliquippa, about 20 miles west of Pittsburgh, to Wampum, a distance of 20.3 miles. Existing traffic control systems extend from Wampum to Youngstown, from Aliquippa to McKees Rocks (just west of Pittsburgh), and from McKeesport (just east of Pittsburgh) to Brownsville.

Through the area West Aliquippa to Wampum (QA to RK), the average daily traffic includes 18 passenger trains and 33 freight trains, and numerous yard movements. The B&O has trackage rights through this territory. Of the above trains, 10 passenger and 12 freights are operated by the B&O. Maximum authorized speeds are: freight 50 mph, and passenger, 70 mph. In addition, three yard engines work at QA and one at DF, and one serves both CO and PO. The heaviest traffic period is between 6 p.m. and 2 a.m.

Previously, the four-track mainline in this territory had unidirectional

Twenty miles of four-track mainline have been reduced to alternate sections of two and three tracks with the installation of CTC. Return to the railroad is 40 per cent annually on its investment.

automatic block signaling. The interlockings at CO and BG were mechanical plants and PO and QA were GRS model 2 electric plants. The two mechanical plants were becoming difficult to maintain and considerable expense would soon have been incurred to rehabilitate them. The plants at DF, EG and RP are new.

This CTC project allowed the retirement of 25 miles of main track, four crossovers and seven turnouts, and the conversion of 4.5 miles of main track to siding. Considerable ballast was reclaimed, and some of the rails and ties were used in Gateway yard at Youngstown.

The P&LE estimates a 40% annual return on its investment. Other benefits derived included the elimination

of the gauntlet tracks at the Ohio River bridge, and improved track alignment. Rock slides are a menace through a shelf-type cut east of PO and watchmen were stationed there. Here, two inner tracks were removed, providing a place other than the tracks for the rocks to fall. A series circuit slide fence with umbrella is being installed through the cut.

With the new signaling the mainline consists of alternate sections of two and three tracks. Both tracks of the two-track sections and the center track of the three-track sections are signaled for bidirectional operation. The outer tracks of the three-track sections are signaled for train movements in one direction only under automatic block system rules. All high

signals are the searchlight type of color light signal. Most of the turn-outs for main track movements are No. 20 or No. 16 equilaterals, so that a speed of 50 mph through switches is allowed. The switches are operated by US&S style M23A dual control 24-volt switch movements.

QA interlocking at West Aliquippa Yard is controlled by direct wire. The yard movements account for 65 of the 115 average daily movements through this 20-mile stretch. The remainder of the CTC system is controlled by two time code systems of the US&S 506-A type. The Ohio River Branch, diverging at DF, has two opposing home signals which are tied into the CTC system.

The type C 15-ft machine has controls for the traffic control system and an extensive interlocking at West Aliquippa. It has a model board of

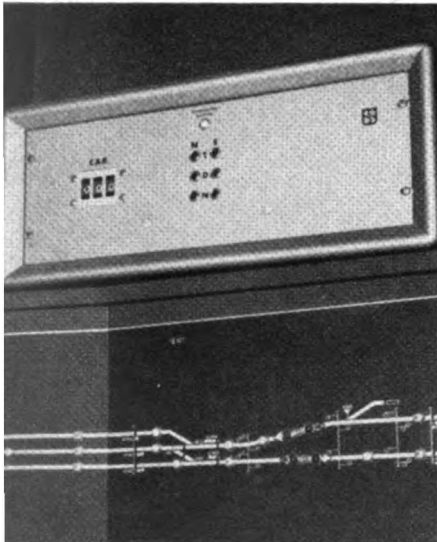
conventional style and a pengraph. The pengraph has three position pens, which when moved to the left position, indicate a home signal set up, and when moved to the right position indicate track occupied, with center position normal. Seven two-position pens are located on right side of pengraph for indicating traffic circuit direction; left position for east traffic and right position for west traffic. Traffic levers are provided to control traffic circuits for those tracks with bidirectional signaling. White approach lights and a single stroke bell are provided to indicate approach, and white lights with arrows engraved in the caps are provided to indicate route of train from RK. The interlocking at RK is controlled from a US&S 502 type "C" control machine using a 502 Time Code System, located at Gateway Yard, Youngstown.

Circuits are provided to allow an engine to return to its train against the current of traffic on single directional track. The operator first positions the appropriate signal lever. Then he pushes an auxiliary button labeled with the number of the track to be entered and the direction (i.e., "4E" or "1W" to allow a movement onto track 4 or 1, which is occupied). The operator then raises the appropriate call-on toggle and pushes the code start button. The white light with the engraved black arrow is illuminated at the exit point, and the train receives a "Restricting" indication.

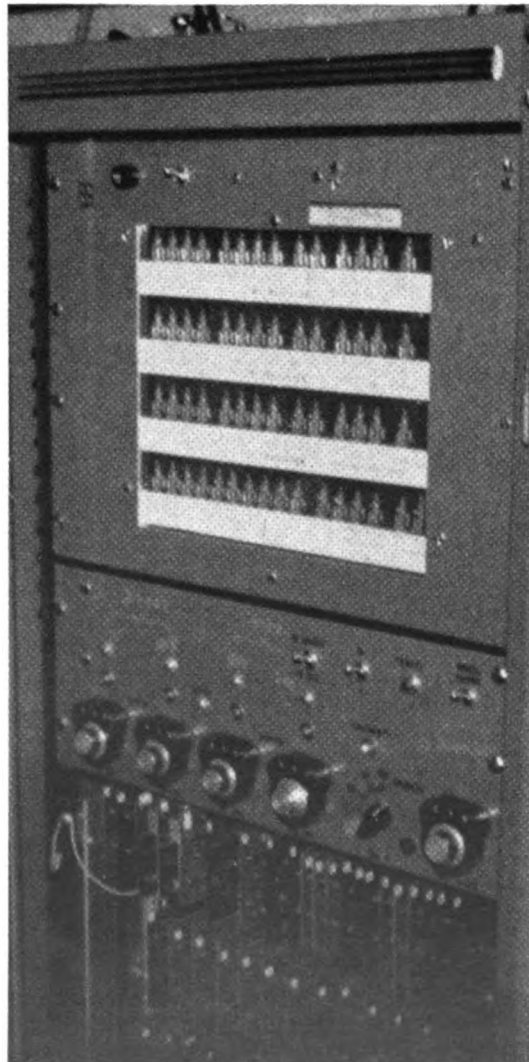
To gain entrance to the main track, in bidirectional territory, from an electrically locked hand-throw switch, the trainman requests permission from the operator. Upon receiving permission, he removes the padlock. The operator moves the appropriate lock lever to the Unlock Position and sends out the code. At the headblock locations for each traffic block, the traffic relays position to send out a track code, both directions toward the lock, allowing unlock to be effected. At the same time, the white lamp with the black engraved "U" is illuminated over the lever on the control machine.

Straight time locking is employed, with the time set as prescribed by AAR Signal Section standards. The minimum time before release is three minutes.

The reversible coded track circuit used on bidirectional tracks operate in this manner: Normally, steady energy is fed in the direction established by the traffic lever. When the operation to clear signal R70, in the example shown, is initiated, the steady energy is removed and coded energy at the rate of 180 pulses per minute is fed from PO toward DF, allowing the intermediate automatic signals to clear and become lighted and eventually resulting in the clearing of signal R70. When the train reaches the position shown, and it is desired to clear signal R70 for a following movement, 120 code, instead 180, is fed from signal 285 to R70. Although the same aspect is displayed on signal R70 with either code, the receipt of 180 code at DF would cause the single block occupancy light for this traffic block to be extinguished. Thus the 120 code allows the signal to be cleared while keeping the block occupied indication



The letters on the hotbox detector readout indicate: T, (high) Temperature (red light); D, Differential (amber); and N, Normal (green light normally on). A special toggle switch on the CTC machine controls a RED/LUNAR aspect on an appropriate signal.



The digital analyzers at the field location ignore a preset number of axles to eliminate the locomotive, and divides the remaining axles count by four to give the number of cars from the head end.

illuminated.

The controlled signals are continuously lighted while the automatic signals in traffic territory are lighted when code is received to clear a signal into the block. The automatic signals on the single direction tracks are lighted when the approach tracks are occupied. In the event of failure of the ac power, the controlled signals are approach lighted.

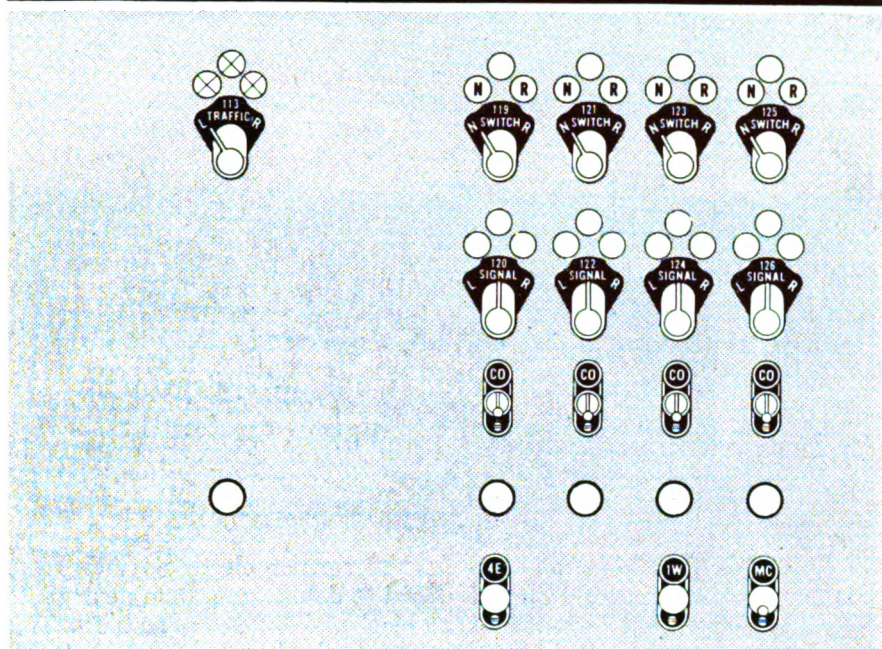
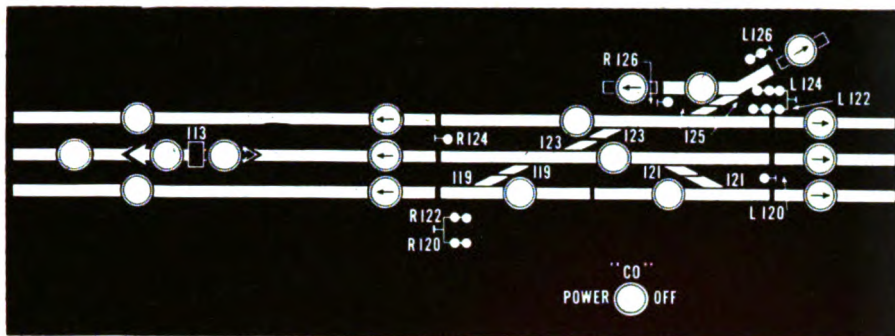
When operator lines a route and positions the signal lever, before pushing code starting button, he checks that his lineup is correct by means of an "Exit Light" located in the track model. This is a white lamp with an engraved black arrow indicating direction and point that train is to exit. The operator can then check himself before actually clearing signal and will not be delayed by waiting for time to run in the event a mistake was made.

Hotbox Detectors at EG

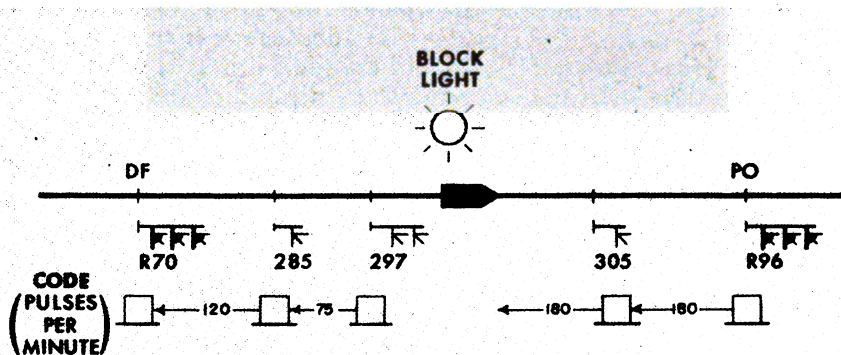
This installation utilizes Servo hot box detectors on both tracks for bi-directional operation. The detector for the proper direction of operation is determined by the position of repeater relays of the traffic relays for EG interlocking.

A digital analyzer supplied by Union Switch & Signal translates signals from the detector heads into a form suitable for transmission serially over time code system. In the field, an axle counter and three storages are provided for hot box data.

The information transmitted is: hot box, whether box is fixed amount hotter than other end of axle, location in train, side of train, additional information awaiting transmittal, and storage full and another hot box detected. The display at the office has three signal lights for each side of train, one for normal box, one for hot box, one for excessive differential. Another light signals additional information waiting. If detection occurs with storage full, this fact is reported with a red signal. Car location is displayed by digital indicators as number of cars from head end of train. As soon as noted, an indication is canceled by the operator and additional information, if any, automatically comes in. The information is available from 14 steps of an existing CTC indication system, and the office display panel is wired directly to the CTC indication storage relays.



P&LE indications are somewhat unusual: Power off, normal signal and switch locked ("hands off" light) indications are red; signal clear indications are amber; traffic indication on model board is blue, and all other indications are white. The route exit is indicated by a white light with a black engraved arrow, and it is illuminated as soon as the switch and signal levers are positioned. Normal and reverse switch indications are white with the black characters "N" or "R" engraved. Lock indications are white with a black "L" or "U" engraved.



120 code allows signal R70 to clear but keeps block light illuminated.

As soon as information appears in the first storage, the CTC start circuit is energized to transmit information when line time is available. The analyzer is circuited to permit direct connection to a standard time code CTC system for transmitting field indications. The time code system is

wired so all 14 steps are transmitted at one time.

The signal system design and installation was under the direction of J. J. Eash, Signal Engineer, recently appointed Assistant Chief Engineer. The signal apparatus was supplied by Union Switch & Signal.