

**A REVIEW OF THE RAIL TRAFFIC  
CONTROL PROJECT  
CN  
SIGNALS AND COMMUNICATIONS**

**1. INTRODUCTION**

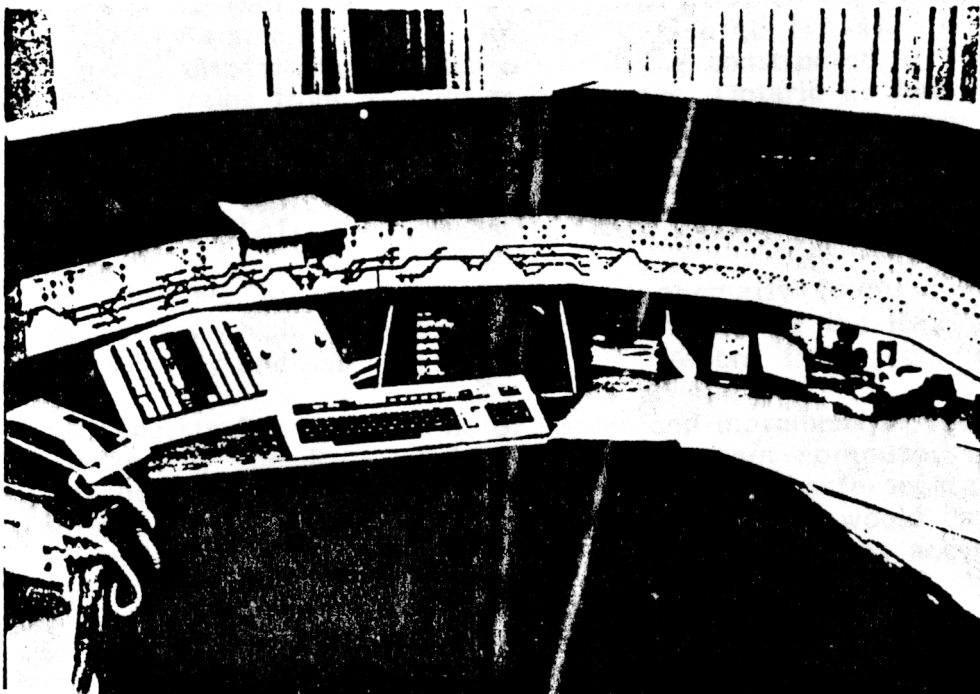
Several methods are currently used by the railroad to ensure safe operation of trains. In areas where there is a large number of trains on a particular section of track each day, an electrical system known as Centralized Traffic Control operates signals which provide for safe operation of trains.

Associated with Centralized Traffic Control is the idea of signals and switches being controlled from a central location by a person known as the "dispatcher". A typical dispatcher might control trains over two subdivisions with a total track length of about 300 miles.

**2. THE RAIL TRAFFIC CONTROL SYSTEM**

The Rail Traffic Control System is a state-of-the-art computer controlled dispatching console designed and built by C.N. The system features a console which places control of all the field signals at the dispatcher's fingertips.

The console also makes it easy to interpret the status of the track at a glance. The track is represented by a continuous line of 3-colour bars layed out to represent the actual track configuration being controlled. All trains on the dispatcher's section of track are identified by their lead engine number, their track occupancy, and by green track bars which indicate the extent to which the train is authorized to proceed by the signals.



In addition, the dispatcher has all the capability of a standard train control console such as switch position indication, indication of track protected by blocking authority, etc.

### **3. HISTORY**

The Rail Traffic Control Project had its origins in 1974 when a group of officers at C.N. was formed to investigate the required form and function of future dispatching consoles. At this time, the Centralized Traffic Control System at trackside was controlled by a variety of dispatching consoles produced by two suppliers, US&S and GRS. Because an increase in the railway traffic in the coming decade was foreseen, it was felt that there was an opportunity to define a "standard" dispatching system which would be used across the system whenever a dispatching office was created or rebuilt. In late 1975, the committee published a specification which became the basis of the current system.

From the earliest discussions, it became evident that the Rail Traffic Control System bore little similarity to the systems offered by the conventional Signal System suppliers. After the conventional suppliers declined to quote on the new design, it was decided to build the Rail Traffic Control System "in-house".

Design of the system began in 1976 on a tight schedule which called for the first phases of the project to be in service in the Spring of 1978 on our Sprague and Fort Frances Subdivisions dispatched from Winnipeg.

After completion of the Winnipeg system, a task force was formed in 1979 to evaluate the existing state of train dispatching in North America. After visiting 6 American cities and conferring with representatives of 15 signal companies, it was decided to implement the Rail Traffic Control System across Canada.

Presently, there are Rail Traffic Control Systems installed in dispatching offices at Edmonton (1982), Kamloops (1983), and Prince George (1984). A large system composed of 15 dispatching consoles is now being constructed in Toronto and will begin controlling trains from Toronto to Armstrong, Ontario in June of 1986. The Toronto system will control all Centralized Traffic Control territory in Ontario by the end of the decade.

### **4. FEATURES OF RAIL TRAFFIC CONTROL SYSTEM**

There are a number of unique features not normally found on conventional dispatching systems which allow dispatching personnel using the Rail Traffic Control System to efficiently and safely dispatch trains. Among these features are:

All requests for the clearing of signals and movement of switches are first checked by the Rail Traffic Control System computers to determine whether they violate the rules regarding the safe separation of trains. Even if the dispatcher should request signals which would cause two trains to collide with one another, the computers would not accept the request and would warn the dispatcher that his request was illegal.

The tests that the Rail Traffic Control System computers perform are also performed again by the trackside relays which comprise the Centralized Traffic Control System.

2. When a train moves into a track where it is not protected by Centralized Traffic Control circuits (such as a siding), the Rail Traffic Control System simulates track occupancy and disallows requests to clear trains into the unsignalled track.
3. All track occupancies are checked when they first occur to determine whether they involve a train which has moved without being authorized by a signal. If it appears that this is true, then the dispatcher is alerted by a buzzer and a written message.

This checking (known as the 292 alarm) is present in the Kamloops dispatching office which controls trains on the B.C. South Line. It is currently being installed in the Edmonton dispatching office.

4. All requests for switch movement are checked for completion before the associated signal is requested. This protects against the very unlikely occurrence of a relay failure causing a route to be lined into an unsignalled siding (the protection does not exist in conventional consoles).

Even if the "misroute" described above occurs, the situation is covered by the Uniform Code of Operating Rules.

5. The manner in which trackside maintenance forces, work trains, etc., are protected by the computer system is to obtain authorization from the dispatcher to work on a section of track. The maintenance crew at trackside must request (by radio) that the dispatcher issue them with a "BLOCKING FORM".

The dispatcher first requests the blocking form from the Rail Traffic Control System computer. By pressing the pushbuttons that limit the area where the authority is required, this will cause a block form to appear which has the limits of the authority already filled in by the computer. Since the form is read over the radio to the maintenance foreman who then repeats it, any misunderstanding or misinterpretation of the authority limits is avoided. The Rail Traffic Control System prevents any signals being requested into the track area specified when the dispatcher first enters the limits of the authority being requested.

## 5. PAPERWORK FUNCTIONS

The dispatcher has many "bookkeeping" duties that he must perform each day. These duties are being automated by the Rail Traffic Control System as the system continues to evolve.

A considerable portion of the dispatcher's time is presently taken up maintaining the "trainsheet" - a record of each train currently controlled by the dispatcher. The "trainsheet" contains such information as the names of the crew members, number of units, etc. An enhancement to the Winnipeg installation enables Transportation department operators to enter trainsheet data directly into the Rail Traffic Control System computer without the dispatcher being involved as he was previously. The time saved is substantial and allows the dispatcher more time to monitor trains.

Future enhancements involve a computer generated "line-up" and computer delivered train orders.

## **6. LINING ROUTES**

The RTC console use an Entrance/Exit procedure when lining routes and as a result interlocking checks are performed twice. Once when the dispatcher selects an entrance point in order to provide an indication of available routes and again when he indicates the desired route through selection of an exit point. The set of interlocking checks performed are identical for both functions.

The checks performed are as follows:

- a. no conflicting routes are established;
- b. no train movements are occupying any part of the route;
- c. no switches involved in the route are out of correspondence with the request;
- d. no blocking form is in effect or is being setup within the limits of the route.

## **7. ANTI-MISROUTE**

To increase the level of integrity of data sent to the field and avoid the inadvertent lining of a route different than intended, the control machine checks the position of all switches involved in the route. This anti-misroute check is performed when the route is requested prior to permitting signal control data to be passed to the equipment which transmits the control data to the field circuitry. If any switch is not in correspondence, the control logic will block the signal controls from being sent to the field. The signal controls will remain blocked until either the dispatcher cancels the route or switch correspondence is attained. If the switches are in correspondence, the signal control data will be immediately transmitted to the field.