Merging divisions require changing circuits

Consolidation of railway operating divisions involves more than a paperwork shuffle. One of the key aspects of such a move is the consolidation of dispatchers' positions. From a communications standpoint, circuit changes are necessary. What must be done is explained by E. P. Mailloux, telephone engineer, Missouri Pacific. Such dispatcher position consolidations may also involve moving CTC machines. How this was done on the St. Louis-San Francisco is described by that road's assistant to general superintendent communications and signals, J. S. Downs. The material presented is abstracted from talks made to sectional meetings of the Communication and Signal Section, AAR.

Centralization of dispatchers' positions

By E. P. Mailloux

When train dispatchers are centralized, communications must also be centralized. From a communications view point, the following must be considered: (1) Voice communications from the dispatcher. (2) Ringing or signaling of waystations by the dispatcher. (3) Telegraph circuits. (4) The effect on other communications circuits by the concentration of other personnel such as car distributors, etc., when dispatchers are moved into a central point.

In order to provide satisfactory voice communications for dispatchers, Missouri Pacific has chosen certain minimum standard transmission requirements. The transmission requirements for such lines have been set up by the Communications Section, AAR. These standards, for the transmission performance of a *good* dispatcher telephone circuit, are as follows:

"High ambient noise levels encountered at waystations and some dispatching centers make it desirable to provide an over-all volume level considerably better than that of commercial telephone circuits. It is also desirable to maintain a reasonably constant volume level at the dispatching point regardless of whether the waystation is at the near or far end of the circuit. Transmission performance requirements must also recognize that these circuits involve public safety and property liability, which factors stress the desirability of providing a low transmission equivalent. Considering all factors, the following transmission limits are suggested as a basis for satisfactory performance: (1) Circuit equivalent between dispatcher and any waystation not to exceed 12 db. (2) Circuit equivalent between any two waystations not to exceed 20 db. (3) Level difference at the dispatching point as between any two waystations not to exceed 6 db. (4) Noise levels and frequency response to be in accordance with standard limits for commercial circuits."

The choice of 20 db as the loss for waystation to waystation transmission is considered adequate in preventing other waystations breaking in during conversations with the dispatcher. It is recognized that a somewhat lower limit is helpful. Any increase in this figure specified will increase the difficulty of the operation.

The main problem is how to meet these requirements. Although several approaches are used, the one most commonly used on the MP is

Frisco centralizes its train dispatching

By J. S. Downs

On March 16, 1965, centralization of the entire train dispatching operations at Springfield, Mo., was completed on the St. Louis-San Francisco. This involved moving CTC machines and dispatchers from Ft. Scott, Kan., Tulsa, Okla., Chaffee, Mo., Amory, Miss., and relocating existing machines at Springfield. All dispatching is now handled from the general office.

In connection with the CTC portion of this consolidation, three major problems were encountered: (1) How to extend CTC voice, control and indication circuits. (2) How to handle traffic while the machines were in transit. (3) What method of transportation to use in moving the machines.

In regard to the first problem, extension of CTC control and indication circuits on one section was accomplished by installing CTC carrier on an existing CTC code line. This required two terminals and three repeaters plus an auxiliary line unit. This equipment was installed in full standby with necessary equipment to provide transfer control. All other circuits were extended to Springfield via Telpak. These circuits were ordered as full duplex printer circuits and delivered as 62 ma receive loops and 62 ma send loops. These loops must appear to the Bell System as closed loops in the idle condition. The railroad provides a 20-ohm KP biased relay in the receive circuit and a reverse contact of a 1070 ohm KP relay in the send circuit.

requires that communications be centralized

to "reach out" to a distant point from the dispatcher with a carrier circuit. A favorable point is one where lines bridge together, in order to take advantage of combination amplifier-voice repeaters and branching networks connected to the drop of the carrier. If this point is ideally located, many times this arrangement will meet transmission requirements to the dispatcher without any additional voice repeaters on the line. Generally, four branch networks are used, which will permit the connection of up to three lines at this distant or remote point. More lines may be connected at this point by using other networks.

MP experience has been that with *voice* controlled amplifier repeaters and branching networks, up to 15 db gain can be realized on each line coming into this remote point. Therefore, a total loss up to 17 db can be realized from this point to the most distant waystation. This is based on a net loss carrier circuit of 4 db, an incoming amplifier gain of 15 db and a minimum level at the dispatcher point of minus 6 db.

This arrangement is remarkably simple and meets the railroad's requirements on several territories. In addition to providing gain to the carrier drop toward the dispatcher, as mentioned previously, it provides up to 15 db gain *between* each line connected at this point.

If conventional amplifier repeaters are used, rather than voice controlled, then the maximum usable gain is governed strictly by line impedance variations. With conventional subsets on and off the line, as with dispatcher circuits, the maximum gain that can be realized is usually about 5 db.

At the dispatch point, where several physical lines or carrier drops are to be used by the dispatcher, a similar method of connection is used, as previously mentioned. The only difference here is that the amplifiers and branching network are used to prevent bridging loss and the amplifiers are set to provide the necessary gain *only* to satisfy the requirements for levels from one line to each of the others. A three position switch is installed on each line, which enables the dispatcher to keep all lines on his main amplifier which enables him to talk and listen to all lines simultaneously. A flip of a switch will remove any one line from his main amplifier and automatically place this line on a monitor amplifier. This permits lines to be cut out of the network which are being used for other purposes in which the dispatcher is not interested. The third position on each line switch cuts the line from both the main amplifier and the monitor amplifier. This permits the dispatcher to cut out a completely bad order line or remove one temporarily that has a high noise level.

Both the dispatcher's main amplifier and monitor amplifier are of the limiter type, which have a constant output within 4 db with an input of minus 0 db to minus 35 db. These amplifiers help meet the transmission requirements mentioned earlier and contribute to maintaining them during adverse conditions.

Signaling or ringing from this centralized dispatch point must be provided. Usually, when the conditions are met, which give the desired voice circuits, the signaling of the waystations present only a minor problem.

Missouri Pacific provides the dispatcher with a telegraph wire over as much of his territory as feasible. Due to the very nature of telegraph circuits, they also present very few problems as far as centralization of dispatchers is concerned.

And last, but very important, as dispatchers are centralized, is the centralization of personnel, such as car distributor, etc. This concentrates the need for communications at this central point. **RS&C**

operations at the general office in Springfield, Mo.

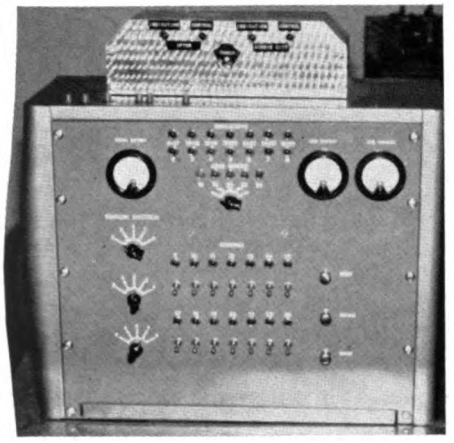
It has been necessary to provide 100% railroad back up circuits for these Bell Telpak circuits because of the several failures of long duration, which have been encountered. The railroad circuits used for emergency backup are existing speech plus circuits and bridge duplex circuits.

A test bay is provided in the wire chief's office at each location with necessary patching jacks and meters to monitor control and indication currents on each circuit. These test bays serve also as a demarcation point for determining whether trouble on a circuit is on the railroad or on Bell System. Code line voice circuits are brought to the test bay to facilitate testing. Code line voice circuits are ordered as 4-wire Telpak circuits and are delivered to the railroad at a minus 10 dbm on the 4-wire receive side. StL-SF delivers to Bell at 0 dbm at the 4-wire send side. Railroad owned 4-wire nets and 4-wire hybrids are supplied to couple the Telpak circuits to the 2-wire code lines. The level stability of some of these Telpak 4-wire circuits has not been good. Excursions of 6 db have been encountered which makes it difficult to maintain stability in the 4-wire hybrids. In connection with the test bays, detained test and patching instructions are furnished to those involved in the restoration of service.

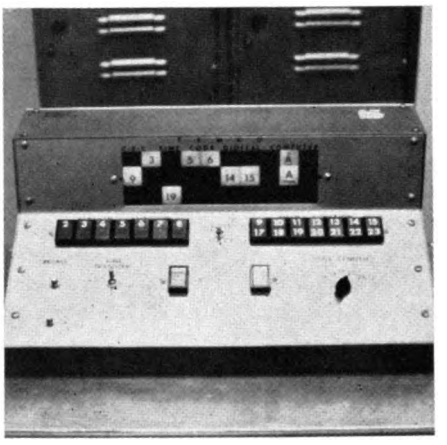
The second problem—handling traffic—was solved by the development of two emergency test machines by communications and signal shop supervisor T. E. Major, and his forces.

Indication lights are controlled through stick relays which pick up on each long indication step. Indication lights were added to detect the long steps in the station selection portion of the code. This is required so that the code ending switch can be properly set to enable the code to complete when used on type 514 equipped line sections. A cancel pushbutton drops the stick relay so that the next indication can be observed. The first machine contained a built in code line rectifier and a DC power supply. This machine could be used in event of an emergency at any location where AC power is available. It will handle two lines, selection of the line being through a toggle switch. Distinction in circuitry between a DC or Carrier line section is accomp-

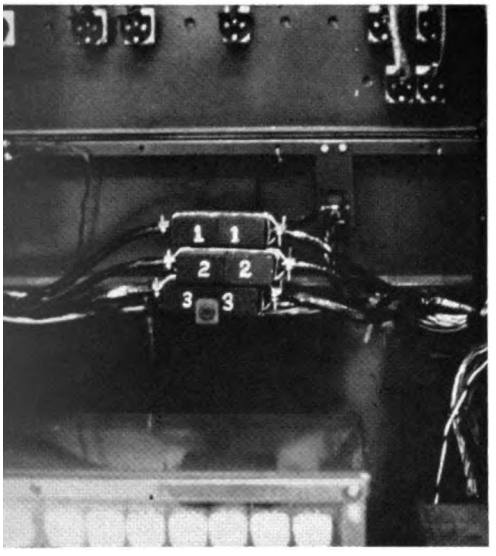
TEST UNITS USED WHEN MOVING CTC MACHINES



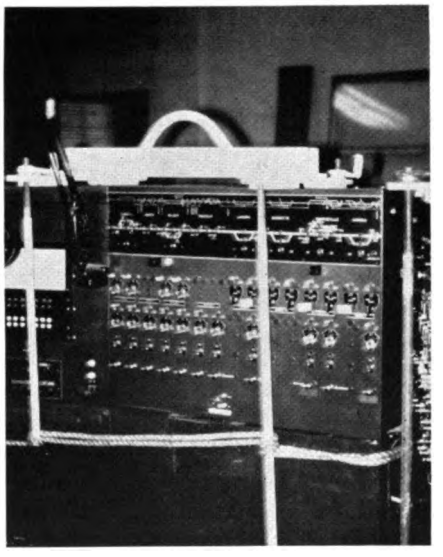
EMERGENCY TEST MACHINE, handling traffic while CTC machines were in transit, has built-in code line rectifier.



SECOND TEST UNIT has pushbuttons instead of toggle switches for setting up and transmitting code controls.



PLUG CONNECTORS were installed at old and new locations on all communications and signal wires connected to machine.



CTC MACHINE STRAPPED and in hold-down rig is ready for moving. Experience showed 5-ft sections were best to move.

lished through the use of a plug connector.

The second machine designed used pushbuttons instead of toggle switches, illuminated number display and did not contain a code line rectifier or DC power supply. This machine also operates on one of two lines. In general, two lines are all that an operator can handle. A two-position transfer switch converts this machine from DC to carrier. This machine is equipped with Start, Cancel, Recall and Indication Elimination pushbuttons. This last pushbutton allows indications to be held out when it is desired to set up and transmit a control at the same time indications are attempting to register. This pushbutton machine is much easier and faster to operate than the first machine.

The third problem—transportation—was resolved by deciding to use trucks in lieu of passenger trains or airplanes. A railroad owned flatbed truck was used to move the CTC machines with a rental truck trailing as backup. The rental truck also hauled the dispatcher's furniture from the office. Insurance was not taken out on the first moves, however, the last two moves were insured. Distances varied from 124 to 400 miles for these various moves.

Preparation for these moves consisted of the following: (1) Cinch Jones type 300 series plug connectors were installed at the old and new locations on all communication and signal wires that connected to the machine.

(2) Plug connectors were installed between the cabinet sections that were to be separated. Although a 7.5 ft cabinet section was handled, it was found best to hold this length to 5 ft.

(3) Machine wiring changes required to convert from direct connection to carrier or Telpak were made prior to the move and temporary interface relays were installed. This saved time later and proved out the machine wiring changes.

(4) Ramps and scaffolds were installed at the old and new locations as required to facilitate loading and unloading the machines.

(5) A few days prior to the move, the emergency machine was set up at the new location, the machine was cut off at the old location and a thorough test of controls and indications was made to check out wiring and circuits. Control was then restored to the machine.

(6) Also, a few days prior to the move, the pengraph, shelf, top and base were removed and cabinet mechanical separations were made. The cabinet sections were placed on dollys.

(7) At the time of the actual move, the emergency test machines were set up at the new location next to temporary dispatcher's tables. The dispatchers made their transfers, and control of CTC was transferred to the emergency test machines. A small metal track diagram was marked with small magnets to show location of trains.

(8) Machines were unplugged, covered with motor car tarpaulins and strapped to a dolly with the lifting rig, rolled and hoisted to the truck where they were padded and tied down for the trip. Unhooking and loading took from 30 min to 1 hr depending on the number of sections involved.

(9) The operators at the emergency machines watched the received indications and compared these with the code assignment sheet. The particular station and position of field functions can thus be determined and related to the dispatcher. The dispatcher tells the test machine operator what lineups he desires. By using the recall button lost trains can easily be found by polling suspected locations. **RS&C**