

Train Operations When CTC Fails

If the CTC code fails, how do you operate trains, i.e., authorize train movements, until centralized traffic control is restored?

Timetable and Manual Block System Rules

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On the Chesapeake district of the C&O, Rules 271-280 (rules governing movements of trains in either direction on one or more tracks by block signals) may be suspended after proper understanding between the chief dispatcher and the signal supervisor, and upon authority of the superintendent by issuing a "31" order.

The "31" order, suspending Rules 271-280, is issued to each train or engine that may be within the track section where the rules are suspended, and to any train before it is permitted to enter such track section. When Rules 271-280 are suspended, trains will be governed by timetable train rules and manual block system rules.

When Rules 271-280 are to be again restored a "31" train order is issued to all trains which are within or may be within the track section at the time the rules are restored. The train order restoring Rules 271-280 is not issued until the chief train dispatcher and the signal supervisor have a proper understanding that the signals and signaling equipment have been restored to proper operating condition, and as to the time the rules are to be made effective.

When Rules 271-280 are suspended, all dual control switches are hand operated. Electrically-locked, hand-operated switches are equipped with a release which may be operated with a switch key to unlock the electric lock.

Dispatcher's Permission and APB Signaling

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Our Rule 676 reads as follows:

"On portions of the railroad specified by special instructions, trains are operated in both directions under a centralized traffic control system. This includes interlockings at the ends of passing sidings, ends

of double track, railroad crossings and junctions, together with automatic and semi-automatic block signals, the indications of which supersede the superiority of trains for both opposing and following movements. Rules 261 to 264, 505 to 519, and 605 to 633 inclusive, govern."

Rules 261 to 264 provide for signals that supersede time table superiority. Rules 505 to 519 are automatic block system rules. On single track we use APB circuits between remotely controlled interlockings, at ends of passing sidings, etc. Rules 605 to 633 are interlocking rules. Our controlled switches in CTC territory are electric with the dual control feature.

If the CTC code line fails, trains on line of road will find interlocked signals at Stop. Rules require them to 'phone the dispatcher for permission to proceed. All power switches are required to be placed on hand-throw operation before movement, and restored to power after movement. Trains then proceed on APB intermediate signals to next interlocked location where same procedure is followed.

If CTC code and dispatcher's 'phone both fail, and there is no other means of communication, train may proceed after waiting 10 min., preceded by flagman to next point of communication, or to next automatic signal indicating more favorable than Stop and Proceed, again observing dual-control rule.

If CTC code, communications and signals all fail, trains may only operate when preceded by flagman.

The above rules are to keep traffic moving, as well as possible, during emergencies of short duration. For longer periods, if traffic warrants, it becomes necessary to annul CTC, and revert to superiority of trains, and operate by one or more of the following in the order listed: (1) time table, (2) train orders, (3) manual or automatic block rules.

Use Manual Block or Train Order System

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When a centralized traffic control installation is placed in service, it becomes exceedingly important that the CTC function with the greatest possible degree of reliability be-

cause the entire operation of the railroad in that territory is then dependent upon CTC. Any failure of the coded control circuit constitutes a major interruption to train operation and, therefore, the apparatus, line wire, and other essential parts of this circuit should be so constructed and maintained that this circuit is the most reliable one on the railroad. With this in view, stand-by service is provided for power sources and electronic equipment; and very substantial construction is used for the coded control line circuit which is generally composed of No. 6 AWG Copperweld line wire, on the Santa Fe, with the best available type of weatherproof insulation.

If in spite of the above precautions, an unusually bad storm or some other condition requires the temporary suspension of the CTC system from service, the electric lamp bulbs are removed from all signals, all switches are changed to hand operation. Then a manual block system is set up if conditions are such that open offices can be provided at suitable locations. If for some reason this cannot be done, then trains must be operated under the train order system. Meanwhile, every effort is made to restore the CTC to normal functioning with the least possible delay.

ABS Rules Apply

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We have operating rules and instructions to cover such conditions when the signal system is interrupted because of a failure, and it is not to be out of service for any length of time. Our operating rules provide under Rule 350 (ABS rules) as follows:

Stop indication per Rule 292—

"When a train or engine is stopped by a Stop indication, and such indication does not change promptly to a more favorable indication:

(1) Communicate with train dispatcher or control operator if means of communication is available.

(2) Train or engine may proceed at low speed to the next 'Clear,' 'Approach-Medium,' or 'Approach' signal, upon verbal advice from train dispatcher or control operator in words: 'There is no opposing train in the block.'

(3) Train or engine may proceed only under flag protection to the next 'Clear,' 'Approach-Medium,' or 'Approach' signal when there is lack

of communication, or upon verbal advice from train dispatcher or control operator in words: 'Proceed under flag protection.' These words must be used when train dispatcher or control operator does not know that there is any opposing movement involved.

"The procedure under (1), (2) and (3) must be repeated at each Stop indication. When the signal in advance can be seen to be a 'Clear,' 'Approach-Medium,' or 'Approach' signal, and track can be seen to be clear to such signal, train or engine may pick up flagman and proceed at low speed to such signal."

Exception to Rule 350:

"Communication with train dispatcher is not required when excepted in rules 345 and 402, or in making switch movements within yard limits under the provisions of Rule 93 outside territory where Rules 400 to 406, inclusive, are in effect.

"Outside territory where Rules 400 to 406, inclusive, are effective, written flagging instructions of work extra flagman stationed at a Stop indication will govern in proceeding from such signal, but in no case will train exceed low speed."

When signals are to be taken out of service, operations of trains are governed by Rule 356, as follows:

"Taking signals out of service.—When emergency requires, ABS and mechanism for movement of trains and engines by block signals, may be taken out of service temporarily by use of train order, Form Z, where territory involved is more than 5 mi., until repairs can be made.

"Trains will be operated by timetable, train orders and rules governing such operation. ABS and rules governing movement by block signals will be considered suspended during the time specified and in territory designated.

"Block signal color lights must be extinguished by signal maintainer as soon as possible. Interlocking rules and interlocking signals are still effective. Trains must approach railroad crossing, draw-bridges, junctions, interlockings and first signal left in service, prepared to stop. Facing-point spring switches must be examined on the ground, by throwing over and back by hand. Remote control switches must be placed in hand operation. On dual-control switches, selector lever must be set in 'Hand' position, switch operated once by hand and left lined for the main track. At other remote control switches, the switch points must be spiked for main-track movement.

"Train order, Form X, must be issued prescribing such speed restriction of passenger trains and freight trains as will insure absolute safety.

"Even though ABS rules are suspended, a light burning Red, or semaphore arm in horizontal position, unless covered, on a block signal must be respected by train stopping, then proceeding at speed prescribed in Form X order.

"When the failure of communication in storms, etc., renders it impracticable to deliver train order, Form Z, to trains in ABS territory (not including territory where rules governing opposing and following movements by block signals are in effect), the superintendent, after specifying speed restrictions, may authorize trains having right or schedule, that permits them to proceed, to consider ABS rules suspended between specified block signals, and in such case all requirements of this rule except issuance of train order, Form Z, will be effective."

The Form Z, train order, referred to in Rule 356 is to be issued as follows:

"Taking Signals Out of Service"

"(1) Effective (Time) (Date) ABS temporarily discontinued from Signal No. at (Station) to Signal No. at (Station) Be governed by Rule 356.

"(2) Effective (Time) (Date) ABS and operation by block signals discontinued from Signal No. at (Station) to Signal No. at (Station) Be governed by Rule 356.

"(3) Order No. is annulled. ABS restored to service.

"(4) Order No. is annulled. ABS and operation by block signals restored to service.

"Example (1) will be used when discontinuing ABS. Example (2) will be used when discontinuing both ABS and operation by block signals. Example (3) or (4) will be used when restoration is made."

Manual Operation of Faulty Station

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In the case of code equipment failures, the controlled locations must be manually operated. In later equipment, facilities are provided to by-pass a faulty station, then manually operating only the station at fault. This greatly reduces the problem of providing operators because only the faulty location requires manual control.

In the case of line circuit wire

failures, the same procedure is necessary until the failure is sectionalized and corrected. With multiple line circuits the controlled station, located between the control machine and a line break, will operate. This also reduces the number of controlled locations at which manual operation must be provided until full service is restored.

Track Circuit Trouble

How would you proceed to locate trouble on a track circuit which gave evidence of being partially shorted to the extent that the relay would not pick up, but would hold up if once picked up?

Use Exploring Oil and Meter

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While the question implies that all necessary tests have been made to indicate a partial short on the track, a "trouble shooter" cannot afford to be satisfied with such evidence. If the relay has been disconnected, and an ammeter, connected in series with the track circuit, indicates considerable current flowing, or a meter reading across (bridging) the limiting resistance or reactance shows that there is still considerable current flowing to the track, then there is no doubt about the partial short. Is the loss of current ("leak") throughout the track circuit, such as might be caused by low ballast resistance, or is it concentrated at a given point, such as might be caused by defective insulation? By means of an "exploring coil" you can locate the latter, and make sure of the former because the coil reveals no concentrated "leak." You can also make a very careful inspection with a meter connected across the track while possible defective points are being tapped with a hammer. The tapping is likely to cause the reading of the meter to vary. A variation in the reading would indicate that the trouble is at the place being tapped.

If you have a Question, Kink or Answer you think would be of interest and help to others in the field, please write